Puget Sound Kelp Conservation and Recovery Plan: Status Update

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Prepared by the Northwest Straits Initiative

Northwest Straits INITIATIVE

partners in marine conservation

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Washington Sea Grant
Washington State Department of Natural Resources
Western Washington University
Whatcom County Marine Resources Committee

Cover Photo: Kelp forest. Image courtesy of Florian Graner.

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List of Acronyms

BACI	Before-After-Control-Impact
BWET	Bay Watershed Education Training
CWA	Clean Water Act
WA DNR	Washington State Department of Natural Resources
DOE	Washington State Department of Ecology
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FPIC	Free, prior, and informed consent
HPA	Hydraulic Project Approval
ISK	Indigenous Scientific Knowledge
NGO	Non-Governmental Organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
PSRF	Puget Sound Restoration Fund
ROV	Remotely Operated Vehicle
SMA	Shoreline Management Act
SMP	Shoreline Master Program
TEK	Traditional Ecological Knowledge
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington State Department of Fish and Wildlife
WSDA	Washington State Department of Agriculture
WWTP	Wastewater Treatment Plant

Puget Sound canopy-forming and understory kelp. Photo by Brooke Weigel.

I. Executive Summary

Puget Sound kelp forests face ongoing threats from human and climate-induced stressors, which has resulted in declines of canopy-forming kelp in South and Central Puget Sound. There is an urgent need to better understand kelp stressors, ecosystem function, and distribution/trends, and identify how to best protect and restore kelp forests, to reverse these trends.

The Puget Sound Kelp Conservation and Recovery Plan (Kelp Plan; Calloway et al. 2020; https://nwstraits.org/our-work/kelp/) is the result of a collaborative effort by diverse partners to co-create a vision and plan to conserve and recover kelp in Puget Sound. The Kelp Plan provides a research and policy framework consisting of goals and actions aimed at protecting and restoring Puget Sound kelp species and the ecosystem services they provide. Published in 2020, the Kelp Plan has guided the development and funding of projects, served as a summary of the state of the knowledge, and inspired regional initiatives and conservation plans. The Kelp Plan's call to action created a wave of momentum within the kelp community, which resulted in advancements in support of the conservation and recovery of Puget Sound's kelp forests.

This report summarizes progress made in early 2020 (noting that the Kelp Plan was published in May 2020) through early 2023 and provides workshop-generated needs and next steps to continue our collective progress towards accomplishing the Kelp Plan goals and actions. Part of charting a path forward includes understanding the work that has happened to date and how it has contributed to carrying out individual actions in the Kelp Plan. The process of information gathering and reflection included the development of an inventory of kelp projects in Puget Sound, and convening a workshop to generate a shared understanding of Kelp Plan status, lessons learned, and next steps.

In these first years of the Kelp Plan (through early 2023), there have been advancements in all Kelp Plan goals. Progress was most notable under Goal 3 (Distribution and Trends) and Goal 6 (Promote Awareness, Engagement, and Action). However, most of these early efforts will require on-going funding and support to fill in knowledge gaps, and some may be needed indefinitely to ensure long-term success of the Kelp Plan. Participants of the Kelp Plan Action Workshop identified that there is a natural sequence among the Kelp Plan goals and actions, and that further progress is anticipated within the other less advanced goals as we develop a strong foundation with activities involving monitoring and promoting awareness, engagement, and action.

Through discussions at the workshop, several over-arching themes emerged as areas of emphasis for future efforts, to bolster the broader kelp community's ability to collaborate and accomplish the goals of the Kelp Plan. These include:

- **Coordinate and Communicate for Cohesion**: Improve communication between kelp partners and workgroups to increase coordination and curtail redundancy.
- **Grow the Community:** Offer opportunities to build relationships and support diverse partnerships, including laying groundwork, engaging early on, and building trust with Indigenous communities and knowledge keepers.
- **Strengthen the Science and Policy Interface:** Improve linkages between research, policy, and management bodies to increase effectiveness of policies and regulations.

- **Share, Integrate, and Apply Research:** Target research that directly informs management planning and implementation, and create structures that support integration, synthesis, and information sharing.
- **Uplift the Understory:** Expand our focus and efforts to include understory kelp in all actions.

The Kelp Plan is a living document and will continue to be reviewed as necessary. A critical next step is the refinement of workshop-generated next steps and sequencing of actions within the Kelp Plan to support targeted funding and implementation of all Kelp Plan goals. The people and partnerships are the heart and driver of the Kelp Plan, and it is critical that we continue to work together to continue to support and progress Puget Sound kelp forest conservation and recovery.

II. Introduction

2.1. Kelp Plan Background

The Puget Sound Kelp Conservation and Recovery Plan (Kelp Plan; Calloway et al. 2020; https://nwstraits.org/our-work/kelp/) is a collaboratively developed, living document that embodies the motivation and vision of kelp enthusiasts throughout Puget Sound. The Kelp Plan provides a research and policy framework of coordinated goals and actions to advance Puget Sound kelp forest conservation and recovery. It is an urgent call to action to recognize and support kelp's critical role within the marine ecosystem and inspire collective movement.

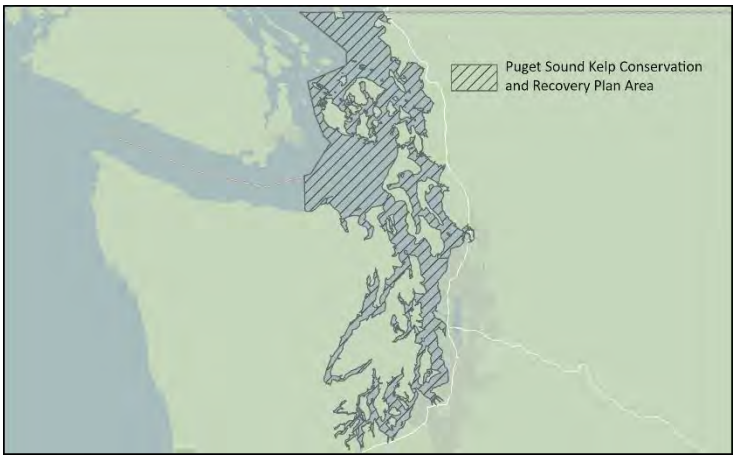

Figure 1. *Geographic scope (shaded area) of the Puget Sound Kelp Conservation and Recovery Plan.*

The Kelp Plan was published in 2020. Its geographic scope consists of Puget Sound, Georgia Strait, and the eastern Strait of Juan de Fuca (Figure 1). The Kelp Plan consists of six goals and 65 actions focused on kelp stressors, ecosystem value, distribution and trends, protection, restoration, and promoting awareness, engagement, and action. The Kelp Plan also acts as a summary of the state of the knowledge for kelp, containing the best available science up to 2020 (Kelp Plan, Appendix A; https://bit.ly/KelpAppA) and describing the cultural importance of kelp for Pacific Northwest Tribes (Kelp Plan, Appendix B; https://bit.ly/KelpAppB).

Since publication of the Kelp Plan, there has been substantial momentum from agencies, community groups, non-profits, Tribes, universities, and other organizations to advance the Kelp Plan's actions. With this momentum comes a need to improve organization and coordination to maximize efficiency and provide guidance in conserving and recovering Puget Sound kelp forests. This is especially important during these first years, so that we as a community continue to build a strong foundation and address the urgent actions of the Kelp Plan, to conserve and recover the vital kelp forests of Puget Sound.

2.2. Report Purpose and Development

The purpose of this report is to summarize advancements made within each of the six Kelp Plan goals from early 2020 to early 2023, and to report on the consensus-generated next steps from the Kelp Plan Action Workshop (see below) to help advance Kelp Plan actions. This report was developed to inform and guide kelp conservation coordination, funding, research, and management efforts in Puget Sound.

Development of this report began in June 2022, and was guided by the Kelp Plan Coordination Advisory Committee and the Kelp Plan Action Workshop Committee (see Authors and Contributors). The developmental process began with the creation of an inventory of Puget Sound kelp-related projects that were active in 2020 through 2022 (Appendix B), to better understand how the Kelp Plan was being addressed. An online survey was shared with over 350 individuals and organizations directly or indirectly involved with kelp within the Puget Sound region to populate the inventory and collect project details and their connections to the Kelp Plan actions. Over 80 projects were included in the inventory, although the inventory likely did not capture all projects contributing to the goals of the Kelp Plan during this timeframe.

A two-day workshop (i.e., Kelp Plan Action Workshop) was convened on March 1-2, 2023, with 46 key Puget Sound kelp partners and stakeholders (see Appendix A). The purpose of the workshop was to collectively evaluate the status of the Kelp Plan actions and generate a list of next steps from participants. Participants were grouped into Kelp Plan goal-based teams and charged with reviewing and updating the action status scores developed by the Kelp Plan Coordination Advisory Committee (using predefined categories presented in Table 1, the kelp project inventory, and participants' personal knowledge). Participants were also asked to identify and rank lessons learned related to each action cluster (i.e., groupings of similar actions/subactions) and next steps. A summary of the workshop results is presented in Section III. Workshop notes are presented in Appendix A.

Table 1. *Kelp Plan action status scoring categories and definitions. Scores are presented numerically (1-4) and/or visually by color and convey general status, not quantitative metrics.*

Score	Definition
Not started (1)	*Action has not been started/no progress has been made*
Off track (2)	*Action started but no strong movement forward; action not likely to be accomplished without a substantial increase in effort (e.g., new projects, large scale-up of pilot or small projects)*
Progressing (3)	*Action moving forward and likely to be achieved with time and a minor to moderate increase in effort of projects (e.g., adding species, adding locations, increasing engagement, etc.)*
On track (4)	*Action completed OR current ongoing efforts will achieve intended action with time*

III. Plan Goals and Actions Status Summary and Workshop-generated Next Steps

3.1. Overview

The Kelp Plan has become a center point in Puget Sound kelp conservation and recovery, and proven to be a valuable summary of the state of the knowledge, guide, justification, and springboard for kelp projects. Advancements were made in early 2020 to early 2023 under each of the six Kelp Plan goals (Table 2). Progress was most notable under Goal 3 (Distribution and Trends) and Goal 6 (Promote Awareness, Engagement, and Action) (Table 2). It is important to note that many of these early efforts will require on-going funding and support to fill in knowledge gaps, and some may be needed indefinitely to ensure long-term success of the Kelp Plan. Participants of the Kelp Plan Action Workshop identified that there is a natural sequence among the Kelp Plan goals and actions, and that further progress is anticipated within the less advanced goals as we develop a strong foundation with activities involving monitoring and promoting awareness, engagement, and action.

Table 2. *Kelp Plan goal status table. Mean score: Mean status score of actions within each respective goal. Status scores were rounded to nearest integer for classification; # actions: Number of actions in goal; % actions started: Percentage of actions within respective goal with a score of >1 (i.e., orange = 2, yellow = 3, or green = 4).*

Goal	Mean score	# actions	% actions started
1: Stressors	1.9	21	71%
2: Ecosystem Value	1.8	5	80%
3: Distribution and Trends	3.1	10	100%
4: Protection	2.0	5	80%
5: Restoration	2.0	13	77%
6: Promote Awareness, Engagement, and Action	3.1	11	91%

Through discussions at the workshop, several over-arching themes emerged as areas of emphasis for future efforts, to bolster the broader kelp community's ability to collaborate and accomplish the goals of the Kelp Plan. These include:

- **Coordinate and Communicate for Cohesion:** Improve communication between kelp partners and the community of networks to increase coordination and curtail redundancy.
- **Grow the Community:** Offer opportunities to build relationships and support diverse partnerships including laying groundwork, engaging early on, and building trust with Indigenous communities and knowledge keepers.
- **Strengthen Science and Policy Interface:** Improve linkages between research, policy, and management bodies to increase effectiveness of policies and regulations.
- **Share, Integrate, and Apply Research:** Target research that informs management planning and implementation, and create structures that aid integration, synthesis, and information sharing.
- **Uplift the Understory:** Expand our focus and efforts to include understory kelp in all actions.

Marine Resources Committee volunteer monitoring a Puget Sound kelp bed. Photo by Rich Yukubousky.

3.2. Kelp Plan Action Status, Lessons Learned, and Recommended Next Steps

The following is a summary of the action status, lessons learned, and next steps generated at the Kelp Plan Action Workshop for each Kelp Plan goal, and provides a few examples of recent advancements and projects that occurred in each goal (see Appendix B for a list of known 2020-2022 Puget Sound kelp projects). Actions in the presented tables are marked with a color representing the status score of the action (see Table 1). These scores represent the perceived status of the action and do not represent the value or quality of the projects addressing the actions. Action status was noted to be more advanced for canopy-forming (or floating) kelp than understory kelp (as defined in the Kelp Plan) for some actions, and is noted in the tables when applicable (denoted by an *). Presented lessons learned and next steps represent the top/prioritized comments (as selected by workshop teams) or a composite of similar comments from workshop participants, and will be further synthesized at a later date. Lessons learned are presented for most individual actions (e.g., 1.1) or action clusters, which for this report refers to groupings of an action with its respective subaction/s (e.g., 1.6 and 1.6.1). All lessons learned and next step comments generated at the workshop are provided in Appendix A.

Goal 1. Understand and Reduce Kelp Stressors

Goal 1 and its actions within the Kelp Plan call for additional research into the effects of individual and cumulative stressors on kelp populations at multiple scales, and for managers to apply adaptive management to reduce stressors.

Our understanding of kelp stressors has advanced, but knowledge gaps on stressor information persist and there are often disconnects between research, policy, and management, making implementation of protection policies and regulations difficult. In 2021, the Kelp Policy Advisory Group was established to explore challenges, gaps, and opportunities for improving the implementation of existing rules and regulations. Recent research and syntheses have started to improve our understanding on the effects of temperature, nutrients, acidification, sedimentation, and small overwater structures (Lambert et al. 2023) on predominately bull kelp (*Nereocystis luetkeana*). For example:

- Hollarsmith et al. (2022) developed a conceptual framework for managing and conserving marine habitats in data-poor systems, using Salish Sea kelp forests as a case study.
- Rubin et al. (2023) documented the long-term (10+ years) response of kelp to stressors instigated from the removal of a dam.
- Several studies at the University of Washington have been investigating effects of temperature, nitrogen, and/or acidification on sporophyte and gametophyte bull kelp and/or sugar kelp (*Saccharina latissima*) from throughout Puget Sound (e.g., Weigel et al. 2023; Figure 2).
- New long-term, multisensor monitoring stations have been deployed throughout the Salish Sea by various agencies, non-profits, and Tribes for the purpose of furthering our understanding of abiotic stressors on kelp forests.

Figure 2. *University of Washington kelp stressor research. Photo by Robin Fales.*

Goal 1 has progressed in early 2020 to early 2023, but most of its actions need substantial support and effort to get “on track”. The status, key lessons learned, and key next steps of Goal 1 actions are presented in Table 3.

