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II. Introduction

DESCRIPTION OF THE PROCESS:

“Working Groups” – are now THEMES

“Themes” – are now RECOMMENDATIONS

Actions within “Themes” – are still ACTIONS

Define Short, Mid, and Long term scales of goals

PROBLEM STATEMENT:

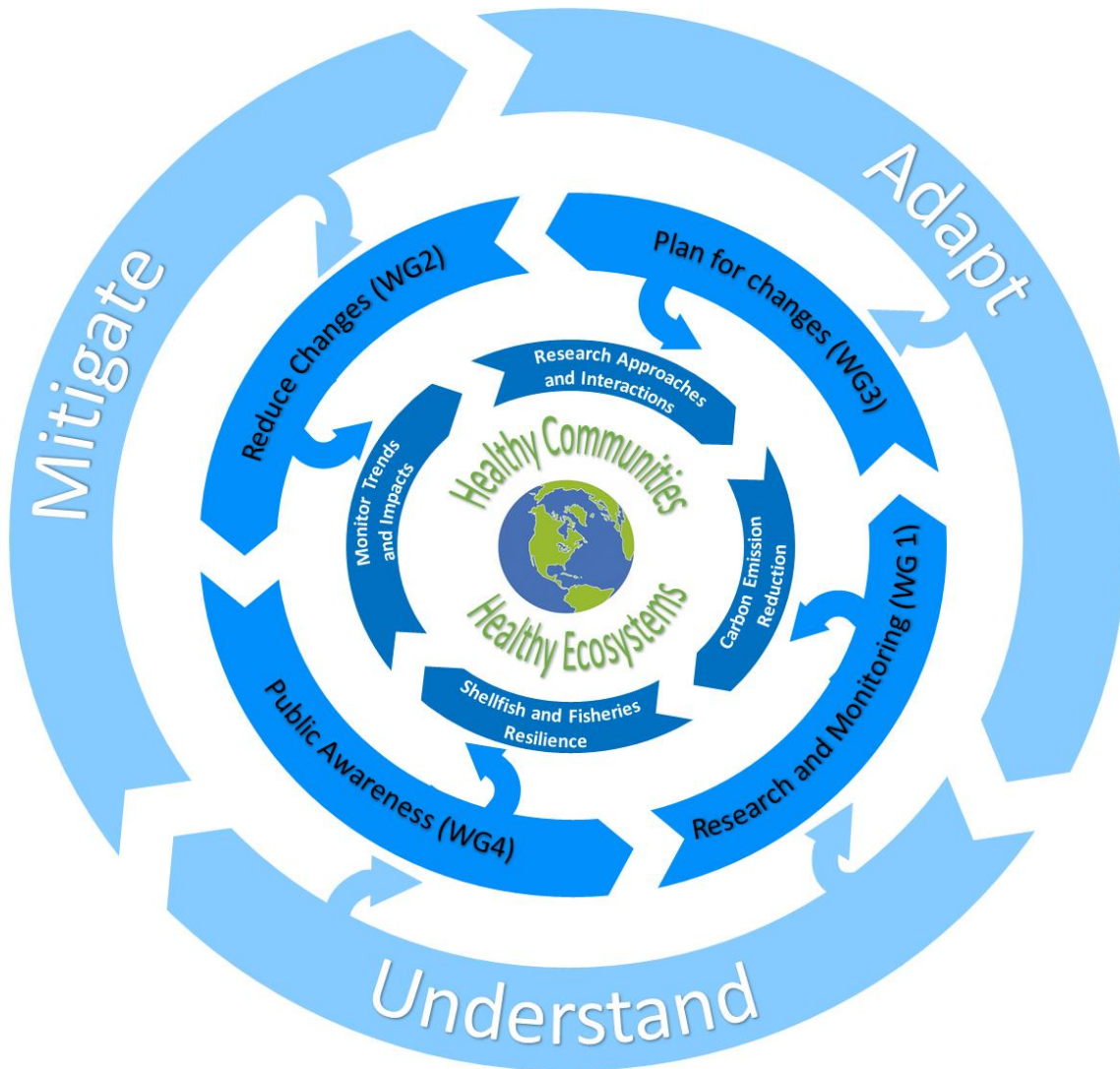
Oregonians care about and rely on the ocean for food and for social, cultural, and economic purposes. Living ocean resources are at risk from Ocean Acidification and Hypoxia (OAH) and other atmospheric-carbon related changing ocean conditions.

SOLUTIONS:

To sustain our marine-based food supply and our social, cultural, and economic well-being, we choose to take action to understand, adapt to, and mitigate OAH.

COUNCIL PROCESS DIAGRAM:

Depicting the process that the Oregon Coordinating Council on OAH took to reach recommendations and actions. The sequential diagram starts with **overarching topics** that were incorporated into **working groups (WG)**, which were then incorporated into **report themes** and in compassed into the **OAH Councils overarching goals**.



III. Quick reference guide

Table ____. Crosswalk of Senate Bill Enrolled 1039 legislative text and OAH Coordinating Council Report Recommendations

SB 1039		OAH Council Report Section	Page
Sec 1	<i>General legislative findings and declarations</i>	Executive Summary	#
Sec 2.(1)	<i>Council establishment and makeup</i>	Council Members and Affiliations	#
Sec 2. (2 - 8)	<i>Terms of service and operating framework</i>	Appendix 1	#
		Appendix 2	#
Sec 3. (1) (a) (A – B)	<i>Review and utilize relevant scientifically supported information</i>	Connections to Past Regional and State Science Initiatives	#
Sec 3. (1) (b) (A-G)	<i>Identify actions and initiatives</i>	Council Recommendations : Themes	#
		Connections of State Agencies to OAH	#
		Appendix 3	#
Sec 3. (1) (c)	<i>Advise and assist the State agencies in coordinating and conducting actions and initiatives</i>	Connections of State Agencies to OAH	#
Sec 3. (2) (a-c)	<i>Develop a Socioeconomic Vulnerability to Ocean Acidification Report</i>	Council Recommendations : Themes	#
		Continuing Work of the Council	#
Sec 3. (3) (a-c)	<i>Recommendations for the Oregon Ocean Science Trust, State agencies, academia, or other organizations</i>	Council Recommendations : Themes	#
Sec 3. (4)	<i>Biennial report to the Legislative Assembly and the Ocean Policy Advisory Council</i>	Appendix 4	#
		Continuing Work of the Council	#
Sec 3. (5)	<i>Agencies assistance to the coordinating council</i>	Appendix 1	#
		Connections of State Agencies to OAH	#

IV. Recommendations

OAH Council recommendations were first developed by a review of other plans (WA, international, OA Alliance), review of existing process/activities in Oregon, and then identification of opportunities for action. The initial opportunities were discussed through the convening of working groups, comprised of a subset of Council members. The 4 working groups were:

Working Group 1: Scientific Understanding and Data Gaps

Working Group 2: Reduce Causes of OAH

Working Group 3: Building Adaptation and Resilience

Working Group 4: Expand Public Awareness

Table __. Senate Bill Enrolled 1039 Section 3 legislative text, as related to working group topics of discussion.

SB 1039		Council Recommendations			
		WG1	WG2	WG3	WG4
Sec 3. (1) (b) (A)	<i>Developing optimal strategies for mitigation</i>				
Sec 3. (1) (b) (B)	<i>Strengthening existing scientific monitoring, research and analysis</i>				
Sec 3. (1) (b) (C)	<i>Identifying habitats vulnerable to corrosive sea water</i>				
Sec 3. (1) (b) (D)	<i>Identifying the socioeconomic and ecosystem impacts</i>				
Sec 3. (1) (b) (E)	<i>Steps to increase public awareness of the science</i>				
Sec 3. (1) (b) (F)	<i>Developing long-term coordination strategy</i>				
Sec 3. (1) (b) (G)	<i>Leveraging opportunities for research partnerships</i>				

After development of working group topics of concern and interest, all recommendations were integrated into a Council list of recommendations that were further refined and adopted by the Council as a whole. The Council categorized recommendations into 5 themes, further described below, with nested high-level recommendations and specific actions to implement each recommendation.

