Washington State Coast Resilience Assessment Final Report

Conducted by the
William D. Ruckelshaus Center

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WASHINGTON STATE UNIVERSITY

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The William D. Ruckelshaus Center is a neutral resource for collaborative problem solving in the State of Washington and the Pacific Northwest, dedicated to assisting public, private, tribal, non-profit, and other community leaders in their efforts to build consensus and resolve conflicts around difficult public policy issues. It is a joint effort of Washington State University hosted and administered by WSU Extension and the University of Washington hosted by the Daniel J. Evans School of Public Policy and Governance.

For more information visit www.ruckelshauscenter.wsu.edu

WILLIAM D. RUCKELSHAUS CENTER
Hulbert Hall, Room 121
Pullman, WA 99164-6248
-and-
901 Fifth Avenue, Suite 2900
Seattle, WA 98164-2040

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Washington State Coast Resilience Assessment Final Report

In 2016, coastal entities in Grays Harbor County, in partnership with the office of U.S. Representative Derek Kilmer's Office, and the Washington State Department of Ecology contracted with the William D. Ruckelshaus Center to conduct an assessment that explores long-term resilience opportunities in response to growing concerns about the impact on coastal communities, infrastructure, and the natural environment from erosion, flooding, and landslides; the number and severity of storms; predictions about rising sea levels; and a potentially large earthquake and tsunami.

Through conducting 104 interviews with coastal tribes, coastal residents, elected officials, federal, tribal, state, county, and city government agency staff, researchers, scientists, engineers, NGOs, and other interested parties this assessment examines the dynamics, interests, challenges, and opportunities related to coastal resilience in Washington State. The assessment provides a mechanism for the experiences and viewpoints of the participants to inform the next generation of strategies for enhancing coast-wide resilience. The assessment begins to identify existing efforts so that new efforts build upon what is already established. It also identifies approaches, processes, structures, and resources needed to enhance and support coast-wide resilience efforts.

The Assessment Team is deeply grateful to the many individuals who gave their time and energy to be interviewed, and to otherwise inform this report.

Assessment Team Members

Amanda Murphy, Ruckelshaus Center Senior Project Lead, WSU Extension Faculty
Phyllis Shulman, Ruckelshaus Center Special Projects, WSU Extension; Principal, Resilience Collaborative NW
Tye Ferrell, Principal, Resilience Collaborative NW
Erin McCarthy, Ruckelshaus Center Project, Development, and Communications Coordinator
Heather Kosaka, Ruckelshaus Center Project, Development and Communications Intern
Trevor Robinson, Ruckelshaus Center Project, Project Intern
Molly Stenovec, Ruckelshaus Center, Project Coordinator

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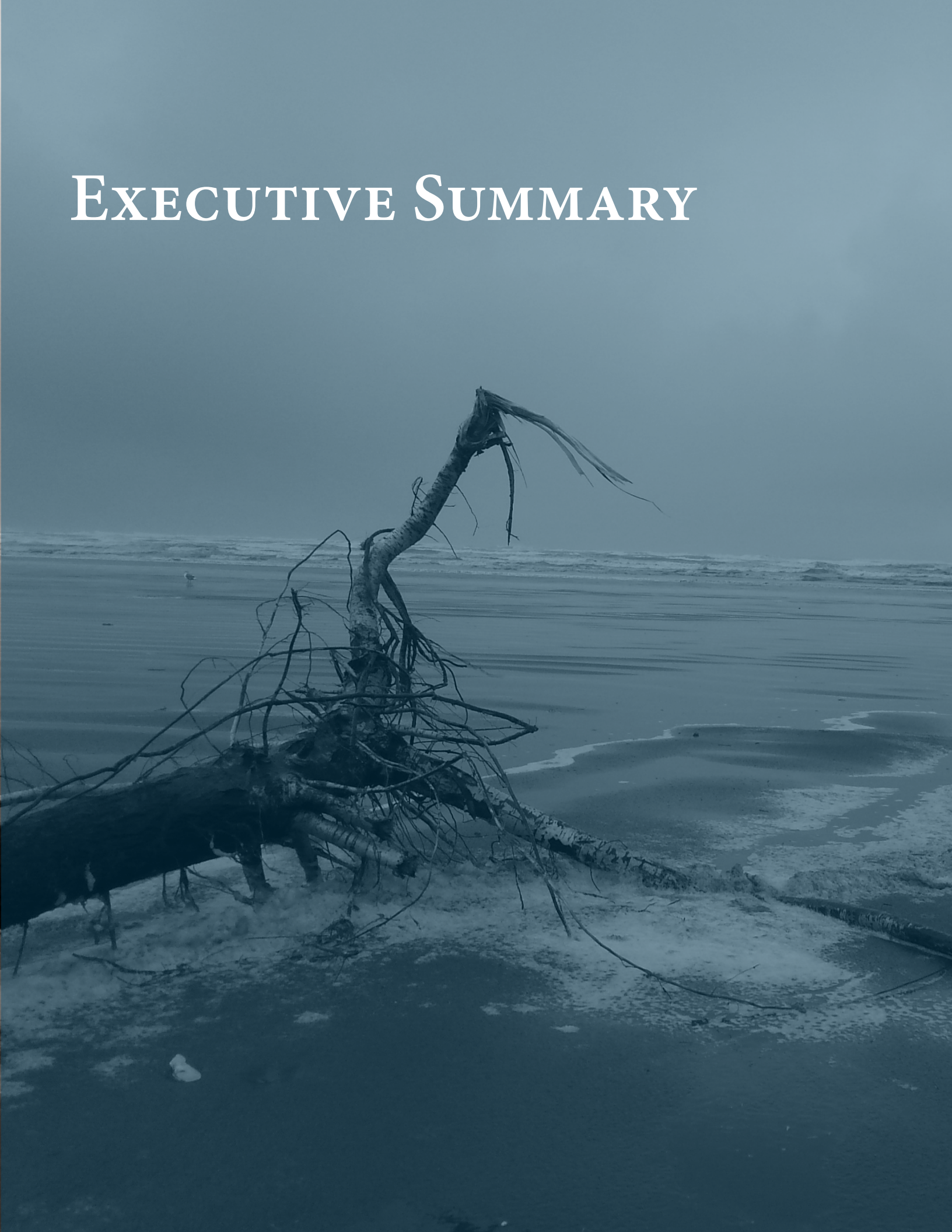


Executive Summary

The Washington coast and coastal communities are at an extraordinary confluence of cultures, unique ecosystems, influences, and potent threats. The coast is home to several tribes, is a gateway to iconic natural treasures, and the people are stewards of distinctive ecosystems that support shellfish growing, fishing, cranberry growing, and timber production. The area, also, is at the epicenter of potentially catastrophic impacts from a Cascadia earthquake and tsunami and is at the frontline of impacts from extreme weather, waves, and ocean changes. These threats are compounded by limited and changing economic opportunities, and emerging issues such as sea level rise and ocean acidification.

All along the coast individuals, groups, communities and tribes are striving to sustain the environment and their option to live in places they love. Many participants in this assessment have attended years of meetings, forums, and discussions with the hope that there will be increased focus and action taken that improves the well-being of the communities, businesses, and the natural environment that provides both sustenance and awe. Increasing coast-wide resilience is not only important to coastal communities and their ability to thrive, but has ramifications for the economic and environmental health of the state and nation as a whole. The stories shared with the Assessment Team about what tribal and non-tribal communities are facing and the economic, cultural, environmental and historical importance of these stories for the rest of the state do not seem fully communicated. In addition, there are innovative and successful efforts to increase resilience along the coast that are important models and lessons for others throughout the coast, state, and nation. It would be beneficial to strengthen these efforts and provide opportunities to expand and deepen their impact.

