Workshop Activity: Identifying Barriers and Gaps in Existing Decision-Relevant Habitat Resilience Information

University of Washington Puget Sound Institute (PSI) and the Habitat Strategic Initiative Lead are curating a regional list of information barriers and gaps about the effects of sea level rise on Puget Sound's nearshore habitats and options for managing those effects. This list is expected to help inform regional research activities and funding decisions. We have sourced 45 potential information barriers and gaps (pages 3-8) from 10 regional reports (pages 9-10) and input from the workshop planning committee. These barriers and gaps are also displayed on posters in Room 2B/C. We'd appreciate your input on this list during the workshop!

Instructions

There are two specific types of feedback we are looking for:

1) Identify Priorities: Please vote for the four information gaps that you think are the **most important barriers to planning and decision-making.** Cast your votes by placing the attached dot stickers next to your top four information gaps either on the workshop posters or on this handout.

2) Refine the List: Please provide any or all of the following input either by placing sticky notes on the workshop posters or by writing directly on this handout. We encourage discussion about your feedback with fellow workshop participants and PSI facilitators in Room 2B/C!
   - Suggested edits: Could any of the information gaps be more specific? Should any of the information gaps be edited to clarify **how a lack of knowledge prevents action to protect nearshore habitats**?
   - Existing knowledge: Is there already some information available about any of these gaps? If possible, please share any useful information sources.
   - Additional information gaps: Are there any information gaps missing from the list? Remember, these should be barriers to action. The workshop planning committee noted a lack of content specific to some types of nearshore habitats, so we added a poster specifically to solicit this type of information in Room 2B/C.

If you choose to provide input on this handout, don't forget to give it to a PSI staff member in Room 2B/C or leave it on the registration table before the end of the workshop!

Depending on the volume of input we receive, PSI may host follow-up conversations to further refine the list. If you are interested in participating in any future virtual conversations, let us know using the online form you can access via this QR code.

Frequently Asked Questions

Why is Puget Sound Institute doing this activity?

PSI receives funding from the U.S. Environmental Protection Agency and Puget Sound Partnership to provide technical support for the Puget Sound National Estuary Program. During the development of Implementation Strategies, we work with Strategic Initiative Leads, technical experts, and stakeholders to identify and prioritize information gaps that impact the ability to plan and/or implement recovery activities. Program partners recognized there was a need to organize and resolve these groups of research needs ("uncertainties") in an intentional and systematic way, so we developed a Grand Uncertainties Matrix (the "GUM") as a repository to catalog uncertainties, capture prioritization information, and track related research activities. You can read more about this work at: https://www.pugetsoundinstitute.org/analysis/codeveloping-a-research-agenda-for-puget-sound/.

The Shoreline Armoring Implementation Strategy (Habitat Strategic Initiative, 2018) was developed in 2017 and 2018. There were only a few questions relating to sea level rise on the original list of uncertainties added to the GUM. We are working with the Habitat Strategic Initiative Lead to generate a list of new research priorities to support a major update to that earlier list.

What will this list be used for?

Once the list is finalized, it will be added to the GUM, used to direct some PSI research activities, and help inform future Puget Sound National Estuary Program request for proposals. Other researchers may also find that referencing a regionally vetted list of research needs may bolster grant applications.

Where did the items on the list come from?

PSI reviewed grey literature from the region and compiled relevant research needs or questions to develop this list. Major sources were a 2022 Washington Sea Grant and Department of Ecology report on sea level rise management options and synthesis reports prepared as part of the Northwest Climate Adaptation Science Center's 2023 "deep dive" on coastal squeeze. You can see the full bibliography on pages 9 and 10. The workshop planning committee reviewed an earlier draft of this list and added a few more items.

Where can I see the full list of shoreline armoring research questions?

Go to https://www.eopugetsound.org/articles/puget-sounds-grand-uncertainties-matrix (Francis & James, 2023). Earlier this year, we added a series of "Research Notes" that summarize progress made since the Shoreline Armoring Implementation Strategy (Habitat Strategic Initiative, 2018) was originally developed in 2018.

Who do I contact if I want to follow up about this activity?

You can reach out to Sandra Dorning <sdorning@uw.edu> if you have questions about the GUM, or Aimee Kinney <aimeek@uw.edu> if you have questions about PSI's work on the Shoreline Armoring Implementation Strategy (Habitat Strategic Initiative, 2018).