THEME 1: Build Scientific Understanding, Data, and Information

Identify information gaps critical for Oregon to have the best available data for the purposes of understanding, adapting to and mitigating OAH.

Recommendation 1.1: Build and maintain a robust monitoring network that captures oceanographic trends (e.g., pH, pCO₂ and/or alkalinity, oxygen, temperature, salinity, nutrient loads), through collaborative efforts in the State and region. **(Sec 3.1.a; Sec 3.1.b.B/G)**

Action 1.1.a. Conduct a series of oceanographic model validations to identify additional monitoring needed in Oregon, to aid in the development of an Oregon-wide model of OAH vulnerability and trends analysis.

- a. Work with regional oceanographic modelers (e.g., Live Ocean project) to develop longer-term annual, multi-year, and decadal scale regional OAH projections that can be used by industry and managers. **(long term)**

Process: Facilitate communications between modelers, industry, and managers to develop models that provide information in a format and scale that can be utilized for predictive, instead of reactionary, actions. Funding for this initiative could be through working with regional granting organizations (e.g., Western Regional Aquaculture Center, Sea Grant, NOAA) or regional industry groups (e.g., Pacific shellfish growers association, regional crabbers' association / fisheries groups).

- b. Identify spatial locations where oceanographic models exhibit uncertainty, which denote locations where more monitoring is needed. **(long term)**

Process: This could be done through the development of a joint request for proposal that encourages public / private partnership, possibly in conjunction with the Oregon Ocean Science Trust. Encourage ODFW, DEQ, and OOMG to work with modelers (from universities, NOAA, regional IOOS, or regional Ocean Observatories Initiative).

- c. Use the West Coast regional OAH monitoring inventory (finished in by the Pacific Coast Collaborative in 2018) to identify gaps in regional oceanographic monitoring coverage. **(short term)**

Process: Encourage the "Gaps analysis" stage of the OAH inventory through suggesting a public outreach strategy. This could be through public opinion surveys, town halls, or workshops. Work with larger national NGOs for guidance and funding (e.g., Nature conservancy, Ocean conservancy, Oceana, Ocean Leadership, Surf rider).

- d. Maintain the West Coast regional OAH monitoring inventory so that it continues to reflect the robustness of oceanographic monitoring inventory and the continued validation of regional models. **(long term)**

Process: Work with regional Sea Grants (AK, WA, OR, and CA) and other fellowship granting organizations to dedicate at least one fellow slot

every 4 years rotating between jurisdictions, fellowship funding permitting, to work on updating and maintaining the OAH inventory.
Process: *State the importance hosting the OAH inventory in a centralized location (geographically for all five jurisdictions: AK, BC, WA, OR, CA). A collaborative funding request for hosting/maintaining the website will most likely be needed involving the Pacific Coast Collaborative (PCC).*

Action 1.1.b. Determine if physical and chemical instrumentation in the Oregon Marine Reserves would be beneficial to gaining an increased understanding of how OAH affects Oregon's marine resources and ecosystems

- a. Consider existing siting of Oregon's marine protected areas relative to OAH hotspots and refugia, as part of the programmatic review. **(short term)**

Process: Conduct a gaps analysis that includes: defining OAH hotspots spatio-temporally, the definition of a refugia spatio-temporally, and if Oregon's marine reserves locations provide OAH ecosystem resilience.

- b. Instruct the Oregon Ocean Policy Advisory Council (OPAC) Marine Reversers 2013 program review to consider the current effectiveness of their instrumentation for OAH monitoring. **(short term)**

Process: Ask OPAC and OSFW to suggest location and types of instruments that would be most useful and would link into their current biological monitoring.

Action 1.1.c. Invest in an oceanographic monitoring station for Yaquina Bay, Oregon's third largest estuary systems for Pacific oyster production, and the only of which does not currently have oceanographic instrumentation.

- a. Allocate State funds to collaboratively develop and maintain a station in Yaquina Bay, in conjunction with academic institutions, Yaquina shellfish industry, and State agencies. **(short term)**

Process: Use the existing collaborative nature of the OOMG to leverage them as an organizational body and have the Oregon Ocean Science Trust act as the grant / funding administrator. ODFW and DEQ to play lead roles for State agencies.

- b. Leverage the historical USEPA data set from Yaquina Bay **(from **** -****)**, when establishing the monitoring site; include historical data in database. **(long term)**

Process: Encourage a federal and state partnership by working with regional EPA 10 (Pacific Northwest) and the Oregon DEQ mid-coast monitoring coordinator to provide data sharing on the project.

- *Work with State and Federal congressmen to facilitate conversations, through federal meetings or federal budgetary processes, to secure federal funding prioritization in NOAA.*
- *Determine the viability of using the Coastal Zone Management framework to designate this initiative as a project of special merit.*

Action 1.1.d. Support vessel-based OAH monitoring data collection in Oregon.

- a. Identify the type(s) of instruments that will be used on vessels to collect OAH data based on user types (e.g., fisheries, academics) needs (e.g., scale, accuracy). **(long term)**

Process: This should include evaluating: cost, ease of deployment, maintenance requirements, and access of recorded data.

- b. Work with existing regional and national scientific programs to include OAH sensors on ongoing research projects and cruises. **(long term)**

Process Examples: (OSU – OOI gliders with the Ocean Leadership; Regional NOAA (4 year – basin cures, monitoring buoy) – have transects come slightly closer inland for OAH monitoring; NOAA – Sail Drone tested in Oregon; NANUS – IOS moorings data).

- c. Instruct ODFW (state fisheries regulations) and the Pacific Fisheries Management Council (federal fisheries regulations) to initiate this action and build fishers based OAH monitoring programs with voluntary sensors attached to fishing vessels (and other vessels of opportunity). **(long term)**

Process: This would need to involve a data management and data quantification aspect as well as a pilot project. Possible funding for this action(s) could come from the NOAA Ocean Acidification, NSF Chemical Oceanography, or a Saltonstall-Kennedy direct or competitive grant.

Action 1.1.e. Support the continued monitoring of the “Newport Line” (biweekly monitoring of chemical, physical, and biological metrics; currently funded by NOAA).

- a. Ensure NWFSC at NMFS and the NOAA OA Program are aware of Oregon’s OAH interests and prioritizations by requesting of legislators to consider and lobby for continuing. This is a keystone of our understanding of biological response in Oregon, and in past budget cycles has been financially vulnerable. **(short term)**

Process: Encourage collaboration through the development of a communications strategy to the federal agencies (e.g., meetings, white papers) to communicate the importance of state OAH programs and actions. Determine if it is applicable to apply for a NSF Long-Term Ecological Research New Site Competition for longer term federal funding.

Recommendation 1.2: Build and maintain a robust monitoring network that captures the biological impacts from/response to OAH-related oceanographic trends, through collaborative efforts in State and region. **(Sec 3.1.a/b, Sec 3.1.b.B/G, Sec 3.3.a-c)**

Action 1.2.a. Facilitate and utilize the work of academics and other stakeholders on developing the “best” biological metric indices, proxies, and model systems.