The well-being of communities and the coastal natural environment are intimately linked; therefore, it is important to consider the intersection of economic prosperity, community health, ecology, infrastructure, and governance when considering how to improve coastal resilience. Addressing and improving the conditions for coastal resilience will require multi-disciplinary approaches, creativity, and nimbleness as new partnerships are formed, regulatory approaches are adapted, joint strategies are developed, and collaboration is increased among governments, researchers, local communities, and others. The regulatory environment often cannot keep pace with changing conditions and uncertainty; therefore, having the flexibility to adapt will be important to the success of local communities and businesses. The relative lack of resources on the coast will require new funding partnerships and opportunities for local revenue generation. While coastal communities have shown grit and self-reliance, increasing uncertainty poses a threat to lives, lands, and future livelihoods. New approaches to the growing challenges will be needed that connect the wisdom and experience of those living on the coast with the expertise of governments, nonprofits, and academics. Work will be required on multiple scales, from the international to the household level.

Addressing coast-wide resilience will also require attention and political will. Participants in this assessment emphasized the importance of working together to address issues especially given capacity constraints and the difficulty generating sufficient local revenue. Participants also emphasized concern that being rural and geographically isolated, the issues facing communities on the coast were either unknown or unlikely to be a high priority for state and federal resources, whether that be for emergency preparedness and response or for mitigation projects. The need for more unified advocacy among the communities was apparent, but there is also need to increase the connection to urban residents who may also love the coast, depend upon the resources that the coast provides, and who have an economic stake in coastal properties and businesses.

The issues that impact community and ecosystem resilience are complex and wide ranging. Participants in this assessment confirmed that place-based initiatives that can utilize local knowledge and experience and respond to specific local conditions are needed and have the best chance to address the social and environmental issues. At the same time, participants called for a coast-wide initiative and integration of efforts that can help to increase success through shared strategies and lessons, and increase capacity for technical assistance, grant writing, planning, research, and project development and implementation.

Defining Resilience

Depending on what kind of system resilience is applied to, it may be defined in different ways. One can think about resilience from an individual, community, organizational, and/or ecological perspective. Scientists are analyzing and continuing to evolve their knowledge of the attributes that make a species or entire ecosystem resilient. They are identifying ways resilience can be measured and achieved at different scales. This information can be applied to the preservation, management or restoration of nature and can assist with community resilience strategies that enhance environmental stewardship.

Community resilience has often been thought of in the context of emergency response and recovery from a major disaster, for example, an earthquake, flood, or extreme storm. Based on this context resilience has often been defined as bouncing back from adversity to the original state of being. As communities face significant social and environmental impacts and change, how community resilience is defined has expanded. Definitions of community resilience are increasingly focused on the capacity of a community to increase social bonds, learn from collective action, and to adapt to new conditions while improving and providing for their well-being. This includes the capacity of a community to evolve without losing its core function. While there are numerous definitions of resilience found in written materials, for the practical purpose of this assessment, the Assessment Team is generally defining community resilience as: "A resilient community is able to thrive in the present, adapt to challenges, and even transform as necessary to meet future threats or opportunities".

Recommendations and Key Leveraging Actions

The recommendations in this section are based on analysis of what was heard and learned from interviews, exploration of and experience with similar resilience efforts, and the Assessment Team's expertise in effective collaborative governance and organizational systems and structures.

Improving resilience is an ongoing process and will require adaptation to conditions that continually evolve over time. Participants in the assessment identified a wide range of needs, ideas, and suggestions for ways to strengthen coastal resilience. The Assessment Team looked for patterns and themes within their responses and considered what might be useful for helping to increase resilience. While this assessment was limited in scope, it does provide insight for next steps.

As part of the recommendations, the Assessment Team identified Key Leveraging Actions. These leveraging actions have the potential to meet multiple objectives, lead to significant and enduring improvements, and leverage greater impact for the relative amount of effort. Some of these leveraging actions were chosen because they begin to address core issues, such as life safety and the availability of habitable land. For example, rebuilding coastal schools that also provide evacuation facilities for tsunamis could protect generations of children and community members; or intensifying efforts to address erosion, wind and wave impacts on communities could contribute to creating the essential foundation for livability. The recommendations and key leveraging actions in this report are intended to improve the conditions for resilience on the coast and to stimulate the next generation of resilience work and discussion among entities involved in these efforts.

1. Establish A Coast-Wide Resilience Initiative To Enhance And Integrate Efforts

Key Leveraging Action: Create an integrated coast-wide effort to strengthen coastal resilience that is staffed by Washington Sea Grant, Washington State University Extension, Washington State Department of Ecology, and Washington State Emergency Management Division.

2. Support And Enhance Local Efforts To Strengthen Resilience

Key Leveraging Action: Through State funding, provide at least $50,000 each in additional funding to coastal tribes, Marine Resource Committees, and Conservation Districts to stimulate additional locally driven resilience efforts. As part of the funding mechanism, provide parameters and guidance so that the funding is utilized for resilience-related projects.

3. Enhance Well-Being And Consider New Approaches To Economic Development

Key Leveraging Action: Consider integrating approaches to economic development that are based on regenerative planning and development and informed by local cultural, social, ecological and political dynamics.

Key Leveraging Action: Undertake community food security assessments and develop food and health-related action plans and initiatives to address food security and access needs.

Key Leveraging Action: Convene a diverse group of interests to focus on insurance issues facing coastal property owners and to develop recommendations.

4. Support Improved Understanding And Application Of Resilience For Planning, Policy, And Strategy Development

Key Leveraging Action: Invest in activities that deepen understanding of resilience and create practical tools that allow for a consistent application of resilience principles.

5. Develop An Advocacy Strategy For The Coast

Key Leveraging Action: Develop narratives and design a campaign through video, print, social, and professional media outlets that communicate the compelling stories of coastal communities.

6. Increase Support For And Learn From Coastal Tribes' Resilience Efforts

Key Leveraging Action: Identify what is needed to support the implementation of relocation efforts, climate action plans, and hazard mitigation plans, and prioritize meeting those needs.

7. Increase Capacity For Emergency Preparedness, Planning, And Recovery Efforts

Key Leveraging Action: Increase funding for State and Local Emergency Management and increase state focus on coastal preparedness, mitigation, recovery, and resilience.

Key Leveraging Action: Utilize the work of Clallam County Emergency Management as a model for emergency preparedness planning for coastal counties and provide support for the enhancement and implementation of plans.

8. Improve And Invest In The Life Safety, Reliability, And Redundancy Of Critical Infrastructure

Key Leveraging Action: Expedite efforts to get coast-wide broadband, improved cell phone coverage, and satellite communications for emergency response. Convene the relevant public and private entities, including those who are currently working on this issue, to identify strategies and solutions to barriers.

Key Leveraging Action: Prioritize the development and implementation of funding mechanisms and plans to rebuild or retrofit coastal schools or buildings near schools as multi-use earthquake ready facilities that include tsunami evacuation safe havens.

Key Leveraging Action: Expedite the development of priorities and actions to address coastal erosion, and identify funding options and support existing collaborative efforts.

9. Increase Opportunities For Collaboration, Coordination, And Partnerships

Key Leveraging Action: Convene a coastal resilience funding task force. The task force could include tribal, federal, and state representatives, nonprofits, businesses, and philanthropic entities to explore creative options and partnerships for funding and coordinating investments.

Key Leveraging Action: Secure adequate funding for technical experts and programs to gather and analyze data. Develop multi-disciplinary technical assistance "advisory teams" that can be configured based on need to work directly with communities on specific issues.

Key Leveraging Action: Increase interdisciplinary and cross-sector collaboration and utilize existing efforts to share information about the work communities and researchers are undertaking.