***Table 3**. Goal 1: Understand and reduce kelp stressors status, lessons learned, and next steps. Grayed cells represent when no lessons learned or next steps were provided for an action. Lessons learned are provided for action clusters (defined in section 3.2) when present. Table continued through page 13.*

Action and Status	Lessons Learned	Next Steps
1.1. Form interagency workgroups to increase collaboration and information sharing across management organizations to improve implementation and to address policy gaps. **On track (4)**	• There is a lot of momentum and progress in kelp conservation, which now requires organization and coordination to communicate and synthesize for policy use and implementation	• Clarify authorities related to kelp habitat and conservation • Continue Kelp Policy Workgroup and share information with researchers and policy makers • Identify and share information on workgroups
1.2. Inform future management actions through continued research on the impacts of current and historical human activities on kelp forests (e.g., nutrient and sediment loading thresholds and impacts, turbidity effects on kelp recruitment, substrate availability, and impacts from recreational and commercial boating activities). **Off track (2) ***	• Research and management discussions need to be more inclusive (currently siloed) • Current management actions are not meeting goals, need clear linkage between research, management, and policy • Research is advancing, but there is a need to identify and fill gaps, and ensure findings are published • Non-local data can be used to fill data gaps where appropriate and until local data is available (e.g., Hollarsmith et al. 2022)	• Increase avenues for sharing among researchers, managers, and enforcement • Increase applied, management-focused research (e.g., effects of sedimentation, substrate, nutrients, boating on kelp) • Scale-up and collocate studies to include multiple stressors • Identify stressor data gaps and prioritize research on stressor thresholds/impacts • Include co-development of research and management as funding opportunity goal
1.3. Identify priority stressors that negatively affect Puget Sound kelp on a sub-regional scale to target management actions. **Off track (2) ***		• Investigate compounding effects of stressors on kelp • Include understory kelp in stressor research
1.4. Fully implement and enforce available protections for kelp through existing regulations, programs, and policies (e.g., DOE SMA Guidance, Local SMPs, WDFW HPA, DNR Aquatic Use Authorizations, mitigation programs, NMFS ESA and EFH consultations). **Off track (2)**	• A disconnect between research, policy, and management is restricting flow of information. Best available science is needed to improve regulations • It has been difficult to implement regulations before the local science is available	• Create educational materials to clarify regulations and terms (e.g., Shoreline Design Guidelines) • Crosswalk best available science (WAC 365-195) with regulatory information gaps • Create educational materials to clarify language in SMA and WAC, which include protections for kelp

Action and Status	Lessons Learned	Next Steps
1.4.1. Fully consider kelp in programs that respond to and prevent chemical and oil spills (e.g., DOE Geographic Response Planning). **Off track (2)**	• WA Aquatic Reserves may be useful for long-term monitoring of adaptive management/protected areas (1.4.3) • Action 1.4.3 is a key step to many actions in Kelp Plan	
1.4.2. Develop tools to support planners' ability to review/access policy regulations that assist in decision-making. **Off track (2)**		
1.4.3. Develop and implement long-term research and monitoring actions using rigorous scientific and adaptive management principles to determine the effectiveness of current regulations and protection actions. **Not started (1)**		
1.5. Increase protection by addressing key gaps in existing regulations and implementation programs. **Off track (2)**	• Important to distinguish between kelp aquaculture for harvest vs restoration in discussing, developing, and undertaking kelp aquaculture permitting process (1.5.4) • There is a lot of talk that needs to be followed with funded action to protect kelp • Kelp conservation and recovery science as well as the seaweed aquaculture industry have similarities and may be able to address common information gaps	• Develop regulatory implementation pathways
1.5.1. Improve kelp-specific mitigation guidance and implementation. **Off track (2)**		• Include cumulative impacts of stressors and kelp services in mitigation guidance • Investigate ways to improve NOAA's Nearshore Calculator with updated research
1.5.2. Add an explicit reference to kelp in existing regulations that include kelp protection but do not reference kelp specifically. (e.g., CWA Section 404 definition of Vegetated Shallows, DNR's definition of submerged aquatic vegetation, and WDFW's Priority Habitats and Species list). **Not started (1)**		• Identify existing regulations that are important to kelp conservation and restoration actions that need language updates

Action and Status	Lessons Learned	Next Steps
1.5.3. Update survey guidelines and foster coordination among the organizations that conduct site-level surveys, such as the WDFW Macroalgae Habitat Interim Survey Guidelines and the Coastal Zone Training Program. **Off track (2)**		• Create continuity between WDFW (preconstruction) and WA DNR (during lease) surveys, and use them in a BACI design • Develop survey training for consultants, regulators, etc.
1.5.4. Form an interagency workgroup to review the kelp aquaculture permitting process and develop best management practices, such as cultivating native species, avoiding the spread of pathogens, and avoiding the use of harmful pesticides and other chemicals. **Not started (1)**		• Consider including cultivation sector in conservation and research discussions • Identify potential environmental pros/cons associated with kelp aquaculture
1.6. Reduce anthropogenic nutrient and sediment loading (e.g., stormwater and WWTP permitting, and TMDL planning). **Off track (2)**	• Some nutrient reduction is occurring, but sediment reduction needs attention (1.6) • Information on the impacts of nutrients and sediments on kelp requires further clarity, which can be sourced outside of Puget Sound (1.6) • Most Salish Sea nutrients are oceanic in origin (1.6.1)	• Incorporate upland nutrient and sediment loading in corrective actions (e.g., modular wetlands) • Update TMDL planning for kelp (based on riparian TMDL and habitat wide exposure) and improve enforcement (e.g., on wastewater treatment plant permits)
1.6.1. Coordinate and share research with the Nutrient Reduction Program planning and implementation program, led by the DOE. **Not started (1)**		• Identify what nutrients are beneficial/detrimental to kelp and integrate into TMDL planning
1.7. Support sustainable kelp harvest by informing recreational harvesters about regulations and sustainable kelp harvest methods. **Off track (2)**	• Outreach for kelp harvest regulations/technique needs to be clearer, better promoted, and tested • Important to increase state agency coordination/ communication to improve recreational kelp harvest education and enforcement	• Develop registration system to track recreational kelp harvests • Continue to develop and improve accessibility of recreational kelp harvest regulations/enforcement information and sustainable kelp harvest practices

Action and Status	Lessons Learned	Next Steps
1.8. Strive to incorporate kelp and other trophic considerations into fisheries management planning. **Off track (2) ***	• There is a disconnect between research and management related to fisheries and trophic interactions with kelp	• Research fishery species abundance in understory vs. canopy-dominated areas • Connect fisheries managers with researchers investigating kelp ecosystem services (e.g., include management in kelp research workgroups) and clarify how to incorporate findings
1.9. Explore invasive macroalgae (including *Sargassum muticum* and *Undaria pinnatifida*) control alternatives, ecological roles, and long-term management considerations related to climate change. **Not started (1)**	• Volunteer and community groups can be high value resources in distribution studies of invasive seaweed • Knowledge outside of Puget Sound (e.g., Channel Islands removal study) can be leveraged for local use • WA DNR's Aquatic Reserves with invasive macroalgae may be useful areas for action 1.9 research	• Collect data on ecological role, distribution, etc. of invasive seaweeds, and run pilot studies on effects of sargassum removal and herbivory • Educate and engage diverse groups (e.g., volunteers) to document and track invasive seaweeds • Develop an invasive seaweed action plan
1.10. Investigate climate change impacts to improve management decisions, such as prioritizing locations for kelp protected areas, restoration sites, and mitigation activities. **Progressing (3) ***	• Long-term planning and improved linkage with management is important for kelp-related climate change management and site prioritization for kelp protection, restoration, and mitigation (1.10) • Information on historical kelp trends and distribution, and kelp resilience is needed but lacking in many locations (1.10) • There is a need for greater communication in climate change discussions between regulatory entities and those managing climate impacts on kelp (1.10.1) • Management of protected areas for kelp and kelp restoration is moving faster than the related science	• Document historical and contemporary kelp distribution to better understand temporal changes and potential climate change impacts • Study "undisturbed" beds (e.g., in aquatic reserves) and beds in unique circumstances (e.g., Elliott Bay) to inform mitigation/restoration targeting areas of resilient kelp • Expand research on effects of climate change on kelp growth, survival, and reproduction at local and regional scales • Coordinate management with researchers to provide researchers with a list of prioritized knowledge gaps needed for local climate change mitigation

Action and Status	Lessons Learned	Next Steps
1.10.1. Include kelp habitat in regional and local climate adaptation strategies and planning. **Not started (1)**	• It is important to use science-based information when discussing climate-mitigating abilities of kelp	• Identify and approach climate adaptation plans that do not mention kelp to explore possibility of including kelp
1.11. Investigate local effects within kelp beds on seawater chemistry (Pfister et al. 2019) and consider potential management opportunities for these benefits. **Off track (2)**	• Interspecies and flow regime differences can complicate assessments of kelp and water chemistry interactions	• Research kelp's influence on seawater chemistry in varying flow regimes • Conduct lab studies on effects of canopy-forming and understory kelp on seawater chemistry
1.12. Investigate the development of temperature-tolerant strains of native kelp species for potential use in restoration and mitigation outplanting. **Off track (2) ***	• Consider precautionary principles, including differences between kelp strains, when outplanting	• Investigate effects of introducing new strains of kelp on native stocks

* Action status of canopy-forming kelp is greater than understory kelp

Goal 2. Deepen Understanding of the Value of Kelp to Puget Sound Ecosystems and Integrate into Management

Goal 2 of the Kelp Plan calls for improving our understanding of the role of kelp in the essential ecosystem services of Puget Sound to support regulatory actions that will better protect kelp and enhance our ability to advocate for kelp conservation.

Our understanding of the ecosystem value of kelp has advanced, but this information has often not been integrated into management plans. Recent research has predominately consisted of snorkel, SCUBA, and/or remotely operated vehicle (ROV) surveys by agencies, non-profits, Tribes, and universities, to monitor the occurrence of select taxa (e.g., forage fish, salmonids, invertebrates) in association with kelp forests. Other work assessed dietary connections between kelp and marine species, or functionality of kelp microbiomes. For example:

- Coastal Watershed Institute and partners explored ecosystem linkages between kelp forests, forage fishes, and juvenile salmonids using snorkel surveys (Shaffer et al. 2023).
- Researchers at the University of Chicago investigated the functional role of bull kelp microbiomes from metagenome-assembled genomes (Weigel et al. 2022).
- National Oceanic and Atmospheric Administration (NOAA) investigated the dietary connection between primary producers, including kelp, and 18 marine consumers using stable isotopes.

Fish inhabiting kelp forest. Photo by Florian Graner.

Goal 2 has progressed in early 2020 to early 2023, but all of its actions need substantial support and effort to get them “on track”. The status, key lessons learned, and key next steps of Goal 2 actions are presented in Table 4.

Table 4. *Goal 2: Deepen understanding of the value of kelp to Puget Sound ecosystem and integrate into management status, lessons learned, and next steps. Lessons learned are provided for action clusters (defined in section 3.2) when present.*

Action and Status	Lessons Learned	Next Steps
2.1. Determine and quantify functional roles of kelp habitats for associated species and provide guidance to managers for regulatory implementation, such as endangered species habitat conservation. **Off track (2) ***	• Ecosystem services and functional roles of local kelp are unclear, and need to be defined to progress actions • Comprehensive spatially diverse sampling is valuable in understanding ecosystem functions of kelp • Many associated species (e.g., killer whales, salmonids) are very seasonal and monitoring location and methods will need to account for this • Important to incorporate Tribal input in determining ecosystem functions of kelp	• Synthesize and translate functional roles of kelp using terms that are useful to regulators (e.g., hydrologic, geomorphic, biological, and water quality functions) • Define shared research and management goals related to kelp functional roles/values
2.1.1. Monitor the use of kelp forests as nurseries, migration corridors, refuges, and high-quality forage grounds for salmonids, rockfish populations, forage fish, pinto abalone, and killer whales. **Off track (2) ***		• Identify key research or policy questions needed to be answered by monitoring role of kelp habitat and ecosystem services • Identify key kelp forests for habitat use monitoring
2.1.2. Utilize local ecological knowledge to assess the value of kelp forests as fishing areas. **Off track (2)**		• Synthesize sound wide fishing (e.g., salmon) and kelp connections using local ecological knowledge • Develop map with location of kelp forest and common fishing grounds
2.1.3. Use isotopic and biochemical analysis of Puget Sound species and other tools to assess kelp contributions to nearshore, deep water, and terrestrial food webs. **Off track (2)**		• Scale-up isotopic analyses to include multiple sub-basins, seasons, and primary producers to assess variations that occur between kelp beds, life stages, and species
2.2. Calculate the value of kelp ecosystem services for use in developing mitigation guidance. **Not started (1)**	• Ecosystem services and functional roles of kelp are unclear, and need to be defined to progress actions	• Define how ecosystem services of kelp are used in mitigation and identify gaps • Investigate opportunities to fine-tune NOAA's Nearshore Calculator with updated best available science • Work with economists and social scientists on valuation of kelp ecosystem services

*Action status of canopy-forming kelp is greater than understory kelp

Goal 3. Describe Kelp Distribution and Trends

Goal 3 of the Kelp Plan calls for expanded and up-to-date information on distribution and trends of canopy-forming and understory kelp to inform planning, detect kelp loss and link changes to stressors, and track regional kelp resources.

Boat and aerial monitoring of kelp extent by agencies, community groups, non-profits, and Tribes has started to improve our understanding of canopy-forming kelp distributions and trends, but has left much unknown about understory kelp. Data from many surface monitoring efforts have been integrated with historical data and other ways of knowing into Washington State Department of Natural Resources' (WA DNR) Washington State Floating Kelp Indicator for the Puget Sound Partnership's Vital Signs. Few understory kelp monitoring projects existed before 2020 (e.g., Rubin et al. 2023), but efforts have increased since and include SCUBA, ROV, and towed underwater video surveys. For example:

- The Eyes on Kelp Initiative, led by Puget Sound Restoration Fund (PSRF), established understory kelp index sites monitored by multi-sensor logger stations, dive surveys, and ROV surveys. As part of this effort, Reef Check Foundation and partners established a network of volunteer divers to survey understory kelp sites throughout Washington (Figure 3).
- The Seattle Aquarium and Samish Indian Nation have been using and assessing ROVs for subsurface kelp monitoring.
- WA DNR conducted underwater video tows in 2019-2021 across the nearshore of greater Puget Sound and are using this footage to assess spatial and depth distribution of several broad groups of marine vegetation, including understory kelp at individual sites and region-wide.

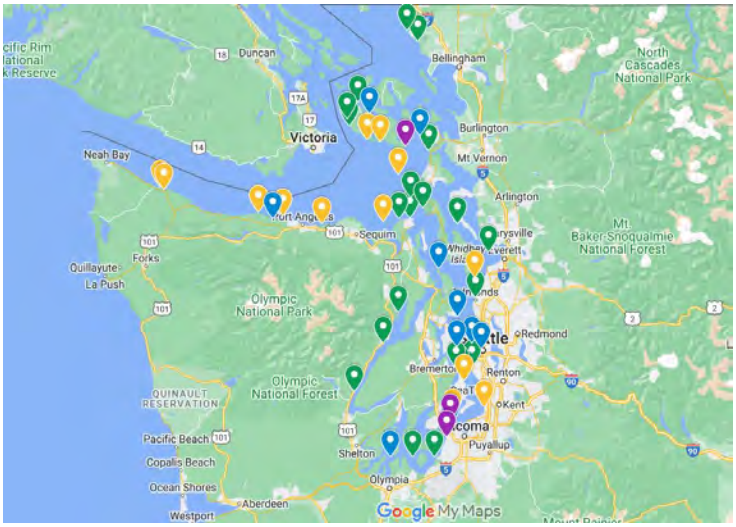

Figure 3. *Reef Check Foundation's and partners' planned 2023 SCUBA survey sites. Provided by Reef Check Foundation.*

There has been substantial progress in Goal 3 in early 2020 to early 2023, and most of its actions need minor to moderate additional effort to get "on track" or are already "on track". Even so, it may take years for current efforts to fill critical information gaps on distribution and trends, and for the actions to reach their intended stage. Monitoring will be required indefinitely, in part, to track success of other goals. The status, key lessons learned, and key next steps of Goal 3 actions are presented in Table 5.