- a. Build on the information collected by the Center for Ocean Solutions workshop (convened in 2017), which followed the West Coast OAH Science Panel recommendations. **(long term)**

Process: This workshop discussion was focused on what organisms could serve as experimental end-points, not necessarily what organisms should be the subject of long-term population trend monitoring.

- Suggested experiments: Pteropods, Mussels, Oysters, Urchins, Rockfish.
- Suggested long-term monitoring: Dungeness crab (e.g., Dr. Alan Shanks' megalopae light traps (faculty at OSU)), Urchins and Mussels (e.g., settlement plates).

- b. Encourage ODFW to continue work with CDFW to build a list of marine species, including intertidal species, which can be used as biological indicators of OAH for use in and out of State managed Marine Reserves.

Process: Consideration for species selection should be made for trophic level, ecological niche (e.g., critical prey, fish nursery habitat), as well as economic and cultural importance.

Action 1.2.b. Encourage regional academics, monitoring groups, and managers (State and Federal) to implement biological monitoring index/program for Oregon.

- a. Prioritize the use of model organism/metrics that are feasible for a wide range of user/observer interests. **(long term)**

Process: Instruct ODFW to continue collaborations with the California Department of Fish and Wildlife on following the 2018 Marine Reserves Indicator Workshop and develop a community workshop that involves relevant resource managers (ODFW, ODLC – Rockery shores initiatives), researchers (e.g., PISCO, OSU, UO), and community monitoring groups (e.g., Surf rider, estuary partnerships, OOMG). Standardization and adaptability framework of goals and priorities among groups; make sure the monitoring framework can respond to changes in knowledge (how and what we think we should be monitoring).

- b. Balance of the relative importance of species to one another, to their prioritization for OAH monitoring. **(short term)**

Process:

- Commercial, recreational (e.g., crab, bivalves, salmon)
- Culturally (e.g., salmon, Olympic oysters)
- Ecotourism (e.g., whales, sea birds, blue mussels and sea stars – rocky shore intertidal)
- Public Health concerns related to OAH (e.g., HABs species/toxins)
- Ecosystem (e.g., Keystone species, Abundant species, Habitat forming species, Iconic Predator / Prey species - Rockfish, Dungeness crab)

- c. Explore the OAH Council's further collaboration with PISCO and utilization of their datasets (20+ years of biological trend monitoring including: Mussels, Urchins, and Sea stars). **(long term)**

Process: Leverage activities conducted by PISCO, and endorse the continued funding and expansion of the PISCO program. Encourage PISCO to continue stakeholder interactions and community science initiatives (e.g., work with Surf Rider, OOMG).

Recommendation 1.3. Establish research priorities to characterize OAH impacts on commercially, recreationally and culturally important species. (Sec 3.1.a and Sec 3.1.b.A/B/G; Sec 3.1.b.D, Sec 3.2.a-c)

Action 1.3.a. Characterize the effects of OAH on recreational and cultural harvest clam beds **(long term)**

Process: Work with management personnel and communities to identify areas of importance for clam harvest, and then work with academia to prioritize research on the effects of OAH on settlement, growth, and survival in these regions.

Action 1.3.b. Support the Molluscan Broodstock Program (MBP) - Coastal Oregon Marine Experiment Station – aquaculture seed development (long term)

Process: Encourage ongoing Oregon legislative funding to MBP, and encourage the expansion of the MBP to include razor clams and other species of regional importance in addition to Pacific Oysters.

Action 1.3.c. Promote HABs monitoring in the ocean (forecasting public health risks) and in seafood (public health exposure) as a source of information for modifying fisheries/harvest strategies and management. **(short term)**

Process: Encourage the DOA and ODFW to continue to work collaboratively to promote HAB monitoring and the Oregon shellfish safety hotline.

Process: Continue OAH Council support for Oregon to create and staff a state HAB and water quality lab. Such a lab does not exist at this time.

Recommendation 1.4: Establish research priorities for developing local adaptation strategies to maximize both ecosystem and socio-economic benefits of local actions. **(Sec 3.1.a and Sec 3.1.b.A/B/G; Sec 3.1.b.D, Sec 3.2.a-c)**

Action 1.4.a. Identify Oregon assets that are at risk and/or vulnerable to OAH impacts by conducting vulnerability assessments.

- a. Work with other West coast states to develop universal/standardized metrics that allow comparable studies, both biological and socio-economic, among the region. **(long term)**

Process: Instruct ODFW to reach out to the CDFW, WDFG, regional state parks, and federal parks to convene a meeting of managers, to discuss

current and ongoing monitoring efforts. Work with regional NGOs that have a coastal citizen science component and discuss educational workshops to standardize data collection and processing. This can be conducted through a series of public process actions (e.g., workshops, town halls, surveys) and written reports.

- b. Support the funding of an Oregon-Specific Ecosystem Vulnerability Assessment consisting of habitats and species of OAH concern (**long term**)

Process: Examples of habitats of concern could include: submerged aquatic vegetation (e.g., eelgrass beds, kelp beds, salt marshes), Rocky intertidal, Native oyster beds

Process: Examples of species/groups of concern could include: Finfish (e.g., salmon, rockfish, halibut – Prey shortages and olfactory disruption); Crustaceans (e.g., Dungeness crabs, pink shrimp, zooplankton, barnacles); Echinoderms (e.g., Sea stars, red sea urchins, sand dollars); Bivalves (e.g., Olympic oysters, blue mussels, razor clams, and recreationally harvested clams - butter, gaper, soft shell)
- c. Support the funding of an Oregon-Specific Socio-economic vulnerability assessment to identify the types and scales of communities that could be affected by OAH. (**long term**)

Process: Collaborate and facilitate regional experts and funding organizations to work with local communities to define the demographics and scale of projects to human communities of concern: Fishing, aquaculture, eco-tourism, recreational / cultural values.

Action 1.4.b. Conduct an assessment of water pollution information needs, to facilitate reductions in statewide and local water pollution that amplify or exacerbate OAH.

- a. Characterize scale of local pollution sources (water based outfalls) and assess if regulatory change could reduce the sources ability to amplify and/or exacerbate OAH conditions. (**long term**)

Process: State actions and research ideas: Non-regulatory: Public awareness on local sources, tracer studies of point sources and “end” locations; Regulatory: Total maximum daily loads (TMDLs) – multiple stressors on a single area with the science of OAH incorporated; number and magnitude of point sources using 309(d) listed streams.
- b. Formulate an understanding the relative magnitude of different types of OAH-exacerbating water pollution sources, to identify missing data and/or regulations that need to be addressed. (**short term**)

Process: Recommend a summary report is created for the DEQ midcoast that should be updated every 6 years.

Process: Recommend that the North coast (finished in 2011) and South coast (finished in 2013) summaries reports are updated every 6 years.
- c. Recommend funding for state agencies and academic institutions to develop estimates of the amplitudes and extents of specific regional point source discharge impacts on surrounding environments. (**long term**)

Process: Encourage state agencies and academics, in addition to the OOMG, to collaboratively identify work plans and timelines for progress, including finding possible outside grants to match State funds.

- d. Identify potential sources whose intensities could contribute to OAH in Oregon Waters other than carbon emissions (e.g., at sea fish processing, sewage discharge, road runoff into watersheds) and their impacts on surrounding ecosystems and communities. **(short term)**

Process: Work with State agencies and regional academics to development public workshops and facilitated meetings with identified point source pollution stakeholders to work on solutions for reductions.

Process: Work with regional monitoring programs (e.g., ODFW Marine reserves, State parks, Federal parks) to determine baseline and identify affected ecosystems as a result of water pollution amplifying OAH.

Action 1.4.c. Characterize the role Oregon's submerged aquatic vegetation can play in building resilience, through SAV protection, restoration, and aquaculture.