10. Advance Coastal Protection And Restoration

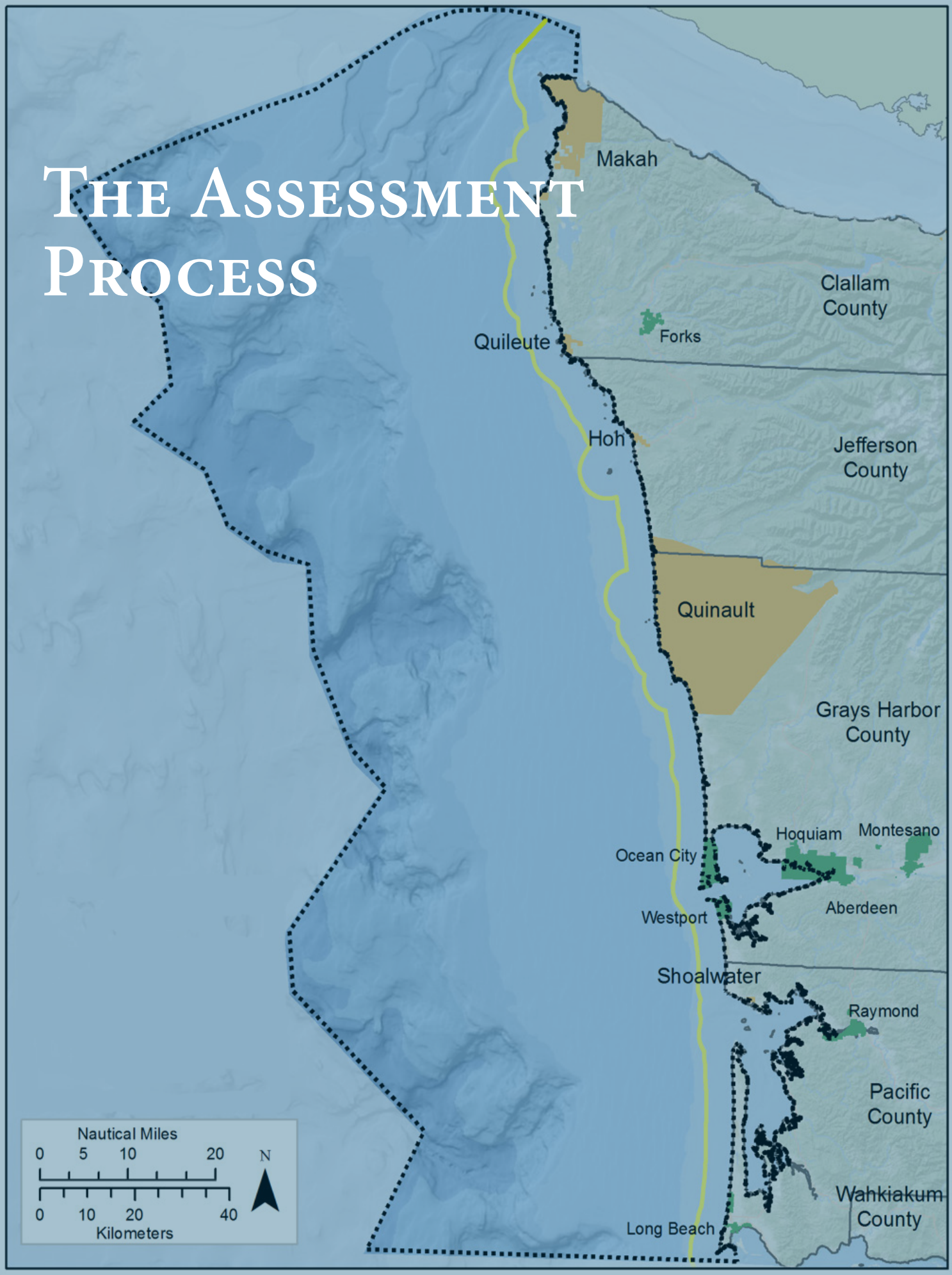
Key Leveraging Action: Explore opportunities to increase flexibility of regulatory approaches and support voluntary and collaborative efforts.

Guiding Principles

During this assessment, the Assessment Team identified key principles that emerged from the interviews that could be used by decision-makers at all levels to help guide the development of coastal resilience efforts. The Assessment Team used these guiding principles to inform the recommendations provided in this report:

- Start with place: understand, honor, and support the unique ecology, culture, social dynamics, and history of each place, acknowledging that the coast is not homogenous.
- Supplement needs-based approaches with focus on community assets.
- Acknowledge, map, and leverage assets whenever possible.
- Support the agency and self-efficacy of coastal communities by building on locally-driven efforts, encouraging local innovation and connectivity, and maximizing the potential for local people to carry out and sustain resilience efforts.
- Recognize the time and resource constraints of small communities, local governments, and tribes.
- Prioritize actions that improve life safety and address basic needs.
- Use a systems approach when identifying, planning, designing, and evaluating efforts. This includes:
    - Using longer-term planning horizons;
    - Identifying interconnections;
    - Considering patterns, trends and changing conditions;
    - Challenging individual and group assumptions;
    - Not being bound by how things were approached in the past;
    - Breaking down silos and working across disciplinary and sectorial boundaries;
    - Addressing multiple objectives whenever possible; and
    - Taking into account the ripple effects of an effort.
- Design and, in some cases, require infrastructure projects to provide multiple benefits.
- Incorporate the support and diversification of local coastal economies as a key element in planning and project design.
- Increase opportunities for coordination of effort, learning, cross-fertilization, and trust building among all involved parties.
- Support and expand the work of existing groups instead of only creating new groups.
- Identify and implement modest "wins" to create momentum and build a sense of collective self-efficacy.
- Minimize bureaucracy and unnecessary hoops.
- Broaden engagement to include low-income and minority residents.
- Look for opportunities to address gaps in communication and coordination among tribal, federal, state, and local entities.

The Assessment Process



The Assessment Process

In 2016, U.S. Representative Derek Kilmer's Office, the Washington State Department of Ecology (Ecology) cities of Ocean Shores and Westport, the Quinault Indian Nation, Grays Harbor County Emergency Management, the Port of Grays Harbor, and other state and federal agencies partnered to create the Grays Harbor Resilience Coalition. Staff from U.S. Rep. Kilmer's Office and Ecology contacted the William D. Ruckelshaus Center (Center) seeking independent facilitation services, originally around convening the Coalition partners to develop a 2017-2019 biennial budget request for coastal resilience projects.

Over a series of conversations, the Center suggested that—while the Coalition as presently constructed may decide to continue pursuing a budget request specific to Grays Harbor County— given the coast-wide scope and the shared interest in increasing coastal resilience it appeared to be an opportune time to begin developing a coast-wide approach. To identify a path forward that would be embraced by and meet the needs of both "top-down" and "grass roots" interests, the Center suggested conducting an assessment consisting of a series of interviews with key parties to explore opportunities that support long-term resilience to natural hazards for the Washington coast and coastal communities.

An Assessment Team composed of Center affiliated faculty and staff with assistance from a consultant carried out the assessment using an interview-based process. Interviews took place from mid-October 2016 through February 2017. The Assessment Team conducted 104 interviews and conversations with individuals who are involved in organizations with a particular role, interest in, or knowledge of coastal resilience efforts (Appendix A). The goal was to gather a range of perspectives, information, and insights about approaches, processes, structures, and resources needed to enhance and support resilience efforts for the coast and coastal communities.

Individual Interview Process and Protocol

The process for identifying individuals to interview was iterative. To develop a broad list of potential interview participants (participants), the Assessment Team used membership lists from various councils, committees, and online sources, input from staff from U.S. Rep. Derek Kilmer's office, Ecology, Washington Sea Grant, members of the Grays Harbor Resilience Coalition, assessment team member discussions, and informed-observer input. The Assessment Team then developed the following criteria to guide the selection of specific individuals to be interviewed.

- Broadly representative of the interests involved in and affected by resilience efforts in response to natural hazards.
- Geographically dispersed.
- Representative of the diverse perspectives and views on past and current efforts.
- Representative of varied tenure.
- Organizational and/or subject matter expertise and leadership.
- Knowledgeable and have understanding of coastal community dynamics and cultures.
- Fit within project time and resource constraints.