Table 5. *Goal 3: Distribution and trends status, lessons learned, and next steps. Grayed cells represent when no lessons learned or next steps were provided for an action. Lessons learned are provided for action clusters (defined in section 3.2) when present. Table continued through page 19.*

Action and Status	Lessons Learned	Next Steps
3.1. Update and expand information on the current extent of canopy-forming and understory kelp. **Progressing (3) ***	• Canopy-forming kelp is easier to work with as it is more accessible and has more public support • Important to develop realistic, standardized, and modular (e.g., adaptable to location, condition, kelp characteristics) protocols that can reliably detect trends • Many surface monitoring protocols only assess canopy-forming kelp trends using kelp bed area • Local technology industry is interested in assisting with technology related monitoring efforts (e.g., ROVs)	• Develop and standardize understory monitoring protocols (e.g., ROV, stationary video surveys) • Assess if understory correlates with canopy-forming kelp or something else to assist with understanding understory distribution and trends • Explore areas and means to strengthen current canopy-forming monitoring protocols to reliably captures changes in kelp bed health
3.2. Make distribution and trends data available to agencies and the public for use in spatial planning, project planning, and regulatory implementation. **Progressing (3)**	• Data integration, accessibility, and sharing can be improved	• Standardize/coordinate data collection efforts and data integration strategy (make accessible) • Link kelp bed extent and trend data to management guidance materials • Provide kelp distribution as a GIS layer
3.3. Coordinate and expand efforts to strategically monitor canopy-forming and understory kelp throughout Puget Sound and build collaborations between organizations. **Progressing (3) ***	• One protocol won't answer all questions (3.3.2) • Coordinating monitoring and collating data is a heavy lift due to the number of organizations involved • Capacity is a hurdle for data integration • Canopy-forming kelp monitoring has progressed more than understory kelp	• Pair prioritized site selection for a subset of monitoring sites (index sites) with expanded understory monitoring throughout all basins
3.3.1. Continue and expand surface monitoring of Puget Sound canopy-forming kelp. **On track (4)**		

Action and Status	Lessons Learned	Next Steps
3.3.2. Develop Puget Sound-specific subtidal monitoring protocol, and establish a network of partners conducting subtidal kelp index site monitoring (e.g., Reef Check, PSRF). **Progressing (3)**		• Hold workshop for development of subtidal monitoring protocols that focus on data gaps in kelp-related ecology • Conduct a methodological comparison between subtidal survey platforms to maximize respective strengths
3.3.3. Encourage compatibility among protocols to support data synthesis, linking ecological functions, and relationships to local stressors. **Progressing (3)**		• Develop data collection, management, and synthesis plan for subtidal monitoring, which includes full data life cycle and encourages public access of protocols, code, and data when appropriate • Develop ecological stressor monitoring protocol that is useful and easy to use • Determine questions that need to be addressed to determine data synthesis needs
3.3.4. Collaborate with the Puget Sound Partnership to expand the eelgrass Vital Sign to incorporate kelp indicators (such as kelp canopy area and understory kelp distributions). **Progressing (3) ***		• Fund and develop understory kelp indicator
3.4. Expand understanding of historical distributions and trends by compiling historical information sources and exploring traditional ecological knowledge. **Progressing (3) ***	• Important to identify which research methods can be used to incorporate different sources of historical information • Collaboration across region/borders/agencies/Tribes is essential	• Locate and digitize historical maps with marked kelp beds • Continue to partner with Indigenous knowledge keepers, and expand studies and integration of TEK/ISK and other ways of knowing to guide policy, restoration, and conservation • Assess the value of historic understory kelp data, and if warranted, develop methods to determine historical distribution

Action and Status	Lessons Learned	Next Steps
3.5. Identify the genetic structure of kelp populations, including connectivity, dispersal, and population dynamics. **Off track (2) ***		• Move forward (e.g., develop plan and designate leads) with genetic work on understory kelp • Until local data are available, incorporate non-local kelp genetic knowledge to inform local efforts, when appropriate
3.6. Form a research and monitoring workgroup to increase collaboration and information sharing across organizations. **On track (4)**	• There is confusion about who is doing what, we need a centralized "Super Group" to improve communication • Time and effort are needed to build relationships and trust • Coordinators can help build trusting relationships with Tribes through learning about TEK/ISK and FPIC	• Consolidate/coordinate existing workgroups to improve efficiency • Develop webpage or newsletter to archive workgroup activities • Include dive groups in research and monitoring workgroups

* Action status of canopy-forming kelp is greater than understory kelp

Goal 4. Designate Kelp Protected Areas

Goal 4 of the Kelp Plan calls for increasing and strengthening protections for kelp, including establishment of priority kelp areas to support local and regional kelp conservation efforts. Protection also includes promoting sustainable recreational kelp harvest and assessing potential impacts and management needs.

Some protection has been granted to kelp (e.g., Aquatic Reserves), but have often been constricted by limited best available science, awareness, and enforcement. Recent efforts are working towards increased and strengthened kelp protections by identifying and establishing kelp protection zones, and continued promotion of educational material to inform the public about sustainable recreational kelp harvest practices. For example:

- The Washington State Legislature passed Senate Bill 5619 in 2022. Through this bill, WA DNR will develop the Washington State Kelp Forest and Eelgrass Meadow Health and Conservation Plan to protect and conserve at least 10,000 acres of kelp and eelgrass in Washington by 2040.
- WA DNR established a 2,300-acre Kelp and Eelgrass Protection Zone in Snohomish County as part of the 2022 Watershed Resilience Action Plan (Figure 4).
- San Juan County's Marine Stewardship Area Plan is being updated to assist with kelp protection.

Figure 4. *Snohomish Watershed Kelp and Eelgrass Protection Zone (blue polygons). Provided by WA DNR.*

Goal 4 has progressed in early 2020 to early 2023, but most of its actions need substantial support and effort to get "on track". The status, key lessons learned, and key next steps of Goal 4 actions are presented in Table 6.

Table 6. *Goal 4: Designate kelp protected areas status, lessons learned, and next steps. Lessons learned are provided for action clusters (defined in section 3.2) when present. Table continued on page 22.*

Action and Status	Lessons Learned	Next Steps
4.1. Protect kelp habitat in existing and new reserves, refuges, and protected areas. **Progressing (3)**	• Some mechanisms of protections are established (e.g., WA DNR Aquatic Reserves) but need to be enforced to be effective • Outreach and engagement of the public, Tribes, and other stakeholders is key and can be done before protection to increase buy-in • Existing protections are not comprehensive for all stressors	• Define, expand (e.g., Tribal marine stewards network, water quality, fisheries regulations, harvesting, anchoring), and increase awareness of place-based tools that protect kelp • Work with agencies to get consistent, place-based regulations • Identify kelp stressors to understand where and how to protect existing kelp • Define metrics of preservation success (base off ecosystem services) and monitor effectiveness of protection
4.1.1. Increase the protection of existing kelp forests through organizations like DNR and USFWS. **Off track (2)**		
4.1.2. Use withdrawal letters and set standards for lease agreements to ensure the protection of kelp forests (DNR). **Off track (2)**		• Identify/develop protective tools and educate landowners and land managers on them • Apply lessons learned from Snohomish protection zone to future withdrawal letters
4.2. Assess the extent of recreational kelp harvest and its potential impacts, and develop spatial management plans and strategies to reduce potential impacts from projected kelp harvest activities. **Off track (2)**	• Enforcement and outreach of recreational harvest regulations can be improved, and may benefit from use of license fees and exploration of enforcement capacity expansion • It is difficult to estimate live versus beach wrack kelp harvest • Interest is growing in recreational kelp harvest; it is important to develop plans and strategies to reduce impacts now	• Use environmental justice lens in recreational harvest planning • Strengthen/promote sustainable kelp harvest techniques and regulation outreach • Develop reporting platform for recreational kelp harvest (e.g., add kelp harvest reporting item to WDFW catch record cards) • Coordinate with Tribes to assess kelp harvest amounts • Add kelp endorsement fee on shellfish license

Action and Status	Lessons Learned	Next Steps
4.2.1. If necessary, identify priority enforcement needs relating to permits and recreational harvest activities to support existing protections. **Not started (1)**		• Clarify roles and authorities for recreational kelp harvesting (e.g., state owned vs. private land, live kelp vs. wrack kelp) • Explore possibility of increasing number of enforcement officers

Goal 5. Restore Kelp Forests

Goal 5 of the Kelp Plan calls for identifying priority restoration sites, focusing on a total-ecosystem approach for restoration efforts, and monitoring and assessing effectiveness of restoration and mitigation efforts to reestablish persistent kelp forests.

Kelp forest restoration techniques and best practices are being developed and tested in Puget Sound. Recent research efforts by non-profits and Tribes made great strides in development of kelp (primarily bull kelp) restoration methods. For example:

- PSRF and Tribal partners continued to trial bull kelp enhancement, primarily through seed transfers (Figure 5).
- PSRF built laboratory capacity to propagate kelp seed and host a Washington seed bank (for ex-situ conservation of genetic diversity), which was started by the University of Wisconsin-Milwaukee and will be populated by various partners, such as the Jamestown S'Klallam Tribe.
- PSRF and University of Wisconsin-Milwaukee started a genomic analysis of bull kelp to detect putative local adaptations and infer population dynamics history.

Figure 5. *PSRF deploying seeded line during kelp restoration trials. Photo by Gray McKenna.*

There has been good progress with Goal 5 in early 2020 to early 2023, with a few actions needing minor to moderate additional effort to get "on track" but which still may require years to be completed or reach their intended stage. However, the majority of actions require substantial support and effort. The status, key lessons learned, and key next steps of Goal 5 actions are presented in Table 7.

Table 7. *Goal 5: Restore kelp forests status, lessons learned, and next steps. Grayed cells represent when no lessons learned or next steps were provided for an action. Lessons learned are provided for action clusters (defined in section 3.2) when present. Table continued through page 26.*

Action and Status	Lessons Learned	Next Steps
5.1. Develop a spatial plan identifying regions and sites for priority restoration actions and mitigation. **Progressing (3)**	• Permitting process for restoration is difficult, especially when adding infrastructure, and could be streamlined (5.1) • There is a lack of consideration for upland stressors (5.1.1) • There is a lack of information on recruitment limited sites and recruitment limitations of kelp (5.1.2) • USACE only has mitigation banks for wetlands • Ecosystem based management can help to avoid or reduce the likelihood of unintended consequences from restoration and mitigation • Across scale-dialogue should be included in restoration plans (e.g., regional plan, local implementation)	• Synthesize and map stressor, geological, etc. data and consider protective status of an area to assess priority restoration sites • Define conservation vs. restoration • Use historical presence, Tribal use/access, etc. to help identify priority sites
5.1.1. Target management actions that reduce stressors at priority restoration sites. **Off track (2)**		• Identify hurdles to stressor management • Include land-based and freshwater partners in stressor management talks
5.1.2. Reintroduce kelp through outplanting at sites that are recruitment limited. **Not started (1)**		• Streamline/fast-track permitting process for restoration process (WSDA pre-permitting projects) • Research recruitment barriers via eDNA, ROV, etc. • Develop database of existing and recommended outplanting sites • Develop zoospore disbursement model
5.1.3. Develop a mitigation bank of priority locations for kelp enhancement and restoration projects, and for when in-situ mitigation is not viable. **Not started (1)**		• Develop database of mitigation banking sites
5.2. Continue development of kelp restoration techniques for use in enhancement projects and mitigation. **Progressing (3) ***	• We can leverage non-local restoration protocols and information as we develop local comparative data (5.2.2) • It is important for genetic research to keep pace with seed banking (5.2.4)	• Include methods for tackling multiple ecological contexts (e.g., competition, predation) in restoration tools • Share restoration protocols with agencies, Tribes, etc. • Focus on applied research, using pilot studies to vet methods, and materials

Action and Status	Lessons Learned	Next Steps
5.2.1. Develop best management practices for designing, installing, and maintaining compensatory mitigation sites and restoration projects. **Off track (2) ***	• Restoration permitting process is difficult and may be expedited through agency coordination • Important to assess the potential role of enhancement techniques (e.g., introducing artificial anchoring spots for kelp)	• Compile lessons learned from restoration projects and discuss in management forum to find shared standards
5.2.2. Define measurable project success standards to include ecosystem goods and services and long-term persistence of kelp forest. **Progressing (3) ***		
5.2.3. Develop monitoring protocols to verify project success/compliance. **Off track (2) ***		• Standardize monitoring protocols, when appropriate, for use in multiple projects
5.2.4. Support the development of local kelp seed banks for use in genetically appropriate restoration. **Off track (2) ***		• Expand research on Puget Sound kelp genetics to inform seed bank development
5.3. Fund and implement restoration activities at priority sites. **Off track (2) ***	• It is important to use historical baselines and biogeomorphological processes for strategic restoration site selection (5.3) • It is important to include land-based and freshwater partners linked to stressors in meetings and workgroups to potentially tap into additional funding sources for upland stressor reduction (5.3.1) • Funders may require information on basic research or proof of concept that are being undertaken and not yet available (5.3.1, 5.3.2)	• Integrate kelp recovery targets into other recovery plans • Synthesize sequence for restoration, including testing • Define restoration vs. conservation vs. mitigation • Leverage partnerships for joint funding opportunities
5.3.1. Target restoration-funding sources for stressor reduction and population enhancement projects. **Off track (2)**		• Publish "Restoration Guide" to inform funders of restoration process and information • Include upland stressor managers at restoration meetings to identify additional funding sources
5.3.2. Reach out to restoration funding sources to include funding for kelp restoration. **Off track (2)**		• Approach agricultural funding (e.g., USDA) for restoration

Action and Status	Lessons Learned	Next Steps
5.3.3. Use compensatory mitigation as a tool to restore goods and services provided by kelp forests. **Not started (1)**	• Non-traditional funders might be more open to fund projects with scientific uncertainty (5.3.1, 5.3.2) • Companies are asking for mitigation options, but guidelines and opportunities are lacking (5.3.3) • Partnering with marinas, parks, and cities may provide compensatory mitigation opportunities and funding (5.3.3)	• Create list of how developments can impact kelp • Develop database of sites and programs (e.g., marinas, parks) using compensatory mitigation for kelp restoration • Develop "accepted" compensatory mitigation practices for kelp restoration

* Action status of canopy-forming kelp is greater than understory kelp

Goal 6. Promote Awareness, Engagement, and Action from User Groups, the Public, and Decision-Makers

Goal 6 of the Kelp Plan calls for increased awareness and engagement in support of actions to sustain kelp. Much of Goal 6 is accomplished through engagement with the public, elected officials, and partners, as well as through knowledge sharing and Tribal, federal, state, and local collaborations.

Kelp awareness, engagement, and action has been an important part of many kelp projects, but needs to be expanded and coordinated to maximize their effect. Recent efforts have included educating the public and legislators to gather support for kelp and the Kelp Plan, and worked to increase knowledge sharing amongst partners and borders to increase inclusion, collaboration, and capacity. For example:

- The Kelp Expedition, led by PSRF, involved over 40 entities that explored, surveyed, sampled, and chronicled kelp forests during an 8-day voyage throughout Puget Sound (Figure 6).
- PSRF, Northwest Straits, the Washington Environmental Council, and partners educated legislators on the importance of kelp and supported kelp conservation legislation, including Senate Bill 5619 (Washington State Kelp Forest and Eelgrass Meadow Health and Conservation Plan) and state provisos, which funded kelp conservation projects in 2021-2023 and 2023-2025.
- The British Columbia/Washington Kelp Node is working to increase transboundary kelp conservation via six working groups with action goals complementary to the Kelp Plan.
- WA DNR's Puget Sound Monitoring and Research Workgroup, The Pew Charitable Trust's 'Kelp Digest' newsletter, and the Seaweed Collaborative's 'Kelp Lines' newsletter were developed between 2020-2023 to increase knowledge sharing.

Figure 6. *Kelp Expedition participants from PSRF and WA DNR. Photo by Hilary Hayford.*

There has been substantial progress in Goal 6 in early 2020 to early 2023, with most actions requiring minor to moderate additional effort to get "on track" or are already "on track". However, it may take efforts years for actions to be completed or reach their intended stage. As a fundamental goal, many Goal 6 actions will be needed indefinitely to ensure Kelp Plan success. The status, key lessons learned, and key next steps of Goal 6 actions are presented in Table 8.