- a. Determine the resilience/mitigation benefits of SAV protection and restoration to Oregon's coastal ecosystems and communities **(long term)**

Process: Encourage experiments, both in the field and in the laboratory, which will not only test what SAV species are most efficient but the scalability of OAH mitigation through the work.

- b. Determine what state management process to insert seagrass/kelp protection and restoration can be incorporated into. **(short term)**

Process: Work with staff at ODFW to determine if mitigation of estuary development projects have been historically successful.

Recommendation 1.5. Establish research priorities for developing a variety of carbon and OAH mitigation solutions (e.g., carbon mitigation and sequestration). **(Sec 3.1.b.F)**

Action 1.5.a. Support research needed to remove carbon from ocean waters and investigate the use of marine habitats for carbon sequestration goals.

- a. Determine if there is a scale and duration of benefits from seawater buffering (e.g., short term mitigation during summer upwelling) and if "blue carbon" (long term sequestration of CO₂) viable in Oregon. **(long term)**

Process: Promote research initiatives in regional academia.

- b. Determine if there is an OAH resilience/mitigation benefit of kelp aquaculture. **(long term)**

Process: Work with other State agencies to determine a permitting pathway for kelp/microalgae farming. Currently there are no clear jurisdictional guidelines for which state agency would permit.

- c. Determine which regional estuaries and riparian buffer zones have the greatest potential for natural carbon capture and sequestration, **long term)**

Process: Instruct State agencies to promote the protection and restoration of these areas.

THEME 2: Reduce Causes of OAH

Recognizing that carbon is a direct cause of OAH, develop an understanding of work being done by others to identify, evaluate and mitigate land-based drivers of OAH impacts in Oregon's estuaries and coastal waters. In addition to provide information on OAH impacts and land-based factors that exacerbate OAH to decision-makers as well as build ocean considerations in state/regional climate discussions and decisions for an integrated approach.

Recommendation 2.1. Develop and maintain coordination strategies between OAH and climate change efforts in the State and regionally, to facilitate the reduction in the anthropogenic causes of OAH. **(Sec 3.1.b.F)**

Action 2.1.a. Build coordination among State government entities that are informing carbon mitigation activities to align OAH Council recommendations and other State government activities.

- a. Oregon Global Warming Commission (GWC) – OAH Council alignment. **(short term)**

Process: Connect the OGWC mission and activities to ocean and OAH Council concerns; inform and support the OGWC process, rationale and actions to reduce local carbon dioxide emissions. OGWC activities includes but is not limited to carbon management such as the use of green energy (CO2 scrubbing).

Action 2.1.b. Coordinate with and leverage preexisting agency programs and non-governmental institutions to support OAH mitigation activities.

- a. OAH Council - EPA Partnership. **(long term)**

Process: Work with state agencies federal liaisons to have EPA Region 10 provide summaries results and raw survey results on OAH to the OAH Council, who will then use the results in further state considerations of OAH adaptation and mitigation strategies.

Background: In April 2017, EPA Region 10 sought data, information, and comments on potential aquatic life impairments in Oregon coastal marine waters related to ocean acidification (in reference to Oregon's 2012 303(d) list - Coastal Nonpoint Control Program under the Coastal Zone Act Reauthorization).

- b. Utilize and expand existing environmental quality policies to promote best practices, and permanent improvements that support participation in programs that leverage national or regional infrastructure and collaborations. **(short term)**

Process: Promote Oregon's continued participation in various groups at the state and local levels: Pacific Coast collaborative; Global Ocean

acidification alliance and the development of a state wide OAH Action plan; Portland's participation in the C40 cities.

- c. Leverage voluntary actions and existing State laws to focus on “best-practices” for local land-based sources and practices. **(short term)**

***Process:** Instruct state agencies to work with local municipalities to determine what form of incentives (e.g., tax breaks, grants, and/or education/outreach) would promote regional voluntary actions and compliance with current laws to reduce OAH stressors.*

- d. Work with State outreach/extension programs to focus on what each “individual” can do to make a difference. **(short term)**

***Process:** Through regulatory or voluntary actions) by packaging existing information to make it easily accessible and meaningful in the context of existing programs, and community dialogues.*

THEME 3: Build Adaptation and Resilience of Ocean Resources

Support activities and initiatives that build resilience in Oregon's human communities and ecosystems to adapt to increasing OAH conditions, to sustain Oregon's socio-economic and ecosystem assets in the face of future OAH conditions.

Recommendation 3.1: Incorporate OAH considerations into the existing decision-making framework to build resilience in Oregon's human communities and ecosystems. **(Sec 3.3.c)**

Action 3.1.a. Support reductions in water pollutants that are co-stressors of OAH, in an effort to identify and mitigate statewide and local water pollutants that amplify or exacerbate OAH.

- a. Reduce identifiable pollution sources by amending allowed state water uses, update wastewater and storm water treatment requirements, and other actions to prevent and reduce water quality issues exacerbating coastal OAH. **(long term)**

Process: Conduct that state agencies submit a programmatic audits to determine what actions they are currently taking, and future actions they would like to take, to increase and enhance water quality regulations practices in the state.

- b. Build and enhance state agency programs to ensure that enforcement of existing water quality regulations is a priority. **(short term)**

Process: Request that DEQ conducted an inventory and evaluation of their current water quality regulations, and note areas where changes and new regulations could directly improve regional OAH. A summary report should be completed by DEQ within 4 years of the OAH Council, or any other interested parties, information request to the agency.

- c. Promote consideration of OAH in local water quality and permitting decisions, as an issue of concern and point to review. **(short term)**

Process: Instruct DEQ and DOA to build a platform for communication (e.g., whitepapers, press releases, town halls, advisory boards) to educate and receive feedback agriculture stakeholders on OAH issues, where the information can be used by OAH Council.

Process: Instruct DEQ and DLCA to build a platform for communication to educate and receive feedback forestry stakeholders on OAH issues, where the information can be used by OAH Council.

- d. Support upgrades to sewer treatment for coastal municipalities for use of advanced treatment technologies on sewage treatment systems to mitigate local water quality impacts. **(long term)**

Process: Instruct state agencies to work with local municipalities and the State legislature to develop cost offset programs, through tax breaks or state grants, to encourage voluntary updates to sewer systems.

- e. Encourage septic system inspections by local governments and municipalities to reduce the potential for water pollution. (**short term**)

Process: Work with local municipalities and the State legislature to develop coast offset programs, state and federal grants, to provide additional personal to local governments and municipalities to conduct inspections.

- f. Assure Goal 5 – safe harbors requirements (50' riparian set back buffers) are applied and enforced, especially along river systems with outflows into OAH sensitive coastal ecosystems and communities. (**Long term**)

Process: Instruct DLCD and DEQ to work with DSL to enforce current goals and regulations.

Action 3.1.b. Anticipate specific management and regulatory decision-making processes, into which OAH resilience considerations can be incorporated.

- a. Rocky Shore/Territorial Sea Plan review process (DLCD/OPAC) (**timeline 2019**) (**short term**)

Process: Consider land use relative to OAH hotspots and refugia during plan development and implementation

- b. Marine Reserves Program review process (ODFW/OPAC) (**timeline 2023**) (**short term**)

Process: Support OAH monitoring within the Program priorities, as an asset to the State's response to OAH.

- c. Oregon's Coastal Nonpoint Control Program - Coastal Zone Act Reauthorization (DEQ/EPA/NOAA) (**timeline 2019?**) (**short term**)

Process: Facilitate DEQ's continued work with the Oregon Departments of Forestry and Agriculture, USEPA, and NOAA to resolve inadequacies in the Coastal Nonpoint Control Plan with regard to forest practices on private lands, specifically as they relate to funding that could aid OAH programs.