The Assessment Team used a chain referral recruitment method to identify additional potential participants. In accordance with this method, each participant was asked to identify individuals, interests, or groups that would be important to interview. A subset of interview slots was reserved for participants identified via this method. The interview list is not meant to be exhaustive, but rather representative.

Due to limited time and scope, this assessment does not represent all potentially interested parties that could be involved in resilience efforts.

The Assessment Team also developed a set of protocols to govern the interview process, based on university research principles and best practices in the field of collaborative governance. A consistent set of interview questions were used for all individual interviews (Appendix B). Participants were invited by email and/or phone to participate in an interview and received the interview questions, background information explaining the process, purpose, and how the interview information would be used. Participants were also sent an online pre-interview questionnaire to be completed in advance of the interview (Appendix C). The preliminary information emphasized that the interview and online questionnaire were voluntary, that the results would be aggregated in a summary report, and specific statements would not be attributed to individual participants unless they requested and consented to be quoted or have their names attributed to information. Notes from the interviews and online questionnaire were not retained beyond the drafting of this report, per University research protocol.

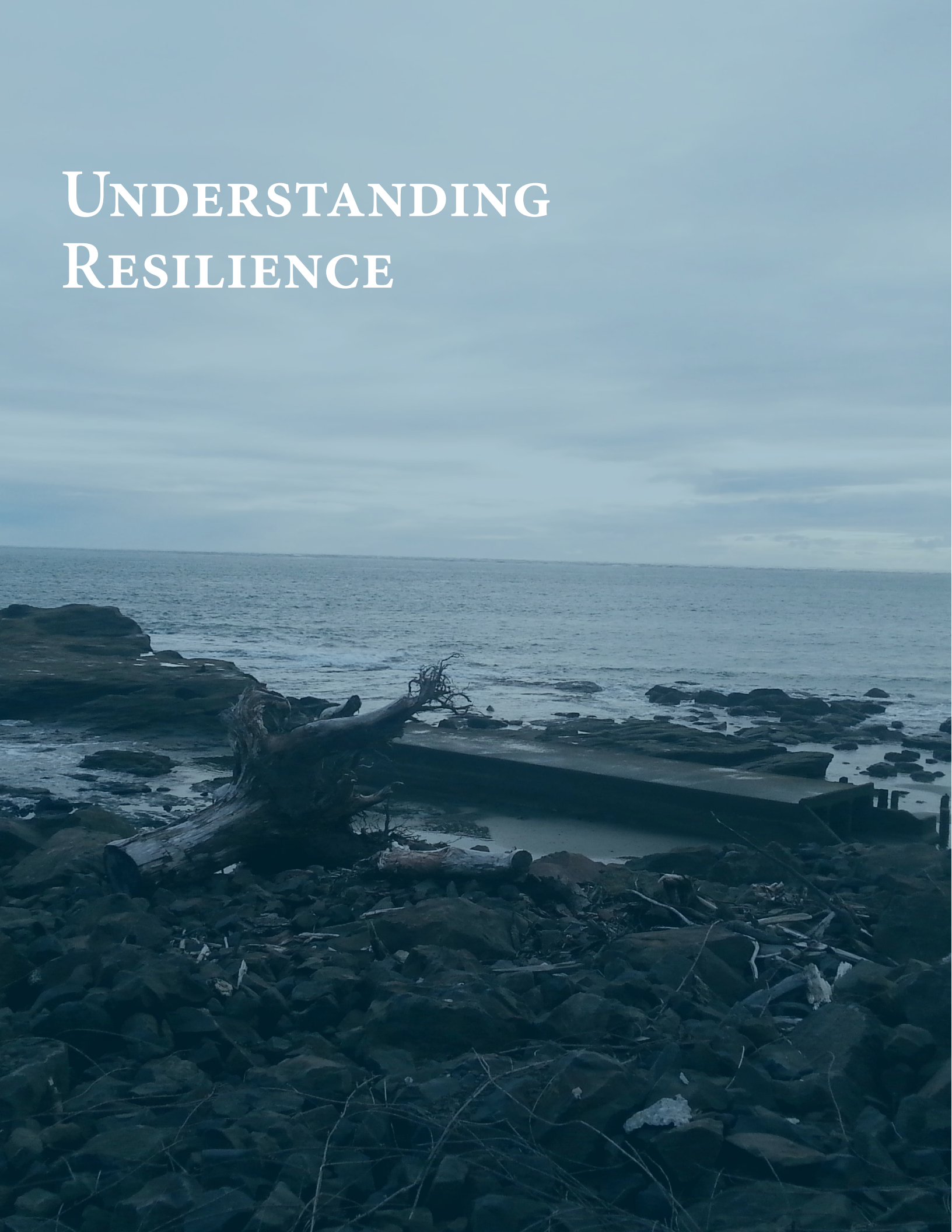
Group Interview Process and Protocol

In addition to individual interviews, the Assessment Team conducted six separate group interviews with university and other researchers, state and federal agency personnel, Shoalwater tribe and community members, and individuals from Clallam, Jefferson, Grays Harbor, Pacific, and Wahkiakum counties. Group interviews took place from January – March 2017, and typically lasted 2-3 hours. While the format of these interviews varied by group, all participants were asked to provide their definition of resilience, thoughts on existing initiatives currently addressing coastal resilience, and what additional resources were needed (Appendix D). Group participants were also sent the same online questionnaire provided to individual interview participants. Likewise, group participants were notified that the group interview and questionnaire were voluntary, that the results would be aggregated in a summary report, and specific statements would not be attributed to individual participants unless they requested and consented to be quoted or have their names attributed to information. Notes from the group interviews and online questionnaire were not retained beyond the drafting of this report, per University research protocol.

Data Analysis and Synthesis

The assessment process was qualitative and the analysis involved the identification, organization, and interpretation of key findings from the individual and group interviews, and questionnaire responses. After each interview, the Assessment Team entered summaries into an anonymous spreadsheet to enable the analysis of the results of all the interviews in combination. Individual members of the Assessment Team analyzed the interview results separately and then convened as a team for discussions regarding observations, key findings, recommendations, and successive drafts of this report. The recommendations in this report are based on analysis of what was heard and learned from interviews, exploration of and experience with similar resilience efforts, and the Assessment Team's expertise in effective collaborative governance and organizational systems and structures.

Understanding Resilience



Understanding Resilience

The concept of resilience offers a way to frame and address the growing social, economic, environmental, and technological challenges and opportunities of the 21st Century. It is a concept being studied and applied to many fields of science, from ecology, engineering, to psychology, and in the professional fields of town and regional planning, and emergency management and disaster recovery. Resilience concepts are grounded in living systems theory and systems thinking. Living systems theory scientifically looks at the nature of complex systems (in nature or society) from the whole system and studies the patterns of relationships between its parts. Systems thinking applies system theory to issues and problems and provides an understanding of:

- interconnections,
- patterns, trends and changing conditions,
- individual and group assumptions and mental models,
- the interaction of the parts, and
- possible leverage points for change.

The seminal work of applying resilience to living systems was in the field of ecology. The analysis of ecological systems provides insight into the core attributes of resilient living systems. As understanding of ecological resilience evolved, the concepts were increasingly applied to social systems. Social science research is increasing knowledge about the factors that enable individuals and communities to respond to, adapt, and transform in response to adversity and/or change. Resilience is also being applied to the built environment to address the impacts of environmental change, mitigate risk related to natural disasters, and align better with nature.

When applying resilience, it is important to acknowledge the interface between ecological and social resilience and see the relationship between ecosystem health and social well-being and prosperity. Strengthening community resilience requires interdisciplinary approaches that incorporate knowledge and observations from a wide range of disciplines and both social and ecological analysis.