Category: Biophysical

ID	Information Barriers and Gaps	Notes
1	Develop a quantitative erosion model for Puget Sound shorelines to assess where and how coastal assets may be affected by erosion.	
2	How will different shoreforms (e.g., accretion shoreform, feeder bluffs) respond to SLR?	
3	How durable will hard defensive structures and soft shore protection projects be over time, both under current conditions and as sea level rises? The rate of repair or replacement will impact expected cost and cost-effectiveness.	
4	What are the ecological trade-offs associated with soft shore projects? Will SLR alter the balance of these trade-offs?	
5	Improve predictive models of habitat-forming processes to increase understanding of site-specific effects of climate change and inform shoreline and river delta restoration planning. Key parameters include bluff recession rates, tide range, fetch, sediment budgets, grain size, accretion rates, marsh elevation, vegetation type, and freshwater quantity, timing, duration, and distribution.	
6	Regional-scale studies of habitat exposure, sensitivity, and adaptive capacity to coastal squeeze. Consider the potential of species or habitats to migrate or to adapt in place, as well as barriers to migration and species' sensitivity to those barriers.	
7	How does coastal squeeze interact with non-climatic stressors (e.g., invasive species)?	
8	Create a general conceptual model of coastal squeeze, as well as conceptual models for specific habitats and species to better identify intervention points and guide adaptation.	
New		
New		

Category: Human Dimensions

ID	Information Barriers and Gaps	Notes
9	How does the decision to undertake a sea level rise response (hard defensive structures, soft shore stabilization, accommodation, retreat and avoidance) approach impact the surrounding community? How do social implications differ between approaches?	
10	What are the benefits that individuals and society experience today from a functioning nearshore ecosystem, and how might SLR impact these benefits?	
11	How can local governments, advocacy organizations, and others effectively communicate the trade-offs associated with each response option to shoreline property owners and other constituents?	
12	Survey waterfront property owners to inform development of the WDFW shoreline loan program. Assess knowledge about coastal flooding risk, level of concern about sea level rise, protection measures, flood insurance coverage, and factors likely to affect decisions to invest in mitigation measures. Assess the importance of loan program features, such as ease of application process, response time, competitive rates.	
13	Survey communities to identify perceptions of nature-based and other risk mitigation approaches, and how perspectives differ within communities (e.g., whether people own beachfront or inland property).	
14	Assess public observations and attitudes related to coastal squeeze to provide insight into both awareness of and opinions about the ecological implications of management strategies to inform future risk communication and education efforts.	
15	Analysis specific to Washington State of the financial, social, and political costs for implementing relocation options.	

16	What are the total costs (including permitting, utilities, etc.) and time commitments to elevate or relocate homes, buildings, roads and other types of infrastructure. When is it cost-effective compared to the other approaches?	
17	Evaluate property appraisal data to quantify the impact of armor removal, soft shore protection, and hazard mitigation activities on property value. Compile data on other economic benefits of these target activities such as lower insurance costs and avoidance of uninsured damage/repairs.	
18	Do property owners consider longer term costs, including future repair and replacement costs, when deciding among shoreline stabilization options?	
19	What is the economic value of a functioning nearshore environment? How will SLR and potential loss of nearshore habitats impact those ecosystem services and their value?	
20	What are the effects and what are the chains of impacts that flooding events have on local economies/sustainability in coastal communities?	
21	Economic costs and benefits of buyouts. What are the long-term costs and benefits of property buyouts to the *individual property owner*? What costs or challenges are faced upfront, and how might they compare to benefits accrued or losses avoided in the future? What is the individual return on investment for participating in a buyout?	
New		
New		

Category: Management and Practice

ID	Information Barriers and Gaps	Notes
22	Social benefits and drawbacks of buyouts. What challenges are faced upfront, and how might they compare to benefits accrued or losses avoided in the future? What is the *public's* return on investment for funding buyouts?	
23	Availability and effectiveness of potential adaptation strategies and actions for addressing the impacts of coastal squeeze on species and habitats.	
24	Identify areas where shoreline public access may be reduced by coastal squeeze and/or infrastructure at public access points may be impacted by SLR. Are there equity concerns existing or exacerbated given the current location, size, and conditions of shoreline public access points?	
25	Research Tribal policy, plans, and actions that relate to management and mitigation of coastal squeeze. What insights from Tribes' existing efforts to address sea level rise could inform other Tribes' and communities' management efforts?	
26	Studies on the enabling conditions and/or barriers that influence relevant coastal management decisions and coastal policy as it relates to coastal squeeze.	
27	Assess community needs regarding funding cycles (i.e. grant deadlines and grant periods are too short for small organizations' capacity to adequately apply).	
28	Analysis of the impacts of management decisions on coastal squeeze to increase understanding of relationships between management strategies for coastal habitats and infrastructure. Include analysis of societal impacts (e.g., economic, psychological, cultural) associated with management decisions or opportunities to maintain habitat and facilitate migration when infrastructure remains in place.	
29	Identify tradeoffs in land management decisions and ways of considering them (e.g., between hazard mitigation and ecological functioning, between different communities, or between different assets within a community).	
30	What is the nature and extent of local government authority to impose regulatory approaches to managing retreat, such as rolling easements, transfer of development rights, or erosion hazard setbacks?	