Background: In 2015, EPA reduced DEQ's 319 grant funds because EPA and the NOAA Administration determined that Oregon did not submit a fully approvable plan. The program was not fully approvable because Oregon's forestry related program had several gaps.

Recommendation 3.2: Support new OAH resilience initiatives to sustain Oregon's habitats, species, and human communities, thereby supporting Oregon's ecosystem health and socio-economic reliance on living ocean resources. (**Sec 3.1.b**)

Action 3.2.a. Promote submerged aquatic vegetation (SAVs - algae, seagrasses, kelps) strategies and opportunities, as supported by best available science, to restore and sustain SAVs

- a. Short-term buffering and sequestration of carbon (**long term**)

Process: Encourage Oregon agencies to develop a “best practices” methodology for occurrences when SAVs need to be transplanted or replanted (e.g., whole sod mat vs single root systems).

- b. General ecosystem services provided by SAVs such as nursery habitat for many fisheries species targets, for promotion of biodiversity, for forage and predator avoidance. **(long term)**

Process: Although Oregon has a “no net loss” policy, programs should be developed to encourage the replanting of SAV and protection of existing areas of SAV to increase current SAV coverage.

Process: Develop coordinated restoration programs for SAV. Focus should be placed on the promotion of biodiversity and nursery habitat, including for economically important species for Oregon.

Action 3.2.b. Promote native ecosystem resilience of native oyster restoration, a species that is more resilient to OAH impacts and a key member of healthy estuary communities.

- a. Work with relevant Oregon state agencies to increase current preservation efforts of current and new native oysters’ beds in state waters. **(long term)**

Process: Work with local hatcheries that produce seed for restoration purposes, as well as encourage research into the use of Olympic oysters as an aquaculture product (including market development and aquaculture industry diversification).

- a. Determine if native oyster restoration act as short term regional buffering through estuary shell bed restoration and long term blue carbon sources through shell carbon burial. **(long term)**

Process: Encourage state agencies and regional academic agencies to prioritize the funding and resource allocation to research and development projects associated with enhancing natural systems of marine organisms.

THEME 4: Raise Public Awareness of OAH Science, Impacts, and Solutions

Identify and advance opportunities to educate and inform students, industry, media, and decision-makers. Specifically, work with Oregon stakeholders to develop K-12 curricula and work with K-12 educators; engage with media and informal educators to promote stories; and educate the public and local, state, and federal elected officials on OAH science, impacts, and mitigation solutions.

Recommendation 4.1: Collaboratively develop communications and public awareness strategies on OAH science, impacts, and solutions (10-year plans). **(Sec 3.1.b.F)**

Action 4.1.a. Formulate an Oregon OAH “communications needs assessment” based on what information is already known and what information is needed/desired by Oregonians.

- a. Informal Logbooks surveys – “free thought” exercise for the public to write questions or concerns. **(short term)**

Process: Log books will be used by OAH Council members and staff for an informal informational purposes, as well as be provided to the academic community as for the preliminary basis of more detailed Oregon public survey in collaboration with formal educators.

- At seafood stores, restaurants, and festivals (e.g., Newport Seafood & Wine Festival, and other regional crab festivals)
- Part of exhibits (e.g., Oregon coast aquarium, OSU Hatfield visitor center, state park visitors’ centers)

- b. Formal surveys – to be provided throughout Oregon. **(short term)**

Process: Work with regional academics to design and implement surveys possibly as part of a graduate/postdoctoral research project in collaboration with state agencies.

- Leverage Washington State public survey methodology (conducted in 2018)

Action 4.1.b. Establish the link in public opinion between OAH and other climate issues

- a. Collaboration with other commissions and working groups including the Oregon Global Warming Commission. **(short term)**

Process: Have the OAH Council leverage partnerships and communication platforms (e.g., websites, Oregon Public broadcasting, NGO social media) to engage the public and increase messaging.

Action 4.1.c. Build a foundation of positive, solutions-oriented messaging on OAH science, impacts and solutions. Messages should include: simple, positive, local connections, actions for individuals and for government.

- a. Connect education and outreach actions with audience values – including monetary gains and savings, personal time, outdoor recreation. **(short term)**

Process: Communicate (or build communications plan) positive messages on how OAH impacts are affecting everyone and that mitigation actions are achievable by and a benefit to personal goals of Oregonians. The OAH Council can achieve this through quantifying and describing how OAH fits with everyday life, and how individual everyday actions can have a positive impact on responding to OAH.

- b. Develop estimates of OAH economic impacts local and regional levels and embed OAH into outreach documentation and materials. **(long term)**

Process: Encourage regional academic institutions to form multidisciplinary partnerships of ecologists, social scientists, and economists to tackle important eco-social issues

Current study: Oregon State University and Pacific Shellfish Institute meta-analysis of Oyster and muscle aquaculture economic/ecological impacts study.

Additional studies could include: Crab and shrimp fisheries; Salmon fisheries and recreational harvests.

- c. Look into similar environmental messaging that was successful – (e.g., protecting the ozone, reducing acid rain). **(short term)**

Process: Work with academia, including using undergraduate and graduate students, to conduct a literature review and final report on techniques that can be borrowed and lessons to be learned from similar environmental messaging. Keep a focus on regional and local invites which were successful and ones that were not.

Action 4.1.d. Create an information resource and outreach library for the OAH Council and others, that highlights OAH science, impacts and solutions, using a positive messages strategy.

- a. Facilitate public conversations with key facts and summaries of the OAH issue (e.g., convene discussion panel, write articles). **(short term)**

Process: Provide documents, one-pagers, and “kits” publically for others to engage the public with – expand outreach past just the Councils actions.

- b. Developing digital resources (web portal) for outreach materials (e.g., one-pagers, curricula), and a centralized repository of hands on kits. **(short term)**

Process: Work with regional academics and extension specialists (e.g., sea grant, state parks interpreters) to formulate OAH hands on kits that can be centralized located and borrowed by local school systems and

educators for outreach. This project could be funded through a grant or a student fellowship.

- c. Standardized “Roadshow”: Prepared PowerPoint slides and one pagers for use by state agencies and the OAH Council. **(short term)**

Process: The OAH Council will construct a series of OAH presentation and informational handouts that can be used as unified message for state agencies and council members to conduct outreach.

Action 4.1.e. Encourage informal education opportunities through State wide outreach events – informal conversations with the general public

- a. Partner with informal venues (e.g., Hatfield Marine Science Center Visitor Center, Charleston Marine Life Center, Oregon Museum of Science and Industry, Creative Minds Learning Centers) to develop and showcase exhibits on OAH. **(short term)**

Process: The OAH Council, in conjunction with other state outreach groups, will work with institutions to secure funds and resources to develop OAH materials.

- b. Working with industry to provide informal experiential opportunities for general public. **(long term)**

Process: The OAH Council can aid in developing regular tours and open houses of industry and educational locations (e.g., oyster farms)

- c. Exhibit general OAH materials at community events (e.g., OSU marine science days, Oregon Aquarium’s Our Oceans Day, State Fair, State of the Coast). **(short term)**

Process: The OAH Council, in conjunction with other state outreach groups, will construct and prioritize a list of regional outreach events, which will incorporate industry connections.

Recommendation 4.2. Increase public awareness and dispel misconceptions of OAH science, impacts, and solutions by building specialized informational materials and reaching specific audiences. **(Sec 3.1.b.E)**

Action 4.2.a. K-12 schools: “Next generation” engagement with local based school curriculum development-in alignment curriculum standards

- a. Encourage the state legislature to continue funding of OAH STEM curriculum supplies in public schools and after-school education programs. **(long term)**

Process: The OAH Council will work with regional STEM hubs to incorporate OAH materials into their curriculum to build a new partnership between the groups.