Table 8. *Goal 6: Promote awareness, engagement, and action from user groups, the public, and decision-makers status, lessons learned, and next steps. Lessons learned are provided for action clusters (defined in section 3.2) when present. Table continued on page 29.*

Action and Status	Lessons Learned	Next Steps
6.1 Share information on (1) the value of kelp ecosystems as critical nearshore habitat and food web support (for forage fish, rockfish, salmon, and killer whales) in Puget Sound; and (2) the growing concern regarding significant losses to bull kelp canopies. **Progressing (3)**	• When educating decision makers, it is helpful to focus on the big picture and how protecting kelp is part of their mission, and to provide examples of how they can help (6.1.1) • Top-level decision makers are enthusiastic about kelp, but middle-level planners need more support (6.1.1, 6.1.5) • Tribal capacity is limited; not all Tribes can be engaged (6.1.2) • Some TEK/ISK related to kelp has been lost due to colonialism, but TEK/ISK is not something that exists just in the past, it is always being created (6.1.2) • Organizations can connect with Tribes about kelp indirectly through salmon, etc. (6.1.2) • Shore parks and marinas can be useful kelp advocates/educators • Expert delivered content is impactful in schools, but it is difficult to find people with content knowledge and education experience (6.14) • Multifaceted approaches tied to personal values can help to reach various target audiences (6.1.6) • It is important to test and adapt educational materials to specific regions (6.1.6)	• Track basic demographic information about who is being reached in local communities and link to environmental justice
6.1.1. Educate decision-makers (federal, state, and local entities) regarding the value of kelp, local declines, and the needs articulated in the Kelp Plan. **Progressing (3)**		• Conduct regular kelp-focused training/tours for decision makers and regulators
6.1.2. Work with Tribal partners to elevate the prominence of traditional ecological knowledge regarding kelp. **Progressing (3)**		• Explore Tribal interest in funding for increasing capacity to engage with kelp • Broaden TEK terminology to TEK/ISK
6.1.3. Encourage partners (e.g., Tribes, anglers, commercial fishermen, Washington Public Port Association, industry, recreational harvesting groups, and NGOs) to help tell the story of kelp to local communities and decision-makers. **Progressing (3)**		• Engage aspiring seaweed farmers as they frequently communicate with public about kelp ecosystem services
6.1.4. Develop curricula and other educational tools focused on Puget Sound kelp ecosystems for K-12 classrooms and other education forums (e.g., aquariums, science centers, reserves). **Off track (2)**		• Short-term: Get experts into classrooms; add kelp to BWET priorities. Long-term: Train students in curriculum development and outreach • Incorporate kelp in 'Salmon in Schools' curriculum, and education tools for in situ educators (e.g., kayak tours)

Action and Status	Lessons Learned	Next Steps
6.1.5. Carry out targeted outreach and advocacy to develop support for Kelp Plan goal implementation. **Progressing (3)**		• Provide information and training for middle-level (implementation) staff at agencies/county offices
6.1.6. Develop public educational materials and maps on how boaters and outdoor recreation groups can minimize their impacts to kelp (e.g., parks, boat launches, marinas). **Not started (1)**		• Update educational materials of existing resources/ programs (e.g., mooring buoy permitting, eelgrass programs, WA Sea Grant's Pump Out Program and Clean Marina, boating and fishing licenses, Waggoner's Guide to Cruising, Boating the Pacific NW) to include kelp • Repackage materials (target specific groups) and share PSRF's resources more widely
6.2 Build research capacity and coordinate knowledge sharing of ongoing kelp recovery projects and research gaps. **On track (4)**	• Coordination and organization of efforts is key and needed to reduce redundancy (6.2.2) • Context and fact checking are key components for social media	• When appropriate, incorporate community science in projects to build capacity and educate the public
6.2.1. Create and maintain a regularly scheduled forum for information sharing and knowledge gathering between Tribal, federal, state, and local entities. **On track (4)**		• Create an overarching Super Group forum to coordinate research, education, and management efforts amongst kelp partners
6.2.2. Coordinate kelp conservation actions and research activities with the Salish Sea International Kelp Alliance, British Columbia, and states of Oregon and California. **On track (4)**		• Include California and Oregon in transboundary actions
6.2.3. Coordinate knowledge sharing through regular participation in conferences, workshops, publications, social media, etc. **On track (4)**		• Include educators in the forums, venues, and communication channels • Use creative means to educate others (e.g., Ze Frank videos, podcasts)

IV. Conclusion

Since its publication in 2020, the Kelp Plan has proven to be a valuable resource and a call to action to support the critical role of kelp forests within the marine ecosystem and inspire collective action to protect and restore kelp populations across Puget Sound. Collective buy-in, commitment, and collaboration of kelp partners who recognize the value and need for kelp conservation and recovery in Puget Sound has resulted in a substantial advancement of many Kelp Plan actions in a short period of time.

There is still an urgent need to continue supporting and expanding efforts, including those undertaking the more advanced Kelp Plan goals and actions, to address critical information gaps and improve policies to sustain kelp conservation and recovery. It is of utmost importance to increase support for Tribes interested in engaging in kelp conservation work, and in continuing to develop strong linkages between research and regulatory bodies. We must expand our focus to include understory kelp in all actions, and target research that directly informs management planning and implementation. It is also imperative that we continue to share and integrate acquired data. As we move forward and expand our efforts, it is now critical to improve communications to increase coordination within Puget Sound and abroad, including with other non-kelp conservation efforts.

The Kelp Plan is intended to be a living document and will continue to be reviewed and updated as necessary. The Kelp Plan Coordination Advisory Committee has recommended that reviews occur in 5-year cycles to ensure the plan evolves and adapts to changes in the physical, political, and economic environments. Workshop participants also recommended that future updates include a review and revision of the Kelp Plan's actions to increase inclusivity and clarity, and to potentially separate multistep actions. A critical next step is the sequencing of actions within the Kelp Plan, which will include continued development of the provided next steps to support targeted funding and implementation. The National Estuary Program's Habitat Strategic Initiative Lead will also be developing a Marine Vegetation Implementation Strategy, which will build on the foundation provided by the Kelp Plan to support increased coordination and fund targeted investments to advance kelp conservation and recovery.

Through continued advancements of the Kelp Plan we, the Puget Sound kelp community, will move closer to our vision of revitalized Puget Sound kelp forests stretching from Olympia to Vancouver, B.C., providing economic, recreational, and ecological benefits to all living things that call these shores and waters home.

Word cloud of workshop participants' answers to: Why is kelp important to you?
Sea cabbage base image by Andrea Dingeldein.

V. References

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Appendix A. Complete Workshop Notes

Appendix A contains the original comments from workshop participants. Presented goals and action clusters reflect how these groupings were addressed in the workshop, noting that Goal 1 was split in two (i.e., Goal 1A and Goal 1B) during the workshop. Action clusters used in the workshop were groupings of similar actions and subactions.

Workshop notes are presented below by Kelp Plan goal. Each goal is subdivided into Action Descriptions, Action Status, Lessons Learned, and Next Steps. Action Descriptions list the action for the listed goal and are grouped by the action clusters used in the workshop. Action Status tables contain Kelp Plan Coordination Advisory Committee generated status scores (scored based off predefined categories provided in Table 1) in addition to each workshop team's suggested score adjustments and reasons for the changes. Lessons Learned and Next Steps sections have both Summary Notes, which consist of workshop selected top/key lessons learned and next steps, and All Notes, which consist of all comments from individuals. Key lessons learned and next steps are denoted by an *. Action numbers are provided at the end of each lesson learned and next step if assigned at the workshop.

Table 1. *Kelp Plan action status scoring categories and definitions. Scores are presented numerically (0-4) and/or visually by color and convey general levels of status, not quantitative metrics.*

Score	Definition
Unknown (0)	*Scorer uncertain and/or action definition may need additional consideration*
Not started (1)	*Action has not been started/no progress has been made*
Off track (2)	*Action started but no strong movement forward; action not likely to be accomplished without a substantial increase in effort (e.g., new projects, large scale-up of pilot or small projects)*
Progressing (3)	*Action moving forward and likely to be achieved with time and a minor to moderate increase in effort of projects (e.g., adding species, adding locations, increasing engagement, etc.)*
On track (4)	*Action completed OR current ongoing efforts will achieve intended action with time*

Kelp Plan Action Workshop Participants

Name	Organization
Sarah Albright-Garland	US Army Corps of Engineers
Caitlyn Blair	NW Straits Commission
Katie Byrnes	WA Conservation Action
Brenda Campbell	The Pew Charitable Trust
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Carolyn Chase	Department of Ecology
Danielle Claar	WA DNR
Ken Collins	Island County MRC
Lamai Cox	WWU
Matthew Curtis	WDFW
Megan Dethier	UW, Friday Harbor Labs
Robin Fales	UW, Friday Harbor Labs
Andrea Fieber	Seattle Aquarium
Cynthia Harbison	WA DNR
Hilary Hayford	Puget Sound Restoration Fund
Kathleen Hurley	Port of Seattle
Robert Kiel	-
Michael Kollins	Vashon Kelp Forest LLC
Alyssa Lind	Seattle Aquarium
Dayv Lowry	NOAA Fisheries

Name	Organization
Rebecca Mahan	Clallam County DCD
Gary Morishima	Quinault Mgmt. Center
Thomas Mumford	Marine Agronomics LLC, UW
Nicole Naar	WA Sea Grant
Kurt Nelson	Tulalip Tribes
Dana Oster	NW Straits Commission
Casey Palmer-McGee	Samish Indian Nation DNR
Zachary Randell	Seattle Aquarium
Leah Robison	NW Straits Commission
Jackie Selbitschka	Reef Check
Jamey Selleck	NOAA
Max Showalter	WA DNR
Allie Simpson	NW Straits Commission
Elizabeth Spaulding	WA DNR
Kimberle Stark	King County DNR & Parks
Jodie Toft	Puget Sound Restoration Fund
Dan Tonnes	NOAA
James Trask	WA Scuba Alliance
Brooke Weigel	UW, Friday Harbor Labs
Tina Whitman	Friends of the San Juans
Jeff Whitty	NW Straits Commission
Megan Williams	Seattle Aquarium
Todd Woodard	Samish Indian Nation

Goal 1A. Understand and reduce kelp stressors

1A.1 Action Descriptions

Cluster I (Implement and enforce available protections for kelp)

1.4. Fully implement and enforce available protections for kelp through existing regulations, programs, and policies (DOE SMA Guidance, Local SMPs, WDFW HPA, DNR Aquatic Use Authorizations, mitigation programs, NMFS ESA and EFH consultations).

1.4.1. Fully consider kelp in programs that respond to and prevent chemical and oil spills (e.g., DOE Geographic Response Planning).

1.4.2. Develop tools to support planners' ability to review/access policy regulations that assist in decision-making.

1.4.3. Develop and implement long-term research and monitoring actions using rigorous scientific and adaptive management principles to determine the effectiveness of current regulations and protection actions.

Cluster II (Form workgroups to implement and address policy gaps; identify priority stressors)

1.1. Form interagency workgroups to increase collaboration and information sharing across management organizations to improve implementation and to address policy gaps.

1.3. Identify priority stressors that negatively affect Puget Sound kelp on a sub-regional scale to target management actions.

Cluster III (Address gaps in and update existing regulations and implementation programs)

1.5. Increase protection by addressing key gaps in existing regulations and implementation programs.

1.5.1. Improve kelp-specific mitigation guidance and implementation.

1.5.2. Add an explicit reference to kelp in existing regulations that include kelp protection but do not reference kelp specifically. (e.g., CWA Section 404 definition of Vegetated Shallows, DNR's definition of submerged aquatic vegetation, and WDFW's Priority Habitats and Species list).

1.5.3. Update survey guidelines and foster coordination among the organizations that conduct site-level surveys, such as the WDFW Macroalgae Habitat Interim Survey Guidelines and the Coastal Zone Training Program.

1.5.4. Form an interagency workgroup to review the kelp aquaculture permitting process and develop best management practices, such as cultivating native species, avoiding the spread of pathogens, and avoiding the use of harmful pesticides and other chemicals.

1A.2 Action Status

Table 2. *Original action status scores and Team 1's (i.e., breakout team that reviewed the actions) suggested score changes for All, Canopy, and/or Understory kelp. Canopy and Understory scores were only reviewed if time allowed during the workshop. Any changes to Canopy and/or Understory scores are listed after the All score and are presented as: (Canopy status score, Understory status score), for example (3, 1). See Table 1 for score definitions.*

Cluster #	Action #	Original status score			Team 1	
		All	Canopy	Under-story	Changed score	Notes
1	1.4	2	2	2	-	
	1.4.1	1	1	1	-	
	1.4.2	2	2	2	-	
	1.4.3	1	1	1	-	
2	1.1	3	3	2	4	5 of 7 known active workgroups are interagency workgroups
	1.3	3	3	2	2	Temperature poorly understood; focused primarily on bull kelp; subregional scale needs work
3	1.5	2	2	2	-	
	1.5.1	2	2	2	-	
	1.5.2	1	1	1	-	
	1.5.3	2	2	2	-	
	1.5.4	3	3	2	1	

1A.3 Lessons Learned

SUMMARY NOTES

Cluster I (Implement and enforce available protections for kelp)

- Sequence matters! Need science/research to inform regulations. Murch harder to have regulations first

Cluster II (Form workgroups to implement and address policy gaps; identify priority stressors)

- Excessive enthusiasm has led to clutter in the kelp community! Time to organize ourselves

Cluster III (Address gaps in and update existing regulations and implementation programs)

- We are early on for many of these actions and will need to avoid unfunded mandates

ALL NOTES

Cluster I (Implement and enforce available protections for kelp)

- Need better best available science for connection to regulations
- Focus is too narrow; what about water quality, biological interactions (e.g., competition with sargassum)
- Sequence matters! Science then regulations. Can't easily do regulations then science

Cluster II (Form workgroups to implement and address policy gaps; identify priority stressors)

- We need a registry for the many kelp groups to guide the excessive enthusiasm and chatter in the kelp community
- "Interagency" should be taken out of Action 1.1, it excludes Tribes and NGOs

Cluster III (Address gaps in and update existing regulations and implementation programs)

- No unfunded mandates. There is a lot of planning and pointing to action but we are still at the very beginning for a lot of these actions

1A.4 Next Steps

SUMMARY NOTES

Cluster I (Implement and enforce available protections for kelp)

- Continue work for the Kelp Policy Workgroup (Dana Oster, Northwest Straits Commission and The Pew Charitable Trust). Hopefully likely to include: 1) creating document like the Shoreline Design Guidance to clarify what rules are and how to negotiate them; 2) crosswalk best available science to inform gaps that hold back better implementation; 3) adding language to Washington Administrative Code (WAC) for Shoreline Management Act (SMA), and others that direct agencies to add protections for kelp

Cluster II (Form workgroups to implement and address policy gaps; identify priority stressors)

- Create kelp super group to connect leads of all workgroups
- Improve understanding of and outreach about who has jurisdiction over what aspects of kelp (e.g., agencies, Tribes) (1.1)
- Language revisions needed for action 1.1 (e.g., change "interagency" to include Tribes) (1.1)
- Do the science, especially with understory kelp (1.3)
- Crosswalk stressors to management actions (1.3)

Cluster III (Address gaps in and update existing regulations and implementation programs)

- Craft regulatory implementation pathways (1.5)
- Update wording of action 1.5.1 (change "improve" to "develop")
- Include kelp in NOAA's Puget Sound Nearshore Habitat Conservation Calculator (1.5.1)
- Analyze needed updates and DO THEM NOW (1.5.2)
- Create training program for folks doing surveys and use surveys as part of Before-After-Control Impact (BACI) analysis (1.5.3)
- Completely reword action 1.5.4 (1.5.4)

ALL NOTES

Cluster I (Implement and enforce available protections for kelp)

- Continue work of the Kelp Policy Group* (1.4)
- Create a document like the Shoreline Design Guidance that clarifies what the rules are and how best to negotiate them* (1.4)
- Develop education for permitters* (1.4)
- Cross-walk info gaps that are holding back better implementation with updated best available science (e.g., WDFW's small overwater structure paper)* (1.4)

- Need to do 1.4.3 first to inform other actions* (1.4)
- Add language to SMA WAC directing agencies to add protections* (1.4)
- Define thresholds that trigger actions and define "success" e.g., loss of kelp area coverage (1.4)
- Hire kelp cops! On the water or as whistle blowers (1.4)
- Better define terms in regulations (no net loss) (1.4)
- Deploy educational signage at boat launches (1.4)
- Acknowledge that kelp conservation and recovery and seaweed aquaculture share info gaps
- Embrace opportunities to address these gaps through science-industry research partnerships (1.4.3)

Cluster II (Form workgroups to implement and address policy gaps; identify priority stressors)

- Remove "interagency" and "management groups" from action wording as it alienates Tribes and NGOs, who are important in kelp community* (1.1)
- Document and communicate who has authority to do what for kelp* (1.1)
- Clarify the role/jurisdiction of Tribes over kelp habitat e.g., Squaxin Island Bed* (1.1)
- Create kelp workgroup super group (pod) with one to two leads from each group* (1.1)
- Rollout Whitener Group/The Nature Conservancy's new Indian Country 101 training to lay groundwork for better collaboration (1.1)
- Coordinate with salmon recovery groups and watershed action plans (1.1)
- Salmon recovery/estuary plans talk about "near-shelf" but not submerged aquatic vegetation specifically (1.1)
- Include understory in stressor research* (1.3)
- Do the science* (1.3)
- Need to look at interactions between stressors* (1.3)
- Finish action 1.4.3* (1.3)
- Crosswalk priority stressors to management actions* (1.3)

Cluster III (Address gaps in and update existing regulations and implementation programs)

- Craft regulatory implementation pathway (1.5)
- Introduce cumulative impacts evaluation to mitigation and implement (1.5.1)
- Change "improve" to "develop" in action wording (1.5.1)
- Consider inclusion of kelp in NOAA's Nearshore Habitat Calculator (1.5.1)
- Include full suite of kelp benefits (including production) when developing mitigation guidance (1.5.1)
- Identify existing regulations that need language updates to include "kelp"; UW capstone project! (1.5.2)
- Use pre-construction surveys as part of BACI design (1.5.3)
- Create training program for whoever will do the surveys (1.5.3)
- Create continuity between WDFW (prior to the activity) survey and WA DNR survey (during the lease) (1.5.3)
- Put surveys in context for status of kelp in broader region (1.5.3)
- Reword action to: "Create a kelp aquaculture and restoration permitting process." (1.5.4)
- Make seaweed aquaculture part of the conservation toolbox! Adopt a more holistic perspective; embrace the opportunity to leverage and learn from the cultivation sector; intentionally design research programs that address common issues whenever possible (1.5.4)

Goal 1B. Understand and reduce kelp stressors

1B.1 Action Descriptions

Cluster I (Increase kelp harvesting education, invasive macroalgae research, and incorporation of kelp and other trophic consideration in fisheries management planning)

1.7. Support sustainable kelp harvest by informing recreational harvesters about regulations and sustainable kelp harvest methods.

