Novel Ideas to Address Priority Research and Capacity Needs

Coastal Squeeze Deep Dive participants discussed novel ideas and potential research directions for several research needs. The table below summarizes ideas discussed during breakout group conversations. Groups did not discuss ideas for every research need described in the report.

Research Need	Novel Ideas/Research Directions
Regional-scale studies of exposure, sensitivity and adaptive capacity for coastal squeeze, particularly for non-marsh habitats. (B3)	• Explore the effectiveness of habitat mitigation and restoration in alleviating coastal squeeze. Investigate how adaptive capacity to coastal squeeze varies by habitat and species type. • Research which habitats and species are the most vulnerable to coastal squeeze in the Northwest. Identify the appropriate scale and granularity of habitat vulnerability information most relevant to practitioners, and consider other factors such as land ownership (i.e., the potential policy barriers to restoration/preservation) and species interactions in the vulnerability assessment.
Quantification of the observed and future potential impacts of coastal squeeze, particularly across a range of geographies and habitat types, and encompassing its biological, physical, and social effects and synergies among them. (B1)	• Create collaborative research projects that integrate human dimensions and social impacts of coastal squeeze. • Use of new LiDAR technology on the Apple iPhone 12 Pro for understanding of sea-level rise and other climate-relevant questions (e.g., sediment transport/erosion) at a finer scale. The availability of this technology makes it a great candidate for inclusion in a community-based science (also known as “citizen science") initiative, enabling greater community engagement, as well as broader coverage of data collection. • Identify potential/likely areas for species migration to inform targeted management actions. • Characterize and quantify cumulative impacts (e.g. the interaction of other climate stressors and impacts) to coastal species and habitats.

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 possible policies that may enable property owners to adequately retreat from shorelines (e.g. transfer development rights). (P1)	• Conduct forward-looking cost-benefit analysis of building an infrastructure in inundation zones. Analysis should include analysis that examines short- vs -long-term benefits of infrastructure in inundation or high-risk coastal zones, and should be inclusive of habitat and ecosystem services values. Analysis for local decision-makers to have a longer-term financial view of their decisions. • Explore possible policy solutions that utilize existing federal and state regulatory frameworks. • Lead coordinated efforts to adopt coastal squeeze terminology and definitions within existing legislation and agency policies.
Availability and effectiveness of potential adaptation strategies and actions for addressing the impacts of coastal squeeze on species and habitats in the Northwest. (B4)	• Assess management strategies for at-risk species & ecosystems already in use across the region. Identify species that are at-risk or close to extirpation. Develop case studies and document novel, effective management approaches that can inform other areas' adaptive management plans and approaches to mitigate coastal squeeze. • Conduct pilot projects for managing species across scales. Address the difficulty of teasing apart coastal squeeze and other stressors, specifically around species. Determine methods and/or approaches to identify the scales at which key species are exhibiting greatest vulnerability in the NW region. Establish model projects at a variety of scales and have examples to extend to other species or habitat types over time. • Explore key migration locations and focus management activities in those places, including measures of where and what adaptation actions will be most effective. • Research strategies that would bring impaired estuaries into compliance with the Clean Water Act. • Build a coordinating network of managers and practitioners that can share estuary and other coastal adaptation plans.

Examination of tradeoffs associated with different management strategies between maintaining coastal habitats and infrastructure in the Northwest, including comparative analysis of opportunities to maintain habitat and facilitate migration when infrastructure remains in place. (M2)	• Host a National Center for Ecological Application and Synthesis (NCEAS) style Workshop(s) with a focus on environmental justice. Workshop(s) should consider community and cultural assets to achieve justice. Workshop outcomes could inform a Management Strategy Evaluation. • Explore management solutions related to soft-shoreline armoring, designs for green infrastructure and shoreline hardening that serves as accommodative measures. Pilot projects that employ a variety of different approaches could be used to test the effectiveness of certain mitigation techniques or strategies. Output could also include a decision-support tool.
Studies on enabling conditions and/or barriers that influence relevant coastal management decisions and coastal policy as it relates to coastal squeeze. (P2)	• Understand the use and incorporation of other valuation and assessment frameworks in decision-making process (e.g. benefit-cost analysis vs. inclusion of natural capital, ecosystem services). • Research and analysis of equitable buy-outs or similar programs to facilitate managed retreat away from shorelines, including an examination of which communities are historically underserved and their intersection with vulnerability to sea level rise.