Defining Resilience

Depending on what kind of system resilience is applied to, it may be defined in different ways. One can think about resilience from an individual, community, organizational, and/or ecological perspective. Scientists are analyzing and continuing to evolve their knowledge of the attributes that make a species or entire ecosystem resilient. They are identifying ways resilience can be measured and achieved at different scales. This information can be applied to the preservation, management or restoration of nature and can assist with community resilience strategies that enhance environmental stewardship.

Community resilience has often been thought of in the context of emergency response and recovery from a major disaster, for example, an earthquake, flood, or extreme storm. Based on this context resilience has often been defined as bouncing back from adversity to the original state of being. As communities face significant social and environmental impacts and change, how community resilience is defined has expanded. Definitions of community resilience are increasingly focused on the capacity of a community to increase social bonds, learn from collective action, and to adapt to new conditions while improving and providing for their well-being. This includes the capacity of a community to evolve without losing its core function. While there are numerous definitions of resilience found in written

materials, for the practical purpose of this assessment, the Assessment Team is generally defining community resilience as:

> ***"A resilient community is able to thrive in the present, adapt to challenges, and even transform as necessary to meet future threats or opportunities."***

Attributes of a Resilient System

There are core attributes of resilient systems. These attributes relate to both ecological and social systems, but their meaning within each system is different. Some of the core attributes for community resilience include:

- **Diversity** within ecological systems; of the economic base; and of the skills, knowledge, experience, perspectives, backgrounds, and opinions that have voice within a community.
- **Redundancy** of critical community elements or sub-systems, for example, doctors, healthcare centers, or key infrastructure services such as bridges, communications, and water.
- **Modularity** in which individual units can be self sufficient if disconnected from larger networks. This includes not over centralizing critical systems, for example food production and distribution, water, waste-water, communications, and energy, as well as community power and decision-making.
- **Feedback systems** that provide the ability to quickly identify and understand the consequences of actions or impacts and have the capability for learning and action.

Cultivating Community Resilience

Some of the domains that are important to focus on when developing strategies to improve resilience include:

- Health and well-being of people and communities
- Economic prosperity
- Social capital and cultural vitality
- Ecological integrity
- Infrastructure reliability and nimbleness
- Formal and informal governance and community participation
- Disaster preparedness and risk reduction

Research and experience has shown that there are certain characteristics of resilient communities. These include:

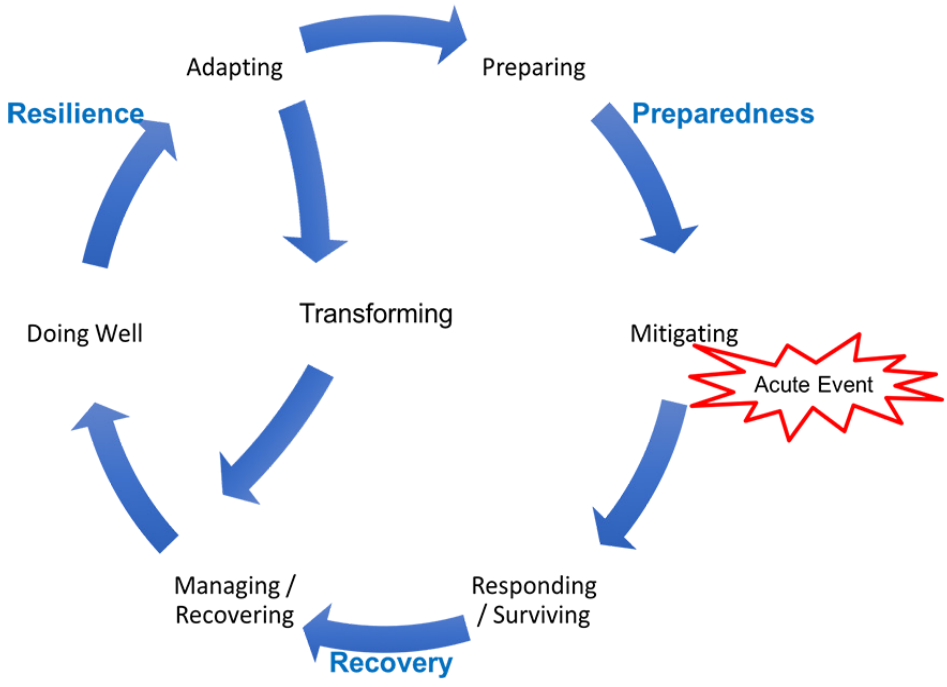
- **Intact ecological systems,** such as wetlands, forests, and rivers that support life and provide services that humans depend on for clean water and air, food, and protection from natural hazards.
- **Strong social capital and high degree of interconnectedness** among members of a community, in which people know and take care of each other, as well as participate in community affairs.
- **The ability of the community to learn** from past behavior and other communities **and to successfully apply this learning** toward adaption to change and adversity, for example in key sub-systems such as infrastructure, governance, and the local economy.

- **A high degree of** individual and community **agency.**
- **Redundancy of essential services and skills.**
- **Values of fairness, equity, and inclusivity** embedded in community life and institutional structures.
- **Dynamic and diversified local economy** that provides opportunities for employment.
- **Empowered local governance** and the involvement of multiple sectors in civic affairs.
- **Processes for non-violent conflict mitigation and resolution.**

It is important to note that stability, durability, and efficiency are not characteristics of resilience. While they are indeed important and may even be an indication of resilience in some communities, the existence of these characteristics should be examined critically to ensure they are not masking a deeper underlying vulnerability that, once exposed, may lead to catastrophic failure.

A large dam, for example is rigid, monolithic, and seemingly impervious. However, it lacks the flexibility to adapt to changing conditions- a key requirement for building resilience. While its imperviousness and durability may seem efficient and effective, without redundancies in place to mitigate and adapt to hazardous events, one failure in the system could be disastrous for the community downstream.

The surrounding ecology and the history of a place and the people who live there are key elements in supporting a community's relative resilience. Because no community is the same, resilience may look different depending on the community and its context. For example, a community could possess many aspects of resilience locally, but be part of a broader regional or global context that inhibits local resilience. Climate change is one such example. Also, one critical variable or overwhelming threat could undermine the resilience of a community completely. For example, a community built on liquefaction prone soils in an earthquake prone area may be resilient only for as long as there are no major earthquakes.



Part of cultivating community resilience is identifying, understanding, and preparing for hazards that can be anticipated. Preparing for future hazards has the potential to also enhance the current well-being of people, communities, and the environment as vulnerabilities are identified and addressed. Resilience efforts can enhance preparedness, mitigation, and recovery planning by helping to reduce impacts, increasing social capital, and strengthening social and economic functioning. This illustration shows how preparedness, recovery, and resilience are connected.

Creating a Common Understanding of Resilience

For this assessment, it was important to understand how participants define resilience and how those definitions were similar or different. How one defines resilience patterns the type of objectives developed and actions taken to enhance resilience. For example, if resilience is defined as mitigating all potential impacts from a specific event (like an earthquake) prior to the event, so that when a significant event occurs there is no damage, then significant resources are going to be spent to mitigate the expected impacts. If resilience is defined as maintaining services and livelihoods after an earthquake, then all efforts are going to be focused on potential impacts from only an earthquake and not focused on other potential hazards.

It is important therefore to understand the extent to which the definition of community resilience and the conditions that support it are shared among people on the coast and the institutions that serve them. If there is to be a coast-wide effort to increase resilience, it will be helpful to have a shared definition and shared vision of what resilience is and how it can best be applied on the coast.

Key Findings From Interviews

HIGHWAYS AND BRIDGES

There will be no surviving ground routes to the county.

80 % of the roads will suffer pavement failures over 3"

100% of coastal area bridges will be out of service for days.