1.8. Strive to incorporate kelp and other trophic considerations into fisheries management planning.

1.9. Explore invasive macroalgae (including *Sargassum muticum* and *Undaria pinnatifida*) control alternatives, ecological roles, and long-term management considerations related to climate change.

Cluster II (Research and reduce human impacts on kelp)

1.2. Inform future management actions through continued research on the impacts of current and historical human activities on kelp forests (e.g., nutrient and sediment loading thresholds and impacts, turbidity effects on kelp recruitment, substrate availability, and impacts from recreational and commercial boating activities).

1.6. Reduce anthropogenic nutrient and sediment loading (e.g., stormwater and WWTP permitting, and TMDL planning).

> **1.6.1.** Coordinate and share research with the Nutrient Reduction Program planning and implementation program, led by the DOE.

Cluster III (Research and apply findings of interactions between kelp and abiotic variables)

1.10. Investigate climate change impacts to improve management decisions, such as prioritizing locations for kelp protected areas, restoration sites, and mitigation activities.

> **1.10.1.** Include kelp habitat in regional and local climate adaptation strategies and planning.

1.11. Investigate local effects within kelp beds on seawater chemistry (Pfister et al. 2019) and consider potential management opportunities for these benefits.

1.12. Investigate the development of temperature-tolerant strains of native kelp species for potential use in restoration and mitigation outplanting.

1B.2 Action Status

Table 3. *Original action status scores and Team 1's and Team 2's (i.e., breakout teams that reviewed the actions) suggested score changes for All, Canopy, and/or Understory kelp. Canopy and Understory scores were only reviewed if time allowed during the workshop. Any changes to Canopy and/or Understory scores are listed after the All score and are presented as: (Canopy status score, Understory status score), for example (3, 1). See Table 1 for score definitions.*

Cluster #	Action #	Original status score			Team 1		Team 2	
		All	Canopy	Under-story	Changed score	Notes	Changed score	Notes
1	1.7	3	2	2	2	Skeptical of progress of 1.7	2	Outreach material distribution can be improved
	1.8	2	2	1	-		-	Research not integrated into management yet
	1.9	1	1	1	-		-	
2	1.2	3	3	2	3-	Some work but also gaps	2	Needs prioritization; Is research happening; No connection to management
	1.6	2	2	2	-		-	
	1.6.1	1	1	1	-		-	
3	1.10	3	3	2	-		-	Monitoring correct parameters on locations for prioritization. Nearly 4; need impacts ON kelp.
	1.10.1	1	1	1	2-	See San Juan MRC's MSA to include bull kelp	-	
	1.11	2	2	2	-		3 (3, 1)	
	1.12	2	2	1	-		- (3, -)	

1B.3 Lessons Learned

SUMMARY NOTES

Cluster I (Increase kelp harvesting education, invasive macroalgae research, and incorporation of kelp and other trophic consideration in fisheries management planning)

- The rules are clear, but they need to be promoted and enforced (1.7)
- Need clarity on how to integrate and connect plans (1.8)
- Research is urgently needed on interactions between sargassum and kelp (1.9)

Cluster II (Research and reduce human impacts on kelp)

- Existing research lacks cohesiveness to inform management
- Connect research, management, and regulatory actions
    - Co-develop applied research questions
- Engage a diversity of stakeholders in research and management questions

Cluster III (Research and apply findings of interactions between kelp and abiotic variables)

- Need to consider regional differences when assessing impacts of climate change on kelp
- Science is progressing! Continue; take stock; reprioritize
- Management must be informed by climate change research

ALL NOTES

Cluster I (Increase kelp harvesting education, invasive macroalgae research, and incorporation of kelp and other trophic consideration in fisheries management planning)

- Regulations are not clear (1.7)
- Rules clear but lack promotion and enforcement (1.7)
- Gaps in accessible information (1.7)
- WDFW permits require proper harvest techniques (1.7)
- There is a data gap of recreational take to inform sustainable harvest (1.7)
- Example: NOAA's Isotope analysis study (1.8)
- Lack of integration of science and policy to inform management (1.8)
- There are some emerging studies on dissolved organic carbon (1.8)
- There is some related work occurring outside of Puget Sound (e.g., Channel Islands removal pilot study) (1.9)
- It is useful to engage industry and volunteer/community groups to inform reporting of presence and distribution (1.9)
- This action presents an opportunity to engage community observations (1.9)
- Urgent need more research on reactions, competition, etc. (1.9)
- Reach out to research/academic community (1.9)
- Fund graduate students (1.9)
- Base level steps only
- Need clarity on HOW to integrate/connect to plans
- Engage fisheries management*
- There is a lot of noise around commercial harvest

Cluster II (Research and reduce human impacts on kelp)

- There is a fair amount of current research (1.2)

- Research is not all encompassing (1.2)
- Subset of projects have data to inform management but remains unpublished (1.2)
- Gaps remain in how results can inform regional management efforts (1.2)
- More are needed (1.6)
- There is nutrient reduction but not sedimentation reduction (1.6)
- Can we learn from other water quality standards programs? (1.6)
- How do these apply to kelp? (1.6)
- Connections needed for downstream impacts (1.6)
- What nutrients are most relevant to kelp? (1.6.1)
- Most Salish Sea nutrients are oceanic in origin (1.6.1)
- How much does nutrient loading contribute? (1.6.1)
- We are not meeting management goals*
- We can build from the Hollarsmith et al. 2022 concept model
- Need more connection between research, management (applied research), regulation to make management and research co-develop and inform regulation*
- Expand Kelp Plan's footprint
- Engage diverse stakeholders in research and management questions

Cluster III (Research and apply findings of interactions between kelp and abiotic variables)

- Long-term planning should be considered for climate change management and site prioritization (1.10)
- Research historical distribution and declines (1.10)
- Need better understanding of kelp resilience (1.10)
- Promising amount of research, but needs addressing to management (1.10)
- Need to understand connectivity (1.10)
- Example: No Anchor Zone Campaign (especially Jefferson County) (1.10)
- Are we including Tribal DNR in the conversation? (1.10.1)
- See San Juan and Jefferson County planning (1.10.1)
- Lack of communications between agencies (1.10.1)
- Tidal currents in Puget Sound complicates seawater chemistry studies (1.11)
- Determine impacts on ocean acidification (Murie et al. in prep) (1.11)
- Research differences between kelp species and mixed-species assemblages (1.11)
- Consider different water flow regimes and impacts of seawater chemistry (1.11)
- Use the precautionary principles when considering outplanting (1.12)
- How do they compare to naturally resilient strains? (1.12)
- Management is moving faster than science, but we can catch-up (re: identifying protected areas and restoration)
- Do not oversell kelp as a climate mitigator
- Time to update plans as some data gaps have been addressed
- Making progress on climate research but it is VERY important and needs to be prioritized

1B.4 Next Steps

SUMMARY NOTES

Cluster I (Increase kelp harvesting education, invasive macroalgae research, and incorporation of kelp and other trophic consideration in fisheries management planning)

- Address baseline gaps
- Encourage enforcement/aggressive outreach (1.7)
- Clarify exactly HOW kelp could be incorporated into fisheries management (1.8)
- Ecological research about sargassum/invasive algae in Salish Sea (1.9)

Cluster II (Research and reduce human impacts on kelp)

- Make connections between interactions to inform management (multiple stressors)
- Require co-development of project/proposal for funding

Cluster III (Research and apply findings of interactions between kelp and abiotic variables)

- Connect research to management
- Target climate research to inform management

ALL NOTES

Cluster I (Increase kelp harvesting education, invasive macroalgae research, and incorporation of kelp and other trophic consideration in fisheries management planning)

- Have recreational kelp harvesters register the amount they harvest* (1.7)
- Collect data on amounts of recreational kelp/seaweed harvest* (1.7)
- Track recreational harvest to understand/inform what a sustainable harvest is* (1.7)
- Develop easily accessible information regarding regulations for the public to access/archive database* (1.7)
- Develop outreach/easier access to information (e.g., a brochure) on sustainable harvest (1.7)
- Expand outreach efforts to recreational harvesters (e.g., social marketing campaign) (1.7)
- Create maps for informing harvesters where/how to harvest and on the regulations for kelp harvesting (e.g., dashboard online tool) (1.7)
- Encourage enforcement/aggressive outreach* (1.7)
- Develop public outreach and signs about harvest limits of macroalgae (1.7)
- Broaden education and enforcement (1.7)
- Create and post informational posters on seaweed harvesting (1.7)
- Investigate and compare abundance of fishery species in areas dominated by understory kelp vs. those dominated by canopy-forming kelp* (1.8)
- Connect managers with researchers doing work on kelp trophic ecology (1.8)
- Fund/focus studies on fish use of kelp to inform management (1.8)
- Clarify exactly HOW kelp could be incorporated into fisheries management* (1.8)
- Update management plans with kelp info (1.8)
- Get fisheries management personnel on the kelp group (1.8)
- Need basic data on sargassum ecological role in Washington, and look at lessons from California (1.9)
- Locate areas of high densities of sargassum and implement pilot studies based on successful removal efforts in other regions (1.9)
- Do food trials to determine if there are any natural predators of sargassum in the system (1.9)

- Engage with diverse groups (e.g., research, citizen groups, etc.) to develop tracking of invasive species to understand Scope 9 issues and to inform management* (1.9)
- Engage volunteers into documenting invasive seaweeds (e.g., *Sargassum spp*. and *Undaria spp.*)* (1.9)
- Conduct public outreach/community engagement about common invasive species and how to report* (1.9)
- Conduct ecological research about sargassum/invasive algae in Salish Sea* (1.9)
- Encourage research projects with universities and agencies (1.9)
- A baseline research and action plan is needed (1.9)
- Fund sargassum research projects (graduate students?) (1.9)
- Develop invasive kelp program to drive out gaps, user groups and clear goals (1.9)
- Improve outreach and understanding (importance of kelp) to engage public in kelp identification (1.7, 1.9)

Cluster II (Research and reduce human impacts on kelp)

- Increase avenues for sharing research between managers and researchers* (1.2)
- Connect research results with local jurisdiction and action to protect kelp* (1.2)
- Workshops to disseminate research to management* (1.2)
- Focus more efforts on substrate availability and sedimentation studies (1.2)
- Investigate sedimentation limits for bull kelp recruitment (1.2)
- Expand local studies to other areas to better understand impacts of current and historical human activities* (1.2)
- Expand projects to include multiple stressors or collaborate and overlap sites with others already doing the work* (1.2)
- More work on less studied areas (e.g., substrate availability, impacts of boating, sedimentation)* (1.2)
- Implement more applied research* (1.2)
- Foster research that provides actionable science* (1.2)
- Further research on nutrient impacts on kelp and phytoplankton* (1.2)
- Need more management focused research and continued management; need to increase interaction between research and management (1.2)
- Prioritize needs (stressors) for research on thresholds/impacts (refine list of data gaps)* (1.2)
- Include enforcement voices into the management plan/research discussion (1.2)
- Correct nutrient and sediment loading upstream of Puget Sound* (1.6)
- Spark community efforts (e.g., rain gardens that have been built for salmon water quality)* (1.6)
- Use modular wetland and rain garden stormwater systems vs. existing systems that do not capture nutrients and sediments* (1.6)
- Review TMDL planning for riparian ecosystems and use this to inform limits for kelp ecosystems* (1.6)
- Improve WWTP permit enforcement (1.6)
- Create more stringent TMDLs based on habitat wide exposure (1.6)
- Collect more information on sediment loading (1.6)
- Update water quality management in Washington to reduce nutrient and sediment loading (1.6)
- Determine what nutrients are beneficial/detrimental to kelp and integrate into TMDL planning* (1.6.1)
- More actions needed to begin implementation* (1.6.1)

- Solicit lessons learned/example from other kelp communities (e.g., South Australia, California, Oregon, British Columbia)
- Explicitly include co-development with management as a goal in research funding calls*

Cluster III (Research and apply findings of interactions between kelp and abiotic variables)

- Identify stressor for historical loss of kelp before restoration* (1.10)
- Include records of historical and contemporary kelp distribution to aid in restoration planning* (1.10)
- Map locations where kelp grows, to better inform kelp restoration* (1.10)
- Monitor "model kelp beds" outside of construction/mitigation projects* (1.10)
- Evaluate emerging kelp beds to inform restoration/mitigation (1.10)
- Understand what makes pockets of Elliott Bay habitable for kelp, and use that understanding to help with management decisions (1.10)
- Consider regional and small-scale differences when applying research and management (1.10)
- Lots of progress has been made on climate change and kelp, figure out remaining knowledge gaps (1.10)
- Try using green gravel in restoration sites (1.10)
- Include more temperature monitoring inside kelp forests, and more climate change research on kelp growth, survival, and reproduction* (1.10)
- Coordinate management with research (catch-up with drive to serve)* (1.10)
- Communicate the kelp/climate change link and publicize (prepare for 1.10 success) (1.10)
- Find what local climate adaptation plans exist; connect with local climate groups to see if they are incorporating the Kelp Plan* (1.10.1)
- Provide technical assistance to Tribes for their own studies, different perspectives (1.10.1)
- Provide opportunities for Tribes and local groups to share climate plans (1.10.1)
- Create opportunities for counties/Tribes/regions to share their plans to include kelp in their MSA (1.10.1)
- Find low flow kelp beds to study seawater change* (1.11)
- Develop sound methodology to account for circulation* (1.11)
- Understand how differing flow regimes affect kelp's influence on seawater chemistry/ocean acidification mitigation potential* (1.11)
- Conduct lab studies (if possible) on kelp and seawater chemistry* (1.11)
- Create seawater chemistry "atlas" (1.11)
- Determine if intact kelp forest (understory and canopy-forming) affect sea water chemistry differently than kelp farms (1.11)
- Bring urgency to understory kelp research on local chemistry (1.11)
- Study impact of introducing new strains of kelp on native stock* (1.12)
- Sample/research kelp from different temperature regimes/environments to identify more resilient strains (1.12)
- Keep Restoration and protection tightly linked to research and engage vested partners*
- Summarize current research and map to remaining needs*
- Prioritize where there is momentum
- Prioritize impacts to research/fund
- Prioritize research gaps and communicate to researchers
- Let ocean acidification and blue carbon run its course
- Update research priorities around climate and action

Goal 2. Deepen understanding of the value of kelp to Puget Sound ecosystem and integrate into management

2.1 Action Descriptions

Cluster III (Ecological value of kelp)

2.1. Determine and quantify functional roles of kelp habitats for associated species and provide guidance to managers for regulatory implementation, such as endangered species habitat conservation.