31	Policy analysis to assess possible policy and regulatory pathways for effective management of coastal squeeze, including factors such as legal/constitutional constraints on mandating managed retreat and policies that could enable property owners to adequately retreat from shorelines (e.g., transfer of development rights).	
32	Is Washington's current shoreline permitting environment amenable to SLR response options? How might the state and federal regulatory environment change in response to SLR? Are there legal or political risks for local governments associated with acting (or not acting) to address SLR?	
33	Identify jurisdictional changes that can be expected as SLR shifts the Ordinary High Water Mark and other tidal datums landward. How could those changes affect policy, decision making, strategy, and planning during anticipation of that predicted shift?	
34	Evaluate how local flood ordinances and other flood hazard mitigation elements of local code currently support SLR resiliency and habitat protection/restoration, and how local flood code could be modified to better advance SLR preparedness and habitat protection/restoration. Assess the potential for FEMA Community Rating System elements (e.g., Coastal Erosion Open Space) to incentivize such code modifications.	
35	To what extent is emergency permitting being used to address flooding and erosion? How will impacts from SLR alter the demand, use, and administration of these permits.	
36	What is the range of land use/regulatory options currently available in Washington to restrict new development in vulnerable areas after experiencing damaging storm events?	
37	Evaluate local code requirements for potential problems in permitting home elevation and relocation projects (e.g., are variances possible for height restrictions and setbacks that could make elevation or relocation of existing structures difficult).	
New		
New		

Category: Spatial Data and Analysis

ID	Information Barriers and Gaps	Notes
38	Identify assets located outside of current FEMA flood zones that may be at risk from impending flooding.	
39	Identify areas where shallow groundwater has the potential to mobilize contaminants at upland CERCLA and MTCA sites to adjacent waterways.	
40	Compile data on ownership of tidelands adjacent to Puget Sound waterfront properties.	
41	Compile spatial data on flow control infrastructure (levees, floodgates, etc.), particularly in large river deltas, to enable more accurate estimates of inundation extent.	
42	Comprehensively map bluff crests and structure setback distances to better understand hazard exposure.	
43	Repurpose existing data (e.g., building footprint data, FEMA flood zones, mapped flood heights and extents) to analyze SLR vulnerability and identify adaptation options.	
44	Compile information on the number of National Flood Insurance Program insured properties, repetitive loss properties, and severe repetitive loss properties in areas vulnerable to coastal flooding.	
45	Assess the number of existing septic systems at risk of damage or failure from flooding or landslides, and where parcels are not large enough to relocate a system.	
New		
New		

Sources of Information Barriers and Gaps

Askerooth, R., Kuhn, K., Krosby, M., & Strong, C. (2023). *Biophysical knowledge of coastal squeeze. Synthesis prepared for the Rising Seas and the Coastal Squeeze Deep Dive.* Northwest Climate Adaptation Science Center, University of Washington, Seattle. https://nwcasc.uw.edu/programs/actionable-science-deep-dives/rising-seas-and-the-coastal-squeeze-deep-dive/

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Kinney, A., Johannessen, J., Fisher, M., Maverick, A., Ø de-Giles, L., & Lane, B. (2021). *Residential shoreline loan program feasibility study: Developing a new Shore Friendly incentive to help Puget Sound homeowners finance beach restoration and sea level rise adaptation*. University of Washington Tacoma, Puget Sound Institute. https://www.eopugetsound.org/articles/shoreline-loan-program-feasibility-study

Miller, I., Faghin, N., & Fishman, S. (2022). *Sea level rise and management options for Washington's shorelines*. A collaboration of Washington Sea Grant and the Washington Department of Ecology. Prepared for the Washington Coastal Resilience Project. https://wacoastalnetwork.com/wp-content/uploads/2022/05/SLR_CoastMgmt_Washington.pdf

Washington State Department of Ecology. (2021). *Lessons learned from local governments incorporating sea level rise in Shoreline Master Programs* (Publication 21-06-014). Washington State Department of Ecology, Shorelands and Environmental Assistance Program. https://apps.ecology.wa.gov/publications/summarypages/2106014.html

Other References

Francis, T. & James, A. (2023, May 22). *Puget Sound's Grand Uncertainties Matrix*. Encyclopedia of Puget Sound at the University of Washington Puget Sound Institute. https://www.eopugetsound.org/articles/puget-sounds-grand-uncertainties-matrix

Habitat Strategic Initiative. (2018). *Narrative. Shoreline Armoring Implementation Strategy*. Washington Department of Fish and Wildlife and Washington Department of Natural Resources. https://pspwa.box.com/v/PublicIS-ShoreArmoring

This project has been funded in part by the United States Environmental Protection Agency under cooperative agreement CE-01J97401 to the Puget Sound Partnership. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.