- b. Work with the Department of Education to incorporate OAH science into Oregon State education standards at multiple education levels (elementary, middle, and high school) (e.g., Next Generation Science Standards (NGSS), common core). **(long term)**

Process: Include state wide efforts on how OAH affects not only the Oregon Coast - focus on inland schools (with both adaptation and mitigation messages)

- c. Teacher training programs – “Best methods” for long term information distribution. **(short term)**

Process: Work with regional Graduate teaching programs and work with STEM Hubs to incorporate messages into teacher curriculum

- d. Help educators develop, adapt, and implement curricula on OAH and associated climate issues for primary, secondary, and higher education. **(long term)**

Process: Provide experiential learning opportunities – field trips for schools and work with regional teacher training programs (such as Education and Research: Testing Hypotheses (EARTH) through MBARI) to reach a wider range of educators.

Action 4.2.b. Policy makers and legislative staff: inform policy actions with increased knowledge

- a. Participate in legislative days, with clear messages on OAH science, impacts, and mitigation strategies. **(short term)**

Process: The OAH Council, in collaboration with state agencies, will work with the Oregon Coastal Caucus and other state legislative caucus to spread awareness of OAH to legislatures and staff. The goal is to attend in person at least one legislative days each legislative session.

- b. Provide “field trip” opportunities for legislative staff to visit science laboratories and industry sites (e.g., fishing boats, shellfish farms). **(short term)**

Process: The OAH Council, in collaboration with state agencies, will work with the Oregon Coastal Caucus and other state legislative caucus to provide at least one field trip each legislative session to legislatures and staff. Examples of field trips could include, local shellfish hatcheries, oyster farms.

- c. Provide “science in Salem” opportunities, outside of legislative days, where hands-on information is brought to the legislative offices of state agencies and other state government offices. **(short term)**

Process: The OAH Council will work collaboratively with interested Oregon legislative committees and caucus, to develop materials and platforms for OAH staff to communicate directly with Oregon Legislatures and staff.

- d. Encourage the appointment of funded positions in State agencies with dedicated focus on oceans, including local impacts of OAH and local actions to combat OA within government and resource management at every level. **(long term)**

Process: OAH Council members and state agencies will work together to identify OAH projects and initiatives where increased staff will be critical for implementations of actions.

Action 4.2.c. Media: Utilize the “Public Arena” – information access, media “take homes”

- a. Develop visuals and clear messages for media to use. **(short term)**

Process: Work with Oregon Public Broadcasting and regional National Public Radio to develop an OAH message that can be used by news outlets.

- b. Develop an OAH media strategy, with clear timeframes and measured messaging outcomes with positive messages. **(short term)**

Process: Through media updates build recognition of POSITIVE impacts of mitigation and adaptation actions by highlight “our” OAH successes. Platforms include: OAH Council created newsletter, Oregon Public broadcasting / radio stories, press releases to local TV news and radios.

Action 4.2.d. At-risk industries and professions: Strengthen cross disciplinary actions and communication with industries affected by OAH

- a. Convene specialists and/or industry representatives across industries and regions using round tables and workshops. **(long term)**

*Process: The Council will work with the OAH Scientist-Fishermen Roundtable, convened by **FF**, to coordinate this action as a shared project of interest, including identifying the student/staff person to who will coordinate and manage the data. Ask the state legislature to allocate additional funds to the OAH Council to help facilitate and run annual Scientist-Fisherman roundtables.*

- b. Engagement with seafood processors and food industry (e.g., chefs and restaurants). **(long term)**

Process: The OAH council will explore similar model as was done in California, to engage Oregon hospitality and restaurant industry in OAH messaging.

- c. Work with existing industry associations and science partnerships to develop unified messages and communication strategies on OAH. **(short term)**

Process: OSU/PSI Shellfish Stakeholder Initiative; Shellfish Growers Climate Coalition to develop a clear set of messages and priorities from the industry community.

THEME 5: Build Sustained Approach to OAH Response

To build resilience in human communities, fisheries, and other ocean resources that are experiencing or at risk from OAH impacts, Oregon needs a sustainable and sustained approach to funding and support. Oregon's OAH response will be well-served by diversified funding, use of existing management processes, and investing in Oregon's intellectual capital to meet future challenges.

Recommendation 5.1. Diversify funding sources that can be used to implement Oregon's science, adaptation, and mitigation goals. **(Sec 3.1.a)**

Action 5.1.a. As the state develops revenue streams from mitigation requirements (e.g., fees from carbon management, development of mitigation banking), consider allocation of mitigation funds to building OAH resilience strategies.

- a. Identify communities, regions, and research topics/programs which would benefit most from funding. **(long term)**

Process: Funds should be considered for use in understanding and building resilience to OAH, as one of the major projected impacts from combustion of fossil fuels.

Action 5.1.b. Support State and Federal science funding entities that provide grant funds to OAH science and response.

- a. Oregon Watershed Enhancement Board (OWEB) **(long term)**

Process: Support funding initiatives that include estuaries and river basins that could be affected by OAH, or that may affect regions experiencing OAH. This includes contained support of currently funded OAH projects such as the Tillamook estuary OAH monitoring programs.

- b. The Oregon Ocean Science Trust (OOST) **(long term)**

Process: Support further implementation of the legislative vision for that funding entity, including funding nearshore research needs by competitive proposals and by developing a pathway for the Trust to make targeted strategic direct investment in projects. Fund (seed funding) the OOST, allow outside funds to flow into OOST, so that priorities can be funded. Build capacity in OOST to earmark/allocate funds, in addition to running competitive RFP for projects.

- c. Federal (Oregon Sea Grant, NOAA, others?) **(long term)**

Process: Support federal funding entities for Oregon and regional grants on OAH initiatives.

Action 5.1.c. Facilitate the acquisition of outside sources of funding to meet the State's needs.

- a. Create an OAH funding library that could be used to support OAH recommendations and actions. (**short term**)

Process: Work with academic fellowship and mentor programs to have a student develop a Federal and regional grants library which state and local managers and academics can use to fund OAH initiatives.

- b. Ensure the State's funding entities have the tools they need to be successful in funding the State's priorities. (**short term**)

Process: OWEB, OOST and other entities have overlapping authorities and interests. Make sure these entities are fully functional to acquire and allocate funding to OAH priorities.