2.1.1. Monitor the use of kelp forests as nurseries, migration corridors, refuges, and high-quality forage grounds for salmonids, rockfish populations, forage fish, pinto abalone, and killer whales.

2.1.2. Utilize local ecological knowledge to assess the value of kelp forests as fishing areas.

2.1.3. Use isotopic and biochemical analysis of Puget Sound species and other tools to assess kelp contributions to nearshore, deep water, and terrestrial food webs.

2.2. Calculate the value of kelp ecosystem services for use in developing mitigation guidance.

2.2 Action Status

Table 4. *Original action status scores and Team 1's and Team 2's (i.e., breakout teams that reviewed the actions) suggested score changes for All, Canopy, and/or Understory kelp. Canopy and Understory scores were only reviewed if time allowed during the workshop. Any changes to Canopy and/or Understory scores are listed after the All score and are presented as: (Canopy status score, Understory status score), for example (3, 1). See Table 1 for score definitions.*

Cluster #	Action #	Original status score			Team 1		Team 2	
		All	Canopy	Under-story	Changed score	Notes	Changed score	Notes
3	2.1	3	3	2	2	Understory is big component and is scored as a 2	2	More to quantifying than food webs and spatial co-occurrence
	2.1.1	3	3	2	2	Wide range of species; rockfish, abalone feel like progress; forage fish, salmon, orcas - seasonal, location and methods vary	-	
	2.1.2	2	2	2	-		-	
	2.1.3	2	2	2	-		-	
	2.2	1	1	1	-		-	

This table contain information from action cluster 3 of 3, from the Goals 2&4 breakout session.

2.3 Lessons Learned

SUMMARY NOTES

Cluster III (Ecological value of kelp)

- Identify audience to split out actions for end user (varying levels of detail needed) (2.1.1)
- Clearly defining terms leads to better science

ALL NOTES

Cluster III (Ecological value of kelp)

- Identify audience to split out actions for end user (2.1.1)
- Clearly define functional role and ecosystem services first
- Kelp is more than housing
- Comprehensive spatially diverse sampling is ideal method of sampling
- We need more Tribal representation opportunities

2.4 Next Steps

SUMMARY NOTES

Cluster III (Ecological value of kelp)

- Reword action 2.1; include social and economic value and reword to broader audience (not just managers) (2.1)
- Clarify research questions – hold salmon and kelp symposium (2.1.1)
- Rephrase – recognize agency of Tribes as owners of Indigenous knowledge (2.1.2)
- Fund postdoc for fisheries study (2.1.2)
- Identify path for kelp in NOAA's Puget Sound Nearshore Habitat Conservation Calculator (2.2)
- Integrate spatial data on kelp, fishing, and other species (consumers, residents, etc.)

ALL NOTES

Cluster III (Ecological value of kelp)

- Refine action to include other values and broaden audience to more than managers* (2.1)
- Expand "functional" roles of kelp to include social and economic value* (2.1)
- How does aquaculture and restoration of kelp fit into this goal? (2.1)
- Refine action: Include more than just regulatory implementation (2.1)
- Have researchers and managers identify their shared goal (2.1)
- Synthesize info from Actions 2.1 and 2.1.1 into categories that regulators think in terms of (e.g., hydrologic, geomorphic, and biological functions, water quality functions) (2.1, 2.1.1)
- Identify key research or policy questions needed to be answered by monitoring* (2.1.1)
- Refine action: Split out species (2.1.1)
- Link monitoring of uses to Action 1.4.3 – Determine effectiveness of mitigation, reserves, etc. (2.1.1)
- Conduct monitoring study in conjunction with state agencies on permitted projects. Add a monitoring requirement to certain permits. Have monitoring be part of academic studies (2.1.1)
- Identify important kelp areas that lack but need monitoring* (2.1.1)
- Hold state of knowledge symposium and proceedings on kelp and salmon* (2.1.1, 2.1.2)
- Synthesize salmon fishing and kelp local communities* (2.1.1, 2.1.2)

- Refine Action 2.1.2 to recognize agency of Tribes and ownership over Indigenous Knowledge* (2.1.2)
- Find postdoc to do Action 2.1.2 Puget Sound wide. Just a first cut* (2.1.2)
- Refine action to confirm if this is a Tribal point or not (2.1.2)
- Local ecological knowledge to include Tribal TEK, recreational/commercial fishers, waterfront property owners, birders, etc. (2.1.2)
- Coordinate kelp map to actual areas fished* (2.1.2)
- Identify how this knowledge would be used and parse out place-based pilot study (2.1.3)
- Define how ecosystem services for kelp forests are used in mitigation and clarify gaps (2.1, 2.2)
- Science for policy makers – what do you need to know; make decision/consequences vs. science to implement regulations (2.1, 2.2)
- ID pathway for including kelp in NOAA's Nearshore Calculator* (2.2)
- Define "values" and money associated with services (2.2)
- Increase research on kelp's role in the ecosystem, especially benthic kelp species* (2.2)
- Move away from looking to kelp as a form of carbon sequestration* (2.2)
- Work with economists and social scientists on valuation of kelp ecosystem services (2.2)

Goal 3. Describe kelp distribution and trends

3.1 Action Descriptions

Cluster I (Expand and share canopy-forming and understory kelp monitoring)

3.1. Update and expand information on the current extent of canopy-forming and understory kelp.

3.2. Make distribution and trends data available to agencies and the public for use in spatial planning, project planning, and regulatory implementation.

Cluster II (Increase knowledge of historical distribution and genetic structure of kelp; form research and monitoring workgroup)

3.4. Expand understanding of historical distributions and trends by compiling historical information sources and exploring traditional ecological knowledge.

3.5. Identify the genetic structure of kelp populations, including connectivity, dispersal, and population dynamics.

3.6. Form a research and monitoring workgroup to increase collaboration and information sharing across organizations.

Cluster III (Coordinate canopy-forming and understory kelp monitoring)

3.3. Coordinate and expand efforts to strategically monitor canopy-forming and understory kelp throughout Puget Sound and build collaborations between organizations.

> **3.3.1.** Continue and expand surface monitoring of Puget Sound canopy-forming kelp.
>
> **3.3.2.** Develop Puget Sound-specific subtidal monitoring protocol, and establish a network of partners conducting subtidal kelp index site monitoring (e.g., Reef Check, PSRF)
>
> **3.3.3.** Encourage compatibility among protocols to support data synthesis, linking ecological functions, and relationships to local stressors.
>
> **3.3.4.** Collaborate with the Puget Sound Partnership to expand the eelgrass Vital Sign to incorporate kelp indicators (such as kelp canopy area and understory kelp distributions).

3.2 Action Status

Table 5. *Original action status scores and Team 1's and Team 2's (i.e., breakout teams that reviewed the actions) suggested score changes for All, Canopy, and/or Understory kelp. Canopy and Understory scores were only reviewed if time allowed during the workshop. Any changes to Canopy and/or Understory scores are listed after the All score and are presented as: (Canopy status score, Understory status score), for example (3, 1). See Table 1 for score definitions.*

Cluster #	Action #	Original status score			Team 1		Team 2	
		All	Canopy	Under-story	Changed score	Notes	Changed score	Notes
1	3.1	3	3	2	2+	Needs a lot more for understory or separate	-	
	3.2	3	4	2	-		-	
2	3.4	3	3	2	-		-	
	3.5	2	2	1	-		- (3, -)	
	3.6	3	3	3	-		4	Done
3	3.3	3	3	2	- (-, 2)		-	
	3.3.1	4	4	-	-		-	
	3.3.2	3	3	3	-		-	
	3.3.3	3	3	2	2 (2, 2)	3 for data synthesis; 2 for linking/ stressors	-	
	3.3.4	3	3	1	2+ (4, -)	Needs more than just a light lift for understory	- (4, -)	

3.3 Lessons Learned

SUMMARY NOTES

Cluster I (Expand and share canopy-forming and understory kelp monitoring)

- Canopy doing well, understory needs more focus/guidance/methods/strategy
- Example: Kelp Vital Sign Indicator

Cluster II (Increase knowledge of historical distribution and genetic structure of kelp; form research and monitoring workgroup)

- Manage expectations and effort for understory
- Genetic diversity questions loom large

Cluster III (Coordinate canopy and understory kelp monitoring)

- There is no single approach
- Need to drive data integration

ALL NOTES

Cluster I (Expand and share canopy-forming and understory kelp monitoring)

- Canopy-forming kelp is easier and much better understood (3.1)
- Canopy-forming kelp has more public buy-in (3.1)
- Caution when lumping canopy-forming and understory kelp (3.1)
- Set realistic expectations for surveying understory kelp (3.1)
- Develop recommendations for standardized tools (3.1, 3.2)
- Data is good but needs to be guided towards management (3.2)
- Make data available as GIS layers (3.2)
- Ensure that there is collaboration across region/borders/agencies (3.2)
- Data collection is good but need better integration and accessibility
- Example: Floating Kelp Vital Sign Indicator

Cluster II (Increase knowledge of historical distribution and genetic structure of kelp; form research and monitoring workgroup)

- Caution when lumping canopy-forming and understory kelp (3.4)
- There is a need to develop methods for historical information (3.4)
- Collaboration is essential (3.4, 3.6)
- There are a lot of next steps (3.5)
- Who is the champion (3.5)
- Requires other basic knowledge (3.5)
- Consider applying knowledge and methods from other regions (3.5)
- Single source vs. mixing genetic diversity research is underway (3.5)
- There is confusion on who is doing what (3.6)
- There is a need for a centralized “Super Group” (3.6)
- Need more best practices for assessing/integrating TEK (3.6)
- Example: Southern California island restoration is based on Indigenous Science (3.6)
- Work at the speed of trust (3.6)

Cluster III (Coordinate canopy-forming and understory kelp monitoring)

- Caution, canopy-forming kelp does not equal understory kelp (3.3)
- There is a lot of progress for canopy-forming kelp (3.3)
- Coordination is a heavy lift as there is a broad range of organizations (3.3)
- Getting the action “on track” was hard (3.3.1)
- Collating data was challenging (3.3.1)
- Focused goals are helpful (3.3.2)
- Reef Check is up and running in Washington (3.3.2)
- There is too much in this action, split data synthesis from the rest* (3.3.3)
- Ecosystem function and stressors are more complex (3.3.3)
- One protocol won’t answer all questions (3.3.3)
- Monitoring alone is not enough, also requires experimenting (3.3.3)
- Yay Helen :) (3.3.4)
- This exercise demonstrates the effectiveness of separating canopy-forming and understory kelp (3.3.4)
- Vital Sign is now a useful tool (3.3.4)
- Integrating historic dataset is still a challenge

- Money and capacity are needed for data integration
- Example of how this could work: National Science Foundation's Long-Term Ecological Research

3.4 Next Steps

SUMMARY NOTES

Cluster I (Expand and share canopy-forming and understory kelp monitoring)

- Methods for understory that informs management
- Data integration, understory!

Cluster II (Increase knowledge of historical distribution and genetic structure of kelp; form research and monitoring workgroup)

- Have a strategic plan for understanding understory kelp
- Traditional ecological knowledge (TEK) best practices
    - Continue to integrate traditional and western scientific knowledge (3.4)
    - More studies on TEK/Indigenous science guiding/policy restoration/compensation; research/more studies on TEK/Indigenous science working with other ways of knowing to guide policy/restoration conservation (3.4)
    - Continue to develop and seek out meaningful pathways with Indigenous knowledge keepers
    - Prioritize learning about TEK and free prior and informed consent (FPIC) to build trusting relationships with Tribes
    - Solicit best practices from similar Indigenous environmental discovery
- Translate genetics – complete genetic work, at least on understory kelp

Cluster III (Coordinate canopy-forming and understory kelp monitoring)

- Prioritize and strategize goals of sub-actions
- Fund data integration/analysis for subtidal

ALL NOTES

Cluster I (Expand and share canopy-forming and understory kelp monitoring)

- Include benthic surveys to determine substrate composition at all locations where kelp historically existed and presently exists* (3.1)
- Develop and standardize understory ROV protocols* (3.1)
- Increase urgency of data collection for understory kelp* (3.1)
- Continue to add understory data (e.g., Reef Check, etc.)* (3.1)
- For tech related efforts, ensure we tap into local tech industry, as many are interested in assisting* (3.1)
- Develop methods for understory kelp mapping* (3.1)
- Locate and survey understory kelp across all basins* (3.1)
- Prioritize site selection for understory kelp that can be more representative when broad geographic surveys are difficult* (3.1)
- Explore efficiencies to map/understand understory kelp, do they correlate with canopy trends or something else?* (3.1)
- Evaluate spatial resolution of using newer satellites for canopy-forming kelp distribution (3.1)

- Create a place to start searching for Washington kelp info (e.g., webpage that is top google hit and links to many others) (3.2)
- Create public database of agencies working on extent mapping to keep info current (3.2)
- For most or all efforts (e.g., data gathering, regulations), separate canopy-forming and understory kelp. This will help focus time, energy, and funding appropriately* (3.2)
- Add stressor data to data map shared with managers (3.2)
- Coordinate/standardize diverse data collection efforts (3.2)
- Continue data integration efforts*
- Develop a data integration strategy that allows data analysists to easily find and use kelp beds. Make available/accessible to various audiences/users*
- Continue to make data more readily available (e.g., create more public source data portals, Kelp data hold on ArcGIS online)
- Link extent and trend data to management guidance*
- Not enough outreach to get input

Cluster II (Increase knowledge of historical distribution and genetic structure of kelp; form research and monitoring workgroup)

- Digitize historical navigational maps and military charts (3.4)
- Continue to integrate traditional and western scientific knowledge (3.4)
- Research/more studies on TEK/Indigenous Science guiding policy restoration/conservation (3.4)
- Research/more studies on TEK/Indigenous Science working with other ways of knowing to guide policy/restoration and conservation (3.4)
- Consider the value of trying to find historical data about understory kelp. Is it worth it?* (3.4)
- Develop methods to determine historical distribution of understory (3.4)
- Isotope analysis to evaluate historical distribution patterns (3.4)
- Conduct isotope analyses to determine historical distribution (3.4, 3.5)
- Conduct genetic work on at least one understory taxon e.g., sugar kelp* (3.5)
- Make data on the genetic structure of kelp populations publicly available and INTERPRET what it means for managers (3.5)
- Be strategic with effort (e.g., start with low hanging fruit)* (3.5)
- Identify leads/plan to get Action 3.5 done. What is the approach?* (3.5)
- Complete studies and knowledge from other regions to inform moving forward in Washington (3.5)
- Tap into transboundary approaches for evaluating genetic structure (3.5)
- Start genetic analyses of understory kelp (3.5)
- Take advantage of university land to run genetic studies (3.5)
- Use webpage or newsletter to archive restoration and monitoring workshop activities (in detail) (3.6)
- Reduce number of kelp workgroups to increase efficiency for all* (3.6)
- Organizations should join together to get things done* (3.6)
- Consolidate/coordinate existing group to improve efficiency* (3.6)
- Increase efficiency of groups - clear oversight and collaboration (3.6)
- Organize coordinate missions of the many kelp working groups* (3.6)
- Expand research and monitoring workgroup collaboration by sharing with dive community
- Prioritize learning about TEK and FPIC to build trusting relationships with Tribes*
- Solicit best practices from similar Indigenous environmental discovery*

- Continue to develop and seek out meaningful partnerships with Indigenous knowledge keepers*

Cluster III (Coordinate canopy-forming and understory kelp monitoring)

- Prioritize goals of subactions* (3.3)
- Be sure monitoring is hypothesis-focused if possible* (3.3)
- Have workshop with key partners focused specifically on protocol development. Have the focus be gathering data that can be used to target key ecological questions* (3.3.2)
- Methodological comparison between various survey platforms (SCUBA, ROV, camera tow), to maximize respective strengths* (3.3.2)
- Fund a data analyst position* (3.3.2, 3.3.3)
- Ensure monitoring protocol includes entire data lifecycle protocols - fund the housing of data* (3.3.2, 3.3.3)
- Fund development of data synthesis plan, data management plan, and/or research to set example of large synthetic analysis* (3.3.3)
- Widespread communities about where to fund standardized protocols and possibly contribute data (e.g., Shoreline Monitoring Toolbox) (3.3.3)
- Prioritize developing ecological stressor protocols that are helpful/useful/tractable* (3.3.3)
- Develop/vet list of questions to be addressed to determine the data synthesis needs (i.e., are there sufficient/right data to answer specific questions)* (3.3.3)
- Make both data and analytical frameworks (e.g., code) public (3.3.3)
- Separate data synthesis from linking/stressors (3.3.3)
- Add new Vital Sign Indicator incorporating subtidal survey data (3.3.4)
- Maintain momentum on bull kelp* (3.3.4)
- Concrete data integration projects must be encouraged, funded, and developed*
- Provide brief on Long-Term Ecological Research Network project and lessons learned over time
- Strategize/plan to expand understory kelp monitoring

Goal 4. Designate kelp protected areas

4.1 Action Descriptions

Cluster I (Use of protected areas for kelp)

4.1. Protect kelp habitat in existing and new reserves, refuges, and protected areas.

4.1.1. Increase the protection of existing kelp forests through organizations like DNR and USFWS.

4.1.2. Use withdrawal letters and set standards for lease agreements to ensure the protection of kelp forests (DNR).

Cluster II (Recreational kelp harvesting)

4.2. Assess the extent of recreational kelp harvest and its potential impacts, and develop spatial management plans and strategies to reduce potential impacts from projected kelp harvest activities.