50% of coastal bridges will be destroyed or unusable.

no damage *completely destroyed*

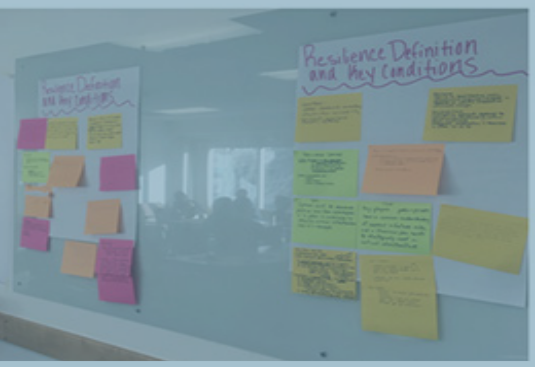
AIR TRANSPORTATION

Most airport structures* west of the I-5 corridor suffer complete to severe damage.

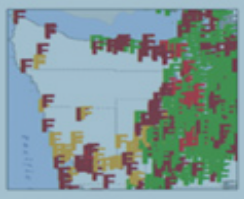
Most airport structures* along the I-5 corridor suffer severe to moderate damage.

*high probability runways intac

no damage *completely destroyed*



LAW ENFORCEMENT AND FIRE SERVICES



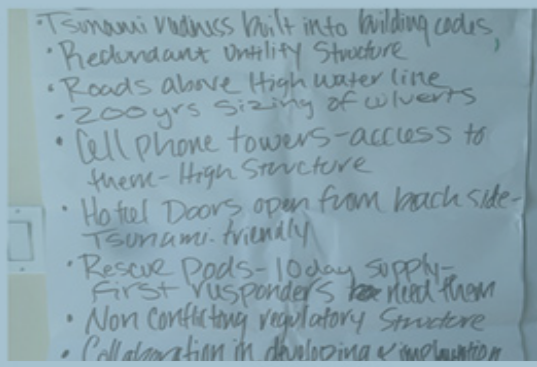
48% of police facilities will be unusable.

5% will be capable of 50% capacity.

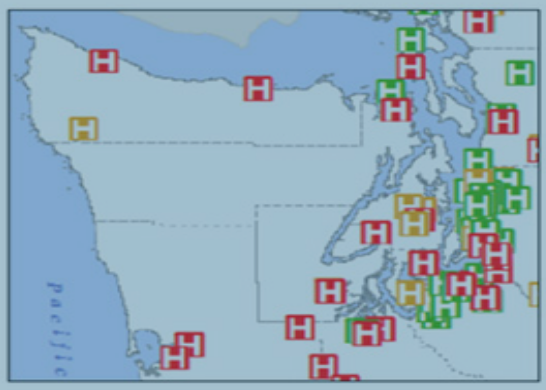
Significantly reduced fire fighting capability west of Shelton.

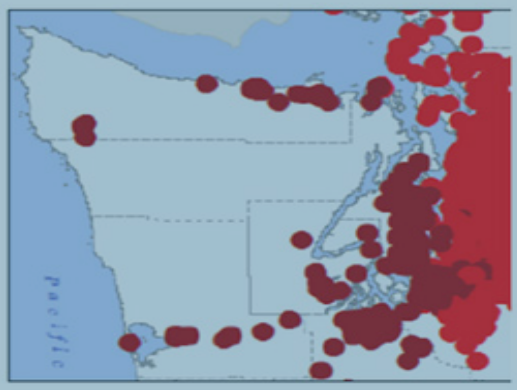
Damage to highways, bridges, and communications renders mutual aid agreements impractical.

no damage *completely destroyed*



HOSPITALS & NURSING HOMES





93% of hospital capacity west of I-5 will require full or partial evacuation.

No senior/DD living facility capacity remains west of the I-5 corridor.

no damage *completely destroyed*

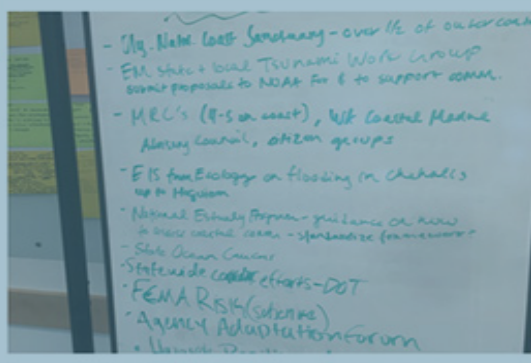
SCHOOLS

Nearly 100% of schools west of I-5 corridor will suffer complete or severe damage and will be unusable.

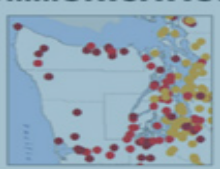
Students in class at the time of the event will be at risk.

NOTE: All of these schools are part of the National Sheltering System Their loss indicates a corresponding reduction in sheltering capacity

no damage *completely destroyed*



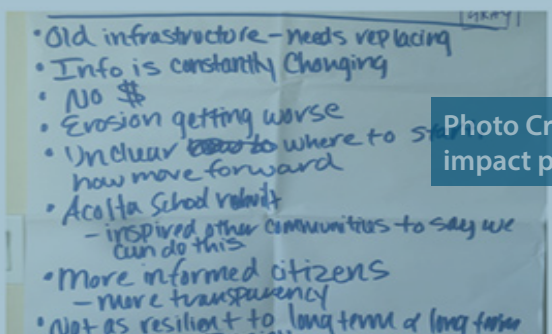
COMMUNICATIONS



fter the CSZE, the county will experience phone, cell hone, internet, radio and TV outages lasting for months.

may take days or weeks to restore 33% of coastal ommunications facilities.

7% may need to be replaced.



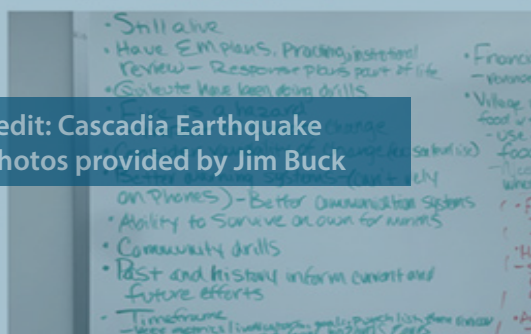


Photo Credit: Cascadia Earthquake impact photos provided by Jim Buck

Key Findings From Interviews

The Assessment Team asked questions in five general areas:

- Participants definition of resilience,
- Whether or not the coast and coastal communities are resilient,
- What the future would look like for the coast and coastal communities if resilience efforts were successful,
- What resources, assets, and efforts currently exist that support resilience, and
- What is needed to support long-term resilience.

Key findings summarized in this section of the report cover both the above general areas, as well as other important findings that arose out of the interview process. Conducting 104 interviews with individuals who have or represent an interest in coastal resilience provided a rich compilation of perspectives, opinions, and ideas. To identify key findings, the Assessment Team paid close attention to issues, perspectives, and ideas that arose frequently across all interviews, as well as those that were notable for their diversity, uniqueness, or originality. It is important to note that the key findings summarized in this report can be associated with a fairly wide range of responses in interviews, due to the qualitative nature of the review and the analysis process. The goal of this section is to provide a summary of key findings and not a list or detailed explanation of all perspectives and ideas.

Participant Perspectives: How is Resilience Defined?

Participants were asked, "How do you define resilience to existing and future natural hazards?" and "What conditions support resilience?". While the initial framing of the interview questions were about resilience to natural hazards, the Assessment Team broadened the first question to "How do you define resilience?" which allowed participants to include other considerations, if they chose.

Participants definitions of resilience varied. Some focused on ecological systems, others on infrastructure, others on people and community, and some definitions focused on all three. For many participants, creating economic prosperity was foundational to resilience. Participant definitions mostly fell within the following characteristics:

- **Bunker down:** doing everything possible on the front end to prevent any impacts.
- **Bounce back to the original state:** take actions that can replicate what was in existence prior to an impact.
- **Adapt:** develop the capacities to adapt to new conditions and create nimble responses to change.
- **Transform:** create the conditions for adaptation and the capacity to transform to completely new conditions.