Capacity Need	**Novel Ideas for Building Capacity**
Funding that enhances capacity to hire and retain staff for organizations involved in coastal management in the Northwest, particularly those that will need to proactively anticipate coastal squeeze and coordinate efforts to pursue effective adaptation responses to it. (M1)	• Build a funding model or structure that provides sustained funding to recruit and retain long-term, professional staff that can address coastal squeeze and similar coastal management issues. • Identify and support coastal communities with limited staff and technical expertise capacity. Seek to reduce existing inequities among coastal communities that are already short on capacity and resources to mitigate coastal squeeze. • Create capacity to increase community engagement, especially as it relates to co-creating coastal management plans with coastal community members and other

	stakeholder groups.
Enhanced funding and capacity to proactively buyback land that faces increased risks from sea-level rise or that supports coastal species and/or habitat migration in the Northwest. (M2)	• Case studies that have documented how these work across different types of contexts and organizations. Especially from groups that are not the government. • Pilot programs that explore novel approaches and funding models to coastal land conservation. Approaches could include adaptive or rolling easements (following seas as the move in-land), conservation and land-use agreements, or incentive programs to encourage soft-shore armoring on private property to allow for habitat transition over time. • Within land buy-back programs, explore ways to ensure equity is considered. Following principles of environmental justice, equitable buy-back programs would ensure that retreat from coastlines is managed in a way that considers disparities in wealth among coastal communities and landowners, and may also seek to address other coastal communities' vulnerabilities as a result of historical inequalities and discriminatory practices.
Decision support tools at fine spatial scales to assist planners and other decision makers in mitigating coastal squeeze impacts where possible. Specifically, comprehensive data is needed on shorelines in terms of rigidity or flexibility of regulation and policy; where does hardened infrastructure block upward migration of habitats and where is there private use like agriculture that doesn't physically prevent migration at present (but might be subjected to armoring in the future), etc. (P1)	• Develop A GIS-based, fine-scale tool with data layers for land ownership, zoning, location of habitats and species at risk, location and type of barriers to landward migration (e.g., bulkheads, riprap, earthen levees, roads). • Explore conceptual models that could be incorporated in decision-support tools. Conceptual models could be more public-facing, and act as a kind of preface to the decision-support tool itself. • Create a database as a source of graphics and images that relate to coastal squeeze impacts and concepts, which could inform the public and decision makers on the issue. • Develop tools and information resources that specifically examine sandy beach and rocky shore habitats. Tools and resources could convey information and education on the importance of these habitat types to a variety of audiences.

Pursuit of coordinated and consistent information sharing among Northwest coastal managers that connects understanding about threats that coastal squeeze poses to coastal habitats and species, existing coastal management activities and their impacts, case studies illustrating best practices and risk communication strategies. (M3)	• Launch a Coastal Squeeze Consortia that meets and shares resources/data tools and connects resource managers on a regular basis. The consortia could also serve as a digital clearinghouse of relevant coastal squeeze information and resources. Consortia could include resource managers, local governments, non-profits, Tribes. Other existing networks (CoPES Hub, WA Coastal Hazard Resilience Network, etc.) could be leveraged to create this group. • Develop a monitoring network across scales; compile and standardize monitoring data. Identify the many disparate sources of information that could inform adaptive management approaches to mitigate coastal squeeze. Information could be housed in a central location or clearinghouse database. Create standardized monitoring and measurement protocols for assessment of coastal squeeze impacts across the region.
Organization and explanation of the many available tools and datasets to bolster planners' and managers' access to and use of existing knowledge. (B2)	• Development of a "decision tree" type toolkit that includes guidance, tools, and datasets for managing coastal squeeze. This toolkit should be suited for a variety of audiences and interests related to coastal squeeze. • Create technical capacity through training (e.g. a 'coastal training program'), which could include the incorporation of key terms, definitions, and management frameworks to address coastal squeeze and its impacts. • Provide greater outreach and communication of coastal squeeze impacts to communities. This might be accomplished through a community science model to reach coastal communities and interest holders throughout the region. Another approach might make use of an ambassador program, where regional staff provide coastal squeeze impacts and mitigation information and provide technical guidance for management.
Leverage existing state- and local-level sea level rise education and outreach programs to convey information on coastal squeeze to reach a variety of interest holders	• Research and identify what existing coastal education and outreach programs are already doing to communicate about coastal squeeze. In the case that this topic is not included in current activities by state and local entities, develop and integrate coastal squeeze information and communication products to be incorporated into existing outreach programs.

such as private property owners, shoreline permit applicants and other coastal community members. (P2)	● Develop a common, unified education and outreach program to educate the public and other interest holders about the impacts of coastal squeeze, as well as available management options.