4.2.1. If necessary, identify priority enforcement needs relating to permits and recreational harvest activities to support existing protections.

4.2 Action Status

Table 6. *Original action status scores and Team 1's and Team 2's (i.e., breakout teams that reviewed the actions) suggested score changes for All, Canopy, and/or Understory kelp. Canopy and Understory scores were only reviewed if time allowed during the workshop. Any changes to Canopy and/or Understory scores are listed after the All score and are presented as: (Canopy status score, Understory status score), for example (3, 1). See Table 1 for score definitions.*

Cluster #	Action #	Original status score			Team 1		Team 2	
		All	Canopy	Under-story	Changed score	Notes	Changed score	Notes
1	4.1	3	3	2	-		2	Programs in place but need large effort
	4.1.1	2	3	2	-		2	What about EPA, local govs, Tribes?
	4.1.2	0	0	0	2	DNR used withdrawal letter for the Snohomish kelp and eelgrass protection zone	2 (2, 2)	Snohomish kelp and eelgrass withdrawal order

Cluster #	Action #	Original status score			Team 1		Team 2	
		All	Canopy	Under-story	Changed score	Notes	Changed score	Notes
2	4.2	2	2	2	-		2-	Lots of work needed
	4.2.1	2	2	2	1	No movement on a kelp endorsement	2- (-, 1)	Lots of work needed

This table contains information from action clusters 1 and 2 of 3, from the Goals 2&4 breakout session.

4.3 Lessons Learned

SUMMARY NOTES

Cluster I (Use of protected areas for kelp)

- Need to refresh actions/subaction wording
- Collaborative enforcement of existing rules needed

Cluster II (Recreational kelp harvesting)

- Barrier: enforcement not happening, current levels of outreach isn't working
- Rules in place, monitoring/enforcement lacking

ALL NOTES

Cluster I (Use of protected areas for kelp)

- Subaction is unclear, is it meaning only DNR and USFWS or others? (4.1.1)
- Unclear if this is a subaction or standalone action (4.1.1)
- What is not on DNR aquatic lands? Other tools? Tribes vs. private landowners? (4.1.2)
- Establishment is great, but enforcement of provisions in rule must follow
- Cross entity collaboration is key
- Non-canopy-forming kelp largely ignored
- Public outreach/engagement is key
- Tribal outreach/engagement is key

Cluster II (Recreational kelp harvesting)

- Enforcement is not happening (4.2)
- Current level of educational outreach is not working (4.2)
- Have WDFW use license fees to enforce rules (4.2)
- Sustainable practices are not based on cumulative impacts (4.2.1)
- Enforce existing recreational harvest*
- Consider cross-deputization with Tribal law enforcement*
- Estimated use of kelp hard to nail down (bureaucracy, harvest mechanisms) for on-water vs. beach wrack collection
- Enforcement is hard and insufficient, even for high priority species let alone kelp
- We need to get ahead of the growing interest in kelp harvest

4.4 Next Steps

SUMMARY NOTES

Cluster I (Use of protected areas for kelp)

- Define tools of actions that preserve kelp at regional/place-based level
- Define metrics of success for preservation of kelp, and monitor
- Engage local entities, Tribes, and more

Cluster II (Recreational kelp harvesting)

- Review access/consumption/impact with environmental justice lens
- Develop plans and strategies to strengthen targeted education and outreach (4.2)
- Enforce existing recreational harvest (consider cross-deputizing Tribes and local entities) (4.2.1)
- Add kelp endorsement fee on shellfish license (4.2.1)
- Find way to estimate recreational harvest

ALL NOTES

Cluster I (Use of protected areas for kelp)

- Define tools that protect kelp – place-based*
- Extend/include all means and protections: water analysis, fisheries regulations, harvest, recreational (anchoring)
- Think about flow of information needed to implement
- Include ongoing monitoring to determine effectiveness of protection
- Increase existing protections through collaborations with local, Tribal, state, and federal partners (add layers of protections)*
- Collaborative research to identify/prioritize kelp stressors for all kelp; would use info and determine where/how to best protect kelp (existing)*
- Expand protection toolset beyond lease withdrawals (e.g. Tribal Marine Stewards Networks, B.C. Guardians)*
- Work with local governments to get consistent place-based regulations*
- Determine important areas of understory kelp to include in protected areas
- Build an all-kelp mapping and monitoring program for Puget Sound; want to be able to locate general "kelp bed", would be able to track trends (expansion/contraction of populations regionally)
- Start outreach and engagement before protection occurs to get local involvement early – could be more successful
- What conservation/protection actions actually preserves kelp?*
- Define what success is – targets?*
- Use PSP Vital Signs to link to Ecosystem Services provided by kelp*
- Elevate up so that it's not a subaction
- Catalog how protections can be enacted by DNR, WDFW, Ecology, Tribes, private landowners, National Marine Sanctuaries
- Ecosystem services provided by kelp are real measure of success
- Shoreline Management Program (SMP) guidance on protection of kelp through Shoreline Environment Designations (SEDs) and use regulations
- Stronger mitigation sequencing guidance to local governments about stress avoidance. First, we need to know what uses and structures impact kelp

- Invite local Tribes to the conversation surrounding increasing protection*
- Include state parks*
- Add partners beyond DNR and UFSWS to help protection responsibility conversations*
- Tie 4.1.2 into 1.4, 1.1, 1.5
- Outreach around differences between tools (withdrawal vs. lease)
- Outreach private landowners
- In addition to lease withdrawals, use restoration leases with Tribal entities, NGOs to lead*
- Reflect on Snohomish Kelp and Eelgrass Protection Zone opportunities for expanded protections. Apply lessons learned to future withdrawal orders*

Cluster II (Recreational kelp harvesting)

- Review access/consumption balance with an environmental justice lens using inventory of recreational harvesters*
- Parse out 4.2 into a couple of sections: assess harvest/impacts, develop plans/strategies*
- Strengthen education outreach*
- Set thresholds at allowable impacts
- Outreach to public about seaweed harvest regulations
- Permit requirement, education, and enforcement for permit requirement and harvest limits
- Evaluate recreational harvest and Tribal harvest*
- Add a reporting element to catch record cards WDFW*
- Coordinate with Tribes to assess amount of harvest*
- Add kelp harvest for catch record card*
- Start a reporting platform for recreation harvest*
- Add kelp endorsement fee on shellfish license*
- Clarify authority of state-owned aquatic lands vs. private tidelands. Collection vs. wrack?
- Clarify roles and authorities of DNR and WDFW
- Not just kelp in these issues (seaweed and eelgrass)
- Hire on more compliance officers*
- Education for enforcement officers on biological importance of kelp*
- Increase enforcement of "kelp cop" capacity
- Grad student opportunity to do surveys at kelp beds*
- How to create awareness with enforcement of kelp harvest including understory
- Modify language
- Create a list of priority needs

Goal 5. Restore kelp forests

5.1 Action Descriptions

Cluster I (Restoration funding)

5.3. Fund and implement restoration activities at priority sites.

5.3.1. Target restoration-funding sources for stressor reduction and population enhancement projects.

5.3.2. Reach out to restoration funding sources to include funding for kelp restoration.

5.3.3. Use compensatory mitigation as a tool to restore goods and services provided by kelp forests.

Cluster II (Developing and implement spatial plan for restoration and mitigation)

5.1. Develop a spatial plan identifying regions and sites for priority restoration actions and mitigation.

5.1.1. Target management actions that reduce stressors at priority restoration sites.

5.1.2. Reintroduce kelp through outplanting at sites that are recruitment limited.

5.1.3. Develop a mitigation bank of priority locations for kelp enhancement and restoration projects, and for when in-situ mitigation is not viable.

Cluster III (Develop restoration techniques)

5.2. Continue development of kelp restoration techniques for use in enhancement projects and mitigation.

5.2.1. Develop best management practices for designing, installing, and maintaining compensatory mitigation sites and restoration projects.

5.2.2. Define measurable project success standards to include ecosystem goods and services and long-term persistence of kelp forest.

5.2.3. Develop monitoring protocols to verify project success/compliance.

5.2.4. Support the development of local kelp seed banks for use in genetically appropriate restoration.

5.2 Action Status

Table 7. *Original action status scores and Team 1's and Team 2's (i.e., breakout teams that reviewed the actions) suggested score changes for All, Canopy, and/or Understory kelp. Canopy and Understory scores were only reviewed if time allowed during the workshop. Any changes to Canopy and/or Understory scores are listed after the All score and are presented as: (Canopy status score, Understory status score), for example (3, 1). See Table 1 for score definitions.*

Cluster #	Action #	Original status score			Team 1		Team 2	
		All	Canopy	Under-story	Changed score	Notes	Changed score	Notes
1	5.3	2	2	1	-		-	
	5.3.1	2	2	1	-		-	
	5.3.2	2	2	1	-		-	
	5.3.3	1	1	1	-		-	
2	5.1	3	3	2	4/2	Development = 4 Implementation = 2	2.5	Process started, but focus is state-wide. Need big effort to tailor to Puget Sound
	5.1.1	2	2	1	-		-	
	5.1.2	1	1	1	-		-	
	5.1.3	1	1	1	-		-	
3	5.2	3	3	2	-		2	We only have 1 strategy for 1 species
	5.2.1	2	2	1	-		-	
	5.2.2	3	3	1	-		-	
	5.2.3	3	3	1	2		-	
	5.2.4	3	3	2	2		-	

5.3 Lessons Learned

SUMMARY NOTES

Cluster I (Restoration funding)

- Need baseline, then prioritize, then money
- Need more refined objectives under subaction
- We are trying to do restoration, do basic research, and demonstrate proof of concept simultaneously. Lack of certainty makes pursuing traditional funding sources hard

Cluster II (Developing and implement spatial plan for restoration and mitigation)

- Ecosystem Based Management (EBM) is needed to avoid unintended consequences
- Permitting process for restoration projects is extremely difficult
- Which sites are recruitment limited and why?
- Lack of info about existing outplanting and mitigation sites
- ACOE only has mitigation banking for wetlands

Cluster III (Develop restoration techniques)

- Beware unintended consequences, but don't let perfect be enemy of the good
- Who is monitoring the monitoring across projects?
- Need comparative data; at the same time, we can leverage protocols and information from other places

ALL NOTES

Cluster I (Restoration funding)

- A certain sequence is required - need to identify priority sites
- Not always a clear picture of what we are trying to accomplish, especially on Washington coast
- Ecological and Physical (geomorphology) complexity; clearly defined; realistic expectations based on historical baselines
- Biogeomorphological processes
- Need more refined objectives within actions/subactions (5.3)
- So far, priority sites only emerge as crisis situations. How else to identify priorities? (5.3)
- Re: restoration - We are trying to do it and do proof of concept, basic research simultaneously (5.3.1)
- Funding sources may require a weight of evidence we don't have yet (5.3.2)
- Non-traditional funders might be more open to fund projects with scientific uncertainty (5.3.2)
- Stressor reduction and enhancement projects really have unknown impacts (in Washington); selling fantasy that may be true (5.3.2)
- Small individual projects may have used compensatory mitigation to restore, but it's unknown how many/how often (5.3.3)
- Need for guidelines on compensatory mitigation - companies with money are asking for this and we can't provide (5.3.3)
- Need to review more potential compensatory mitigation
- Partner with marinas and cities to restore goods and services provided by kelp forests (5.3.3)
- Grant funders are generally reluctant to support kelp stressor reduction and restoration so far. Proposals need to better articulate science/methodology and monitoring to justify their projects (5.3.3)

Cluster II (Developing and implement spatial plan for restoration and mitigation)

- Long timeframe for spatial plan
- Geophysical context
- Multi-use habitats
- Ecosystem based management
- Across-scale dialogue (regional plan, local implementation)
- Restoration permitting needs to be streamlined and fast-tracked (5.1)
- Lack of consideration of upland-source stressors (5.1.1)

- Poor information sharing about sites for ouplanting mitigation banks (5.1.2)
- We don't know which sites are recruitment limited (5.1.2)
- Limited information on recruitment limitation. We can back track from sites that will grow kelp once it's re-introduced, but this approach is patchwork (5.1.2)
- Can we assume recruitment limitation for all regions with high decline? (among other stressors) (5.1.2)
- Create list and share with all agencies (5.1.2)
- ACOE only has mitigation bank for wetlands (5.1.3)
- How to best distribute mitigation banks? (5.1.3)
- Create list and share with all agencies (5.1.3)

Cluster III (Develop restoration techniques)

- Unintended consequences
- Coordinate to ease permitting process
- Pair citizens with researchers to pilot out of the box ideas
- Don't let "perfect" be the enemy of the "good"
- Separate the creativity associated with restoration from compensatory mitigation
- Understory kelp? (5.2)
- Lots of work needed from state including continued consultation with non-local experts (Maine, Australia) (5.2)
- Leverage existing protocols! Don't reinvent wheel or do so at known cost of time and effort (do we really have that?) (5.2.2)
- Huge need for comparative data - from monitoring or like projects (5.2.2)
- Need to monitor the monitoring (beyond just a single project) (5.2.3)
- We are seed banking, do we know about the genetic appropriateness part? (5.2.4)

5.4 Next Steps

SUMMARY NOTES

Cluster I (Restoration funding)

- Integrate biogeophysiochem into reports and maps
- Define conservation vs. mitigation vs. restoration*
- Aggregate joint funding priorities to avoid internal competition
- Include land-based and freshwater partners linked to stressors*
- Publish a restoration guide with best available science
- Apply to NOAA's Saltonstall-Kennedy, agriculture-related restoration funding
- Create a database of existing mitigation projects*
- Incorporate compensatory mitigation for kelp into NOAA Nearshore Calculator

Cluster II (Developing and implement spatial plan for restoration and mitigation)

- Synthesize stressors in GIS context
- Streamline restoration permitting process
- Include land-based and freshwater partners linked to stressors
- Conduct research on recruitment limitation
- Create a database of existing outplanting and mitigation banking sites

Cluster III (Develop restoration techniques)

- Synthesize efforts, standards, best management practices
- Fund a project to monitor across projects
- More research on status and genetics of understory species
- Share lessons learned, best management practices for restoration techniques
- Decide on a rule about number of plants, geographic distance for kelp seed for restoration projects

ALL NOTES

Cluster I (Restoration funding)