Examples of Participant Definitions of Resilience

Ability to react and restore public infrastructure (highways & bridges) in response to natural disaster or climate change

Resilience is the capacity to **withstand and recover** from natural hazard impacts

Adaptability
able to roll with change

The ability to **bounce back** from shocks and downturns

When you can shock the system or change big drivers over longer timeframes and the system can absorb or shift in non-catastrophic ways

Ability of community to **adapt** & continue to thrive under changing social and & environmental conditions

Communities that can bounce back from stressors

Certainty of performance or response to action or hazard event

Rubber band – **flexibility**

Ability to recover, adapt, or cope from or with catastrophic or incremental impact or change

Options exist to minimize physical harm from catastrophes and a plan is available to rebuild critical infrastructure once it is damaged

Planning for/preparing for/ responding to/recovering from current and future coastal hazards

A community taking **deliberate action** to prepare/avoid, adapt, respond, and recover to/from natural hazards, all while protecting or enhancing human and natural systems

Ability to **rebound** after a significant event

The ability to **recover** from the occasional damage from variability (natural or external)

The ability to recover after a catastrophe

Ability of a community to be exposed to stress and recover quickly to a stable new condition that is similar to or better than the original state

Ability of the ecosystem to respond to a disturbance by **resisting damage** and recovering quickly

Ability to withstand, adapt to, and/or recover

Capacity of "community" to respond to impacts from hazards/stressors and be able to move forward

Preparedness necessary to minimize negative impacts from hazards and changing conditions, **recover quickly** from negative impacts when they do occur, and redevelop/rebuild rapidly and in a sustainable manner after hazard events

Ability of community or environment to respond to impacts from natural hazards, either "immediate" (e.g. tsunamis/ earthquakes) or "evolving" (e.g. sea level rise)

Ability to withstand climate and other hazards, able to bounce back soon after without major new investments, and sustainable now and in the future

Surviving natural processes without infrastructure or social welfare damage

Ability to suffer natural disasters with minimal costs, injuries, downtime, and permanent degradation in the region

Ability to meet emergencies that will affect homes, people's livelihoods, and lives along the coast with special attention to economic stability and growth

The ability to experience a hazard/event with little to no interruption in function, quality, character, stability, etc

Planning and implementing strategies to minimize future hazards to people and property

The ability to withstand and recover from hazard impacts with minimal damage and time; includes avoidance of and preparation for hazards, and continued innovation to accommodate in the smartest way possible

Having awareness, appropriate resources, and appropriate infrastructure for community to minimize loss and recover quickly from a natural disaster

Inform disturbances in an expedient, cost-acceptable manner such that lives, livlihoods, and community needs are not affected beyond acceptable thresholds

The ability to survive and rebuild; the **ability to change** and meet specific challenges

Ability to address environmental and socio econ. As that effect communities (both human and ecological) and the services they provide

Survive without losing my home,
Being able to go to work,
Having a work place to go to

Saving our coastline, homes, tribal reservation, fishing industry, cranberry boggs, and safety for residents and way of life

Communities/persons to continue to exist in the face of a changing environment

Being able to survive and thrive in a healthy environment and community

To be able to maintain or sustain a community as a result of change

Capacity to absorb the effects (or prior knowledge) of such hazards, and to reorganize accordingly in terms of function, structure, identity, governance, with the goal of **maintaining and improving** "human flourishing"

Being able to look at the problems of all involved and be able to offer a solution to meet all the needs

Resilience to hazards = no risk via no exposure and no vulnerability; assuming this isn't feasible it is reduced risk and increased capacity for recovery

The ability of a system to return to its original state after perturbation

Bounce back and protection

Ability to withstand and/or adapt to a problem or threat facing a community

Steadfast, long-term, the ability to outlast your environment

How are we going to respond to natural disasters in a positive way - being prepared - and how we are going to survive

Ability to survive and rebuild after a catastrophic event or a disruptive event/disaster; access to resources such as transportation, fuel, food, water, clothing, infrastructure, bridges, roads, and crossing; landscape stability around landslides, land, rivers, and wetlands

To have a community that is **capable of surviving** and achieving common goals, and looking into the future for the better

The ability of the community to survive and recover from various shocks

The community's ability to incorporate and work within natural systems

Resilience is the capacity of individuals, communities, and systems to survive, adapt, and grow in the face of stress and shocks, and even transform when conditions require it

How a party approaches a problem and the success in completion of the problem

Preparedness. Including climate change in planning efforts, updating existing plans and incorporating them in new planning

Bouncing back, adapting, being **elastic** to change

We believe we can when people say "no, there is no way you can succeed", and we keep working our way to the goal

The ability to recover and learn from adversity or disaster, and develop new learning and/or ways of changing practice

Ability to understand, cope, and deal with situations and to make meaningful purpose of the situation

To be in tune

Ability/capacity to survive and adapt to natural or man-made impacts to status quo economy and ecology

The ability to work through adversity, survive it,

more forward, and prosper

Maintaining health as conditions change

Being able to sustain no matter what outside sources throw in your way

Being **able to deal with** everyday issues that come up and being strong to dealing with issues - to bounce back

To fix the erosion on SSRT 105 Hwy, the Jacobson Jetty, ASAP

Being able to bounce back after a disaster and rebuild, to try to correct what is wrong and do better to fix it

Ability to undergo change through adaptation environmentally, socially, and culturally

The ability to resist, adapt to, and recover

Ability to **rebound** from catastrophe **financially and socially**

The ability to be challenged by adverse conditions and carry forward with minimal damage or interruption of functions

Not in Tokeland,
Nothing gets finished -
the jetty or sand berm,
A few people hold it together,
Love for the area

The ability to withstand natural hazards socially, politically, and economically

Recovery in the form of getting services (electric, water, phone) back at the earliest possible time after a natural disaster

Ability to "bounce back" to overcome adversity

Being able to adapt and **thrive** in different situations

The ability to provide
safety and protection of infrastructure
along an ever-changing shoreline

The ability to return to normal without any significant impact from events; population is protected from dange; resources exist to mitigate impact

Definitions tended to fall within the following categories:

- Analysis, Policy, Planning and Preparing
- Funding, Mitigation, Risk Reduction for Disruption
- Response and Recovery
- Adaptation
- Awareness and Education

Many definitions focused on surviving natural disasters, improving the well-being of communities and the environment, and having the ability to thrive now and into the future. Time was an important element in some definitions in that being resilient was the ability to quickly respond and recover from an event. Others differentiated between ecological resilience as it relates to ecosystem function and ecological resilience as it relates to the interface with human communities and economic vitality. At the core of some definitions was the caveat that, if there are no people (referring to the imapct of a tsunami or earthquake), then there is no resilience, and without life safety measures other efforts may be meaningless.