Recommendation 5.2. Identify opportunities to incorporate OAH resilience into current and future management actions, as well as to streamline and minimize cost of management response, by conducting an inventory of Oregon State agency management processes that are relevant to OAH. (**Sec 3.1.a**)

Action 5.2.a. Department of Land Conservation and Development (DLCD) - land use and ocean planning (**short term**)

Process Examples:

- *Creation of a permitting structure for kelp farming.*
- *Consideration of OAH in the regulation of at sea fish processing waste discharge permits.*
- *Consideration of OAH in the regulation and permitting of the ocean floor/space for projects such as open ocean aquaculture, windfarms, oil/mineral exploration, and other such uses that could stress ecosystems and exacerbate the regional impacts of OAH.*

Action 5.2.b. Department of State Lands (DSL) – submerged aquatic vegetation (**short term**)

Process Examples:

- *Saltmarsh preservation projects – prioritization of regions with the potential for carbon sequestration and/or that are within regions sensitive to OAH.*
- *Goal 5 – improve riparian buffers on streams, Goal 17 – Coastal shorelines,, Goal 18 – protect rocky shores*

Action 5.2.c. Department of Environmental Quality (DEQ) - water quality planning (**short term**)

Process Examples:

- *Update sewer treatment and outflow regulations, especially near coastal regions and/or river basins that empty into coastal regions that are near OAH sensitive habitats/species/communities.*
- *Review point and non-point source permits to take into account coastal regions and/or river basins that empty into coastal regions that are near OAH sensitive habitats/species/communities.*
- *Increase development of TMDLs for other nutrient and water quality metrics (303(d) and point source pollution)*

Action 5.2.d. Oregon Department of Agriculture (ODA) - food safety management and aquaculture practices improvement (not as a mitigation for OAH) (**short term**)

Process Examples:

- *Consider the interplay between HAB biotoxins and OAH in crab, clams and oysters testing and regulations.*
- *Maximize Biodiversity of Marine stocks / aquaculture (e.g., “crop variety” – selective breeding programs, multiple species grown at one time, selecting species that are OAH tolerant)*
- *Improvement and regulation of Aquaculture reporting standards – standard size of basket, production levels that can be used as monitoring metrics for the vulnerability of the aquaculture industry to the ongoing effects of OAH*

Action 5.2.e. Oregon Department of Fish and Wildlife (ODFW) - emerging fisheries and resilient fishing communities (**short term**)

Process Examples:

- *Encourage development of emerging fisheries in federal and state waters to add socio-economic resilience in fisheries portfolios (ODFW in collaboration with the Pacific Fisheries Management Council); emerging fisheries will occur as fish stocks shift due to OAH and climate change.*
- *Encourage research on fisheries species migration and distribution patterns as a result of OAH (e.g., halibut distributions to hypoxia).*

Action 5.2.f. ODFW and the Oregon Ocean Monitoring Group (OOMG) - monitoring network for oceanography and biological response (**short term**)

Process Examples:

- *Build OAH monitoring considerations into existing research and monitoring efforts/metrics.*
- *Continue coordination of the OOMG and monitoring community in Oregon.*

Action 5.2.g. Global Warming Commission (GWC) - inclusion of ocean considerations in policy recommendations and activities (**short term**)

Process Examples:

- *Coordinate efforts for carbon emission reduction and deforestation issues relative to OAH sensitive coastal habitats, species, and human communities.*
- *Calculations of carbon sequestration in specific habitats (e.g., sea grasses, eelgrass).*
- *Effects of deforestation on coastal areas with respect to ocean carbon budgets.*

Action 5.2.h. Oregon Ocean Science Trust (OOST) – inclusion of OAH in coordinate nearshore research priorities (short term)

Process Examples:

- *Work with the Ocean Science Trust during their competitive RFP process to incorporate OAH initiatives into project requests.*
- *Encourage the Ocean Science Trust to develop a direct funding program framework that can be used for specific projects of importance.*

Action 5.2.i. Ocean Policy Advisory Council (OPAC) – Territorial Sea Planning (short term)

Process Examples:

- *Coordinate Territorial Sea Plan policy, management, revisions with OAH Council to achieve shared outcomes efficiently and strategically.*

Action 5.2.j. Science and Technical Advisory Committee (STAC) – research, monitoring, science efforts evaluation (short term)

Process Examples:

- *Consider using STAC to help identify research and monitoring goals and methods, best available science, etc.*

Recommendation 5.3. Communicate and institutionalize OAH research priorities in Oregon communities, agencies, and programs. (Sec 3.1.b.A/B/E, Sec 3.3.a-c)

Action 5.3.a. Build a list of research needs as a reference list for outside parties to use as desired, which will be reflective of the needs addressed in the Oregon OAH report to the legislature. (short term)

- a. Priorities to regional partners (e.g., OOST, Sea Grant, academics)

Process: *Work with regional partners to whenever possible directly incorporate research needs addressed in the Oregon OAH report in the RFP granting requests as areas of importance.*

- b. Priorities to National partners (e.g., NOAA – aquaculture and OA; NSF – biological and chemical oceanography, funding of moorings, UNOLS vessel time; EPA – land sea interactions, USDA – aquaculture) as well as to Oregon’s Congressional delegation, and Congressional Committees.

Process: Demonstrate to National partners that research areas listed in the Oregon OAH report are supportive of national interests and priorities, and should be taken into account during federal funding processes.

Action 5.3.b. Raise awareness and communicate research needs to scientific and granting community. (**long term**)

- a. Developing a seminar series, by academic and management presenters for both community members and academics audiences.

Process: These public seminar series would be used to show communities throughout Oregon the importance of OAH research.

- b. Attend national conferences and workshops with a unified message and informational handouts to provide information on Oregon OAH priorities.

Process: The OAH Council will encourage presentations on a national scale will be used to build awareness of regional concerns within the larger national policy arena.

Action 5.3.c. Support Oregon University prioritization of OAH scientific understanding, adaptation, and mitigation in research, education, and outreach. (**long term**)

Process Examples:

- Support building a Center of Excellence on OAH.
- Support research in engineering solutions for sequestration, measuring OAH variables, developing monitoring proxies.

Action 5.3.d. Build training programs specific to OAH in Oregon to tackle specific OAH needs for the State, and requests from the OAH Council. (**long term**)

- a. Establish Oregon OAH fellowship program, to be collaboratively supervised by OOST, OAH Council (OSU and ODFW co-chairs), to address changing ocean conditions priorities, relative to biological monitoring.

Process: Remove institutional barriers among these institutions so that collaboration is easy (legislative mandate helpful here?). Work with regional Oregon Universities (OSU, UO, and Portland State) to determine graduate student needs (i.e., health insurance, salary/tuition, and research funds) and institutional overhead allowed on a grant. Determine if funding will be for a student/postdoc in Oregon going to an Oregon school, and who will be the administering authority (Oregon Ocean Science Trust, Oregon Sea Grant).

- b. Support the ongoing development of an OAH instrumentation hands on workshop by the University of Oregon.

Process: Aid in the widespread distribution and funding of the OAH instrumentation hands on workshop that can aid stakeholders and managers in operating OAH monitoring systems and sample collections.

V. Senate Bill 1039

Sponsored by Senators ROBLAN, KRUSE
79th OREGON LEGISLATIVE ASSEMBLY
AN ACT

Relating to ocean chemistry.

Whereas Oregon is an epicenter for the global manifestation of ocean acidification and hypoxia; and
Whereas the natural seasonal process of upwelling transports corrosive waters into the nearshore and estuaries, causing marine waters within this state's jurisdiction to be especially vulnerable to ocean acidification; and

Whereas ocean acidification, hypoxia and changes in ocean temperature are intensifying; and
Whereas Oregon has rich and vibrant wild marine fisheries, including shellfish fisheries; and
Whereas ocean acidification and hypoxia are known to cause mortality and reduced growth and productivity in marine organisms, including in species that form the foundation of the marine food web; and

Whereas negative impacts from ocean acidification, hypoxia or both have already been observed in species that are commercially, culturally and economically important to this state, including oysters, mussels and crabs; and

Whereas Oregon's coastal communities and economies are important to this state and are dependent on a thriving marine ecosystem; and

Whereas Oregon has academic institutions with world-class expertise in ocean issues, including ocean acidification and hypoxia; and

Whereas Oregon has played a leading role in fostering collaborative ocean acidification and hypoxia monitoring, research and action; and

Whereas the partnerships between the shellfish industry and university scientists in this state are an example to the nation for building innovative solutions to address ocean acidification and hypoxia; and