- Define priority sites; explain why site was selected; describe known history of site (e.g., kelp and substrate presence)* (5.3)
- Integrate kelp recovery targets into other recovery plans that are tied to funding (e.g., Vital Signs, salmon recovery, rockfish recovery)* (5.3)
- Synthesize sequence (1. formulate hypothesis, 2. design to test, 3. identify potential priority for criteria, 4. fund and implement, 5. evaluate)* (5.3)
- Develop restoration projects that build in learning/testing restoration ideas. For example, a project that explores Roberts Kiel's small boulder idea (5.3)
- Public/stakeholder engagement - build empathy, understanding for importance of Puget Sound kelp; begin to build network of concerned folks wanting to play a role (money or otherwise) (5.3)
- Fund recovery tool development that can be implemented at a priority site depending on identified barriers to natural recovery (5.3)
- Education aimed at funders, other arms of agencies e.g., fisheries (5.3)
- Identify diverse sources of funding (i.e., think like a non-profit) and help graduate students/universities, volunteer networks (5.3)
- Define restoration vs. conservation, mitigation* (5.3)
- Aggregate joint-funding priorities to avoid internal competition* (5.3)
- Fund research/workshops to create comprehensive approach to defining "priority"; include previous presence, Indigenous use/access, etc. (5.3)
- Fund studies to identify stressors and develop tools to reduce stressors (first step)* (5.3.1)
- Stressor reduction from land-based stressors; need freshwater terrestrial buy-in and partners in the meetings and workgroups (5.3.1)
- Applied research! (5.3.2)
- Perform small pilot studies to vet means/methods/materials, etc.; adaptive management (5.3.2)
- Publish "Restoration Guide" that entities can follow, to make funders more comfortable (5.3.2)
- Submit more projects to NOAA's Saltonstall-Kennedy Grant* (5.3.2)
- Agriculture funding, etc. (e.g., USDA) as examples of restoration funding that could be tapped - do we need commercial industry in Washington first?* (5.3.2)
- Target upland stressors to expand grant opportunities (5.3.2)
- Check with marinas, other projects that might be doing compensatory mitigation (5.3.2)
- Potential solution is to provide (data-tec solutions) data management/automation support so a comprehensive database from Joint Aquatic Resource Permit Applications (JARPAs) can be made readily available to researchers and managers (5.3.2)
- Database of existing projects that use(d) compensatory mitigation for restoration efforts (5.3.2)
- To require compensatory mitigation, a project/proposal must be known to impact kelp first. Regulatory agencies need to know what the impactful uses and developments are first* (5.3.3)

- In the absence of 1:1 kelp restoration tools that can mitigate loss of existing kelp forests, identify regional stressors that are barriers to natural recovery and direct mitigation effort toward addressing those barriers (5.3.3)
- Database of existing projects doing compensatory mitigation* (5.3.3)
- For the future - compensatory mitigation via kelp projects could be incorporated in the Puget Sound Nearshore Calculator (via NOAA) (or add to update, fine tune)* (5.3.3)
- Establish "accepted" mitigation practices for kelp restoration - What? How? Monitoring? What is success? Include NMFS/USFWS/USACE in discussion for what's accepted (5.3.3)

Cluster II (Developing and implement spatial plan for restoration and mitigation)

- Synthesize map data for ALL stressors, geology, environmental, etc., to support priorities* (5.1)
- Fully assess potential priority sites (substrate, hydrodynamics)* (5.1)
- Ensure broad-based support for continued work on DNR health plan. Don't let it burn out! (5.1)
- Streamline permitting process for restoration projects (WSDA pre-permitting projects?)* (5.1)
- Spatial prioritization requires targeted definitions of conservation and recovery now and over time (e.g., future changes) and goals (5.1)
- Best practices for underwater dive surveys of understory kelp (5.1)
- Consolidate/create a network of groups (i.e. volunteer divers) trained and interested in fieldwork (cleanups, monitoring)* (5.1.1)
- From an out-of-sequence, critical area: trying to zero in on relevant stressors, what are the management points necessary to start to tackle stressors* (5.1.1)
- Include land-based and freshwater partners linked to stressors* (5.1.1)
- Research on recruitment limitation* (5.1.2)
- List of sites where outplanting is happening (5.1.2)
- Recruitment limitation data through eDNA and ROV. What other techniques are needed? (5.1.2)
- Develop an initial larval disbursement model (past due) (5.1.2)
- List/database of existing outplanting and mitigation banking sites* (5.1.3)
- List of sites used for mitigation banking (5.1.3)
- Start coordinating early with ACOE on a kelp (or eelgrass) mitigation bank (5.1.3)

Cluster III (Develop restoration techniques)

- We largely have a single tool/approach developed for restoration…we need methods for tackling other ecological contexts (e.g., competition and herbivore-limited populations) (5.2)
- Need more research on status and genetics of understory kelp (5.2)
- Create ‘best practices and protocols’ and share with all involved agencies (5.2)
- Compile lessons learned from multiple restoration projects and bring to multiagency management forum to discuss. Look for opportunities for shared standards (5.2.1)
- Need to share info on best management practices for restoration (5.2.1)
- Establish (or decide no rules are needed) rules for number of plants and geographic distance required for restoration projects (5.2.1)
- Defining success standards likely to be place-based (but could still be within a framework) (5.2.2)
- Monitoring protocol across projects (5.2.3)
- We need to emphasize a unified but modular/partner-based implementation strategy for the Statewide Plan (5.2.3)
- More research on local kelp species genetics (5.2.4)

Goal 6. Promote awareness of, engagement, and action

6.1 Action Descriptions

Cluster I (Educational tools)

6.1.4. Develop curricula and other educational tools focused on Puget Sound kelp ecosystems for K-12 classrooms and other education forums (e.g., aquariums, science centers, reserves).

6.1.6. Develop public educational materials and maps on how boaters and outdoor recreation groups can minimize their impacts to kelp (e.g., parks, boat launches, marinas).

Cluster II (Build research capacity and coordinate knowledge sharing)

6.2. Build research capacity and coordinate knowledge sharing of ongoing kelp recovery projects and research gaps.

> **6.2.1.** Create and maintain a regularly scheduled forum for information sharing and knowledge gathering between Tribal, federal, state, and local entities.
>
> **6.2.2.** Coordinate kelp conservation actions and research activities with the Salish Sea International Kelp Alliance, British Columbia, and states of Oregon and California.
>
> **6.2.3.** Coordinate knowledge sharing through regular participation in conferences, workshops, publications, social media, etc.

Cluster III (Sharing information on ecosystem value of kelp and concern for kelp losses)

6.1. Share information on (1) the value and role of kelp ecosystems as critical nearshore habitat and food web support (for forage fish, rockfish, salmon, and killer whales) in Puget Sound; and (2) the growing concern regarding significant losses to bull kelp canopies.

> **6.1.1.** Educate decision-makers (federal, state, and local entities) regarding the value of kelp, local declines, and the needs articulated in the Kelp Plan.
>
> **6.1.2.** Work with Tribal partners to elevate the prominence of traditional ecological knowledge regarding kelp.
>
> **6.1.3.** Encourage partners (e.g., Tribes, anglers, commercial fishermen, Washington Public Port Association, industry, recreational harvesting groups, and NGOs) to help tell the story of kelp to local communities and decision-makers.
>
> **6.1.5.** Carry out targeted outreach and advocacy to develop support for the implementation of the goals outlined in the Kelp Plan.

6.2 Action Status

Table 8. *Original action status scores and Team 1's (i.e., breakout team that reviewed the actions) suggested score changes for All, Canopy, and/or Understory kelp. Canopy and Understory scores were only reviewed if time allowed during the workshop. Any changes to Canopy and/or Understory scores are listed after the All score and are presented as: (Canopy status score, Understory status score), for example (3, 1). See Table 1 for score definitions.*

Cluster #	Action #	Original status score			Team 1	
		All	Canopy	Under-story	Changed score	Notes
1	6.1.4	2	2	2	-	Status depends on goal (broad but inclusive vs. immersive but less accessible); X-box games development with ROV; no K-12 curricula developed yet; focused on experimental education (5 senses); kelp summer camp
	6.1.5	3	3	3	-	Policymakers and regulators are paying attention, "everyone loves kelp"
	6.1.6	2	2	1	1	No one aware of the programs… no one has seen signs or info at marinas, beaches, etc.
2	6.2	4	4	3	-	
	6.2.1	3	3	3	4 (4, -)	What about the Kelp Science and Policy Forum; we have a lot of kelp related meetings; are there missing connections? Lots of projects focused on this
	6.2.2	3	3	2	4 (4, 3)	Indigenous Aquaculture Hub is not in inventory; Include canopy-forming and understory kelp
	6.2.3	4	4	3	-	
3	6.1	4	4	3	3 (3, -)	No K-12 curricula; information sharing has been a MAJOR challenge; downgraded many sub-actions; we're mostly preaching to the choir
	6.1.1	3	3	3	-	This is an easy lift…the what/why is easier than the how; strongest at state, federal then local
	6.1.2	2	2	2	3 (3, 3)	Big lift but not off track. Is onus on Tribes (3ish) or other partners (2ish)? Moving at speed of trust/capacity
	6.1.3	4	4	3	3 (3, -)	Partners are Tribes, aquaria, agencies; what about anglers, recreational fisheries? Industry?

6.3 Lessons Learned

SUMMARY NOTES

Cluster I (Educational tools)

- Tradeoffs between experts sharing content knowledge/enthusiasm and feasibility of developing curricula developed by teachers (breadth vs. depth; short vs. long-term)
- Need for targeting specific groups using diverse tactics (self-interest, fear, empathy)
- Top-level (decision-makers) are enthusiastic; middle level (implementers) need more support

Cluster II (Build research capacity and coordinate knowledge sharing)

- There is A LOT of effort, some of which is overlapping. Need to clarify what each project, initiative, etc. are doing and how to decrease duplication
- Communications needs funding and capacity/staffing to do this well

Cluster III (Sharing information on ecosystem value of kelp and concern for kelp losses)

- Do we need to "elevate" TEK or listen to/include what is already there (e.g., Samish Indigenous Scientific Knowledge integration into Kelp Vital Sign)
- How is local community defined? Who are we reaching and who are we missing?

ALL NOTES

Cluster I (Educational tools)

- Hard to find people with expert content knowledge and education/outreach skills* (6.1.4)
- Expert delivered content presented in schools is impactful (6.1.4)
- Don’t provide curricula without professional development (6.1.4)
- Top-level (i.e., decision makers) are enthusiastic, but middle level (i.e., implementors) need more support* (6.1.5)
- Folks are saying what is needed is top-down enthusiasm for kelp (6.1.5)
- Barriers seem to be in the middle (e.g., county/state planners) (6.1.5)
- Target specific groups using diverse tactics (love, money, fear-based)* (6.1.6)
- Where is the understory kelp? We don’t know its distribution (6.1.6)
- At the Seattle Aquarium it is important to engage via empathy. What avenues do we have to pursue this? (6.1.6)
- Does signage work? Do people see/read it? Do they change behavior? (6.1.6)
- Engage via self-interest, safety, productivity (6.1.6)
- Commercial, recreational, and sailboats all have different user impacts (6.1.6)
- Concerns over declines are place-based (6.1.6)

Cluster II (Build research capacity and coordinate knowledge sharing)

- We already attend a lot of meetings (6.2.1)
- There is A LOT of effort, some of which is overlapping. Need to clarify what each project, initiative, etc. are doing and how to decrease duplication* (6.2.2)
- Example of transboundary coordination: Kelp Node (6.2.2)
- We don’t need many of these groups (6.2.2)
- Example: ‘Kelp Lines’ Newsletter (tries to bring aquaculture and conservation together)* (6.2.3)
- DNR has a great social media presence (6.2.3)

- Social media sound bites often need more context, vetting/fact-checking beyond communication/social media team (6.2.3)
- Need funding and staff to support these* (6.2.2, 6.2.3)

Cluster III (Sharing information on ecosystem value of kelp and concern for kelp losses)

- Include information on how "this" applies to an organization and its mandate/mission? How do they get involved/act* (6.1.1)
- ESA listing for kelp would make it easier for federal organizations (e.g., ACOE, NOAA) to act but would make restoration and research harder (6.1.1)
- Important to ensure agencies see the big picture (6.1.1)
- Is it "elevating" or "listening" to what has already been done (e.g., incorporating Samish Indigenous Scientific Knowledge into Kelp Vital Sign)* (6.1.2)
- A lot of TEK related to kelp has been lost for many reasons linked to colonialism. Some knowledge persists or has been recovered but TEK is not something that exists in the past (ISK is always being created) (6.1.2)
- Is it realistic to expect all Tribes to be engaged? Tribes have limited capacity and a lot of consultation responsibilities (6.1.2)
- Tribal engagement does not have to be about kelp directly, it could be about salmon (6.1.2)
- How is local community defined? (6.1.3)
- Action example: Seattle Aquarium's ROV kelp surveying project, which educates students and Tribes (6.1.3)
- Action example: Indigenous community day at the Seattle Aquarium – Tulalip Tribe came and shared stories (6.1.3)
- Where is the line between "educating" and "encouraging partners to tell the story" (6.1.3)

6.4 Next Steps

SUMMARY NOTES

Cluster I (Educational tools)

- In the short-term, get experts into classrooms and add kelp to Bay Watershed Education Training priorities. In the long-term, train graduate students in curriculum development and outreach
- Update/modify existing resources/programs (there are many!) to include kelp
- Provide info and training for middle-level staff at agencies/county offices

Cluster II (Build research capacity and coordinate knowledge sharing)

- Create a kelp SUPER GROUP
- Include educators in the forums, venues, communication channels

Cluster III (Sharing information on ecosystem value of kelp and concern for kelp losses)

- Regular training/tours for decision makers and regulators focused on kelp
- Track basic demographic info about who is being reached in local communities (zip code, gender, race/ethnicity); link to environmental justice!

ALL NOTES

Cluster I (Educational tools)

- Short-term next step: guest lectures in schools is smaller lift than experts writing curricula*
- Long-term next step: add priorities such as Bay Watershed Education and Training, graduate courses, etc.
- Salmon in Schools program could easily incorporate kelp (Salmon in Schools, Nature Vision)*
- Bay Watershed Education and Training!
- La Conner teachers will be creating lessons in April 2023
- Graduate course on curriculum development design FOR their content area
- Education/other students interested in outreach? Curriculum writing? Guest lectures?
- Update/modify existing resources/programs (there are many!)*
- Most existing info is geared toward eelgrass - add kelp!
- Permitting via ACOE/DNR for mooring buoys, piers, etc. - consider eelgrass, should add kelp
- Tell folks where to anchor, not where to avoid
- Washington Sea Grant has 2 programs: 1) pump out program, 2) clean marina. Add handout related to kelp
- Incorporate this info/training into boating license, fishing license, Wagner's Guide, etc.
- Share PSRF resources more widely and to specific groups (repackage for fishers, boaters)
- Information/training by experts for middle level/implementers*
- Need organization engaged at high level of state agencies

Cluster II (Build research capacity and coordinate knowledge sharing)

- Super Group. Create an overarching forum; right now there are several fora*
- One centralized meeting forum organization chart?
- More kelp at Salish Sea Ecosystem conference?
- Add Oregon and California to Kelp Node if they aren't already on it
- Wendell Raymond is making a list of all the kelp groups; add to this, combine as appropriate
- Include educators in these venues*
- Ask Ze Frank to make a kelp video
- Academic venues for sharing research with colleagues less formally (i.e., Botany Lunch)
- Kelp podcast (A Cry for Kelp - seaweed industry podcast), accessible but space for context, nuance
- ROV efforts are an opportunity to showcase understory kelp (at least on social media)

Cluster III (Sharing information on ecosystem value of kelp and concern for kelp losses)

- Link Action 6.1 to Environmental Justice
- Track some basic demographic info to understand who in the local community is being reached*
- PSRF-led 3-day kelp summer camp for ACOE to help them see big picture and learn about options for mitigation
- Regular training/tours for decision makers/regulators (PSRF? ECY?)*
- Is there funding available to support increased Tribal capacity to engage with kelp; if needed
- Broaden Traditional Local Knowledge to Traditional Local Knowledge/Indigenous Scientific Knowledge
- Reach out to The Nature Conservancy, Melissa Poe, to add projects to lists
- Engage aspiring seaweed farmers - they communicate with the public a lot about the ecosystem services of kelp

Appendix B. Puget Sound Kelp Project Inventory

Appendix B consists of an inventory of Puget Sound kelp-related projects that directly addressed actions within the Kelp Plan in 2020-2022. This inventory was used to help inform the Kelp Plan Coordination Advisory Committee and participants of the Kelp Plan Action Workshop in March 2023. This inventory is likely to represent the majority but not all projects contributing to the Kelp Plan during the described timeframe. The inventory can be found at https://nwstraits.org/media/3470/puget-sound-kelp-project-inventory_2020-2022.xlsx.