Conditions that Support Resilience: Frequently mentioned by participants

- **Diversity including modularity at multiple scales, integration and connectivity across scales, self-organizational capacity, and feedback mechanisms**
- **Economic diversity and self-sufficiency**
- **Trust**
- **Identity and understanding of community**
- **Advance and long-range planning and ability to adapt**
- **Redundancy and flexibility of infrastructure and social and economic systems**
- **Coordination and collaboration**
- **Political and social structures to allow functionality and adaptation**
- **Adequate funding for maintenance**
- **Governance: stable community connections**
- **Ability for habitats to withstand impacts**
- **Strong understanding of hazards and risks**
- **A vision for future development after extreme events**
- **Gray and green capital investment priorities for reducing risk**
- **Development restrictions to prevent construction in hazardous areas**
- **Funding available to make changes when necessary**
- **Existence of resilience/contingency plans**
- **Key players (public and private) have a common understanding of current and future risks, and a financial plan exists to strategically invest in critical infrastructure**
- **Adaptive management of ecosystems**
- **Resources to monitor changes**
- **Natural systems: healthy habitats with intact processes**
- **Access to adequate health care**
- **Strong sense of cohesion**
- **Strong supportive services and volunteerism**
- **Considers cultural and economic dynamics**
- **Continued adaptation**
- **Time and capacity invested in preparation**

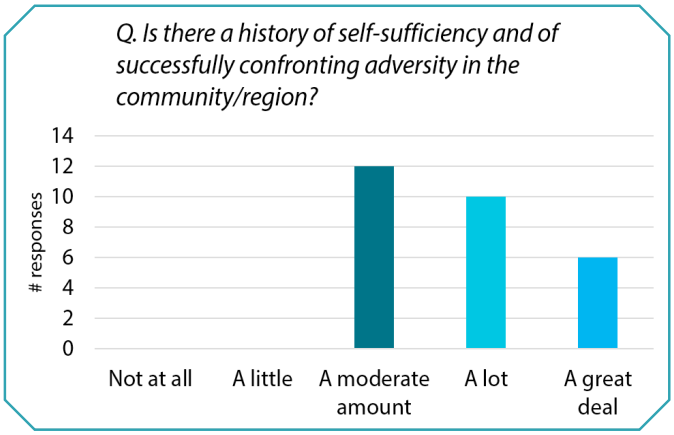
Participant Perspectives: Is the Coast Resilient?

Participants were asked what ways the coast and coastal communities are and are not resilient, and to identify strengths, assets, vulnerabilities, and potential threats. Most participants either said coastal communities are not resilient or that answering the question depended on how resilience is being defined, the type of threat, and the amount of time communities have to respond. Similar to definitions of resilience, participants talked about infrastructure, economic prosperity, community self-sufficiency, and environmental health and ecological systems. Nearly all talked about the self-sufficiency and the grit of coastal communities as a defining feature of resilience. Participants identified a number of vulnerabilities and natural hazard threats facing the coast and perceptions of whether or not communities are resilient varied depending on location and type of threat.

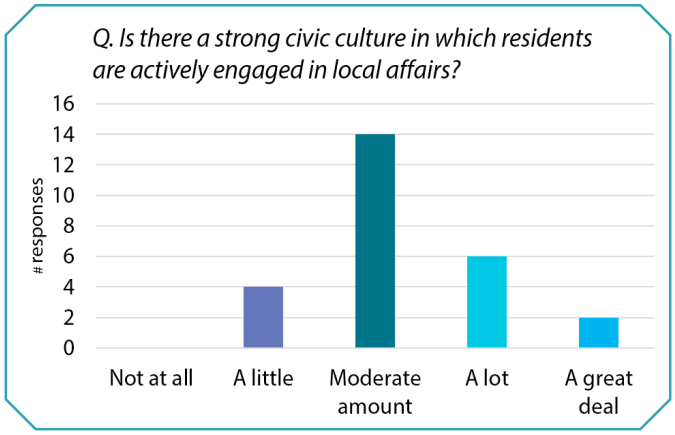
Strengths and Assets

Community Self-Reliance and Disaster Experience

Community self-reliance and disaster experience were frequently mentioned as examples of resilience. Many talked about coastal communities' long history and local knowledge of multiple types of hazards. Many lamented about how it is not easy living and working on the coast and that there is a history of self-reliance and survival when it comes to natural hazard threats and economic hardships. Many talked about how these experiences have tested communities' internal self-reliance and resourcefulness, and have significantly contributed to coast communities' ability to respond to hazard events. For example, participants talked about how coastal communities are resilient to some frequently occurring events such as severe storms. Many talked about how it's not uncommon in winter months to experience power outages for days or weeks and for there to be flooding and mudslides that block roads. Coastal communities are capable of adapting to such impacts for short periods of time.



Dedicated, Knowledgeable, and Active Volunteers



Participants regularly talked about how the coast has dedicated, knowledgeable, and active volunteers who invest a great deal of time and energy in meeting, planning, seeking resources, and implementing projects locally. Participants talked about how coastal residents possess skills that have the potential to be very useful in the aftermath of a disaster, such as construction, logging, and hunting skills. Some have access to and/or the knowledge of how to use heavy equipment that could be used to move debris, open roads, and rescue survivors. Participants also said communities are working towards being resilient to a natural disaster through

Community Emergency Response Team (CERT) training and working with individuals and businesses to help them better plan and prepare for an emergency event.

Active and Effective Local Efforts

Several examples of efforts by coastal tribes, state and federal agencies, local community efforts, universities and nonprofits were talked about that support coastal resilience. Some of the frequently mentioned efforts included:

Project Safe Haven: Project Safe Haven is a community driven process and a collaboration between the University of Washington and the Washington Emergency Management Division to develop a community responsive vertical evacuation strategy along the Washington Coast. Reports that identified potential vertical evacuation sites were created for Clallam, Grays Harbor, and Pacific counties, and for the Makah and Quileute Tribes.

Ocosta Elementary School: The Project Safe Haven work had created conversations about dual purpose vertical evacuation centers. In 2013, residents in the Ocosta School District voted in support of a $13.8 million bond measure for a dual-purpose school building. Participants talked about how in a community where 70% of kids are on free or reduced lunch, this was a major achievement. The new school is the nation's first vertical tsunami evacuation structure and the first in North America. Participants explained that it is able to hold at least 2,000 people, can withstand a mega thrust earthquake and tsunami, and only cost $2 million more than the original design for the school.

Clallam Emergency Management Department: A number of efforts were noted that were currently happening on the coast to better plan and prepare for a Cascadia Subduction Zone Event (CSZE). Participants frequently talked about Clallam County's island concept as a model to be replicated along the coast. In Clallam County, the County Emergency Management Department and a group of volunteers have been working together to assess the CSZE impact (Appendix E). Lead by Jim Buck, an emergency preparedness spokesman and former state legislator, the volunteers developed assessments called "Ground Truths" of the county's infrastructure. Volunteers cross referenced assessments with Washington's Department of Natural Resources ground shaking, liquefaction, landslide, and tsunami hazard maps, and Department of Transportation and county bridge maps. The results showed that multiple failures of roads and bridges would divide the county into at least 20 isolated communities. Fire stations, police stations, hospitals, schools, airports, electricity, fuel, water, and sewer facilities would be severely damaged or destroyed. The isolation of communities will prevent mutual aid, emergency response, evacuation, and supply of resources from reaching communities. The volunteers, in conjunction with the Washington National Guard labeled these isolated communities as "micro-islands." The micro-islands were divided into 5 Area Commands.

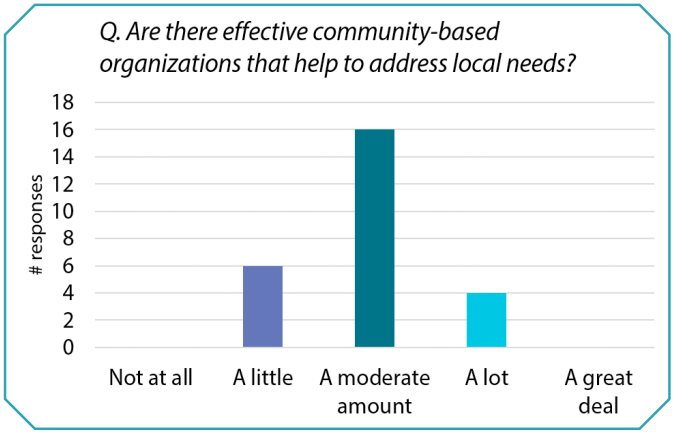
This information led Clallam County to develop a de-centralized pre-planned approach that is also readily applicable to an "all hazard" emergency. To implement the new plan, county volunteers prepared damage assessment maps for all 