Whereas an Oregon Ocean Acidification and Hypoxia Center of Excellence is explicitly identified in the Oregon State University Marine Studies Initiative Strategic Plan as a possible center of excellence to be housed in the Marine Studies Initiative to leverage and build upon existing state contributions to ocean acidification and hypoxia research; and

Whereas the Ocean Policy Advisory Council and the Oregon Ocean Science Trust have identified ocean acidification as a priority issue for Oregon; and

Whereas the West Coast Ocean Acidification and Hypoxia Science Panel, comprised of eminent scientists from Oregon and other west coast jurisdictions, working in collaboration with ocean management counterparts in Oregon, Washington, California and British Columbia, recently issued recommendations and associated specific actions that can be implemented immediately to respond to ocean acidification and hypoxia; now, therefore,

Be It Enacted by the People of the State of Oregon:

SECTION 1. The Legislative Assembly finds and declares that ocean acidification and hypoxia severely endanger the state's commercially and culturally significant ocean resources. The Legislative Assembly therefore declares it to be the policy of the state to ensure a coordinated, effective response to ocean acidification and hypoxia. To facilitate efforts that are coordinated and effective, it is the state's policy to support ocean acidification and hypoxia actions and initiatives that are developed through close collaborations between federal, state and local agencies, academic institutions and commercial industries, among others.

SECTION 2.

(1) The Oregon Coordinating Council on Ocean Acidification and Hypoxia is established, consisting of 13 members as follows:

- (a) The Governor or the Governor's designee;
- (b) The director of an initiative for integrative marine studies at Oregon State University or the director's designee;

- (c) The State Fish and Wildlife Director or the director's designee;
- (d) The Director of Agriculture or the director's designee;
- (e) The Director of the Department of Environmental Quality or the director's designee;
- (f) The Director of the Department of Land Conservation and Development or the director's designee; and
- (g) Seven members appointed in consultation with the Governor's office as follows:

- (A) One member representing the Oregon Ocean Science Trust, appointed by the executive director of the Oregon Ocean Science Trust;
- (B) One member representing the Sea Grant College of Oregon State University, appointed by the director of the Sea Grant College;
- (C) One member representing a conservation organization, appointed by the Ocean Policy Advisory Council;
- (D) One member representing fishing interests, appointed by the State Fish and Wildlife Commission;
- (E) One member representing the shellfish mariculture industry, appointed by the State Board of Agriculture;
- (F) One member representing the academic research community with relevant expertise, appointed by the scientific and technical advisory committee to the Ocean Policy Advisory Council; and
- (G) One member representing the interests of federally recognized Oregon Indian tribes, appointed by the State Fish and Wildlife Commission in consultation with the Commission on Indian Services.

(2)(a) The term of office of each member of the coordinating council appointed under subsection (1)(g) of this section is four years, but a member serves at the pleasure of the appointing authority. The terms must be staggered so that no more than two terms end each year.

(b) Before the expiration of the term of a member, the appointing authority, in consultation with the Governor, shall appoint a successor to take office upon the date of that expiration. A member is eligible for reappointment. If there is a vacancy for any cause, the appointing authority, in consultation with the Governor, shall make an appointment to become immediately effective for the unexpired term.

(3) The State Fish and Wildlife Director or the director's designee and the director of an initiative for integrative marine studies at Oregon State University or the director's designee shall serve as cochairpersons of the coordinating council.

(4) A majority of the members of the coordinating council constitutes a quorum for the transaction of business.

(5) The coordinating council shall meet at times and places specified by the call of the chairpersons or of a majority of the members of the coordinating council.

(6) The coordinating council may adopt rules as necessary for the operation of the coordinating council.

(7) The members of the coordinating council are not entitled to compensation but are entitled to expenses as provided in ORS 292.495. Claims for expenses incurred in performing functions of the coordinating council shall be paid out of funds appropriated to the State Department of Fish and Wildlife for purposes of the coordinating council.

(8) The State Department of Fish and Wildlife shall provide staff support to the coordinating council.

SECTION 3.

(1) The Oregon Coordinating Council on Ocean Acidification and Hypoxia shall:

(a) Review and utilize relevant, scientifically supported information, including the recommendations of the West Coast Ocean Acidification and Hypoxia Science Panel and other available information, reports and studies, to:

(A) Identify research and monitoring activities necessary to better understand the changing ocean chemistry and the potential impacts of ocean acidification and hypoxia; and

(B) Recommend prioritized state actions to address ocean acidification and hypoxia;

(b) Identify actions and initiatives to address Oregon's vulnerabilities to ocean acidification and hypoxia that may include, but need not be limited to:

(A) Developing optimal strategies for mitigating the effects of ocean acidification and hypoxia;

(B) Taking steps to strengthen existing scientific monitoring, research and analysis regarding the effects and trends in ocean acidification and hypoxia;

(C) Identifying habitats that are particularly vulnerable to corrosive sea water, including areas experiencing multiple stressors such as hypoxia, sedimentation and harmful algae blooms;

(D) Identifying the socioeconomic and ecosystem impacts of intensifying ocean acidification;

(E) Taking steps to increase public awareness of the science and impacts of ocean acidification and hypoxia;

(F) Developing a long-term ocean acidification and hypoxia coordination strategy among state agencies, academia, the federal government and industry; or

(G) Leveraging opportunities for research partnerships with academia, tribes and the commercial fishing industry, in order to advance the understanding of ocean acidification and hypoxia in Oregon; and

(c) Advise and assist the State Department of Fish and Wildlife and all other represented public agencies in coordinating and carrying out, as directed by the agencies' governing bodies, the actions and initiatives identified under paragraph (b) of this subsection.

(2) The coordinating council may develop a Socioeconomic Vulnerability to Ocean Acidification Report. A report developed under this subsection may include, but need not be limited to, information identifying:

(a) Coastal communities in this state that may be impacted by ocean acidification;

(b) The impacts of ocean acidification and hypoxia on the communities identified under paragraph (a) of this subsection; or

(c) The gaps in understanding that exist regarding the impacts of ocean acidification and hypoxia on economically or commercially important species, particularly species that support commercial, recreational and tribal fisheries and shellfish aquaculture in this state.

(3) The coordinating council may develop recommendations for the Oregon Ocean Science Trust, state agencies, academia or other organizations on high-priority, strategic research that may be done to address gaps that exist in the understanding of ocean acidification and hypoxia. Strategic research recommendations developed by the coordinating council may include, but need not be limited to, research related to:

(a) The impacts of ocean acidification and hypoxia on marine organisms and the marine ecosystem;

(b) The economic impacts of ocean acidification and hypoxia on communities in this state; or

(c) Developing adaptation and mitigation strategies for conserving and enhancing the resilience of marine organisms and ecosystems for future use and enjoyment by Oregonians and visitors to this state.

(4) The coordinating council shall submit a biennial report to the Legislative Assembly and to the Ocean Policy Advisory Council by September 15 of each even-numbered year on the coordinating council's activities and recommendations.

(5) All agencies of state government, as defined in ORS 174.111, are requested to assist the coordinating council in the performance of its duties and, to the extent permitted by laws relating to confidentiality, to furnish such information and advice as the members of the coordinating council consider necessary to perform their duties.

SECTION 4. Notwithstanding any other provision of law, the General Fund appropriation made to the State Department of Fish and Wildlife, Fish Division, by section 1 (1), chapter 544, Oregon Laws 2017 (Enrolled House Bill 5010), for the biennium beginning July 1, 2017, is increased by \$162,286 for the purpose of implementing sections 2 and 3 of this 2017 Act.

VI. Definitions

OAH

Understanding

Adapting

Mitigating

Oceanographic monitoring – includes chem/phys/biol metrics

Chemical metrics:

Physical metrics:

Biological metrics:

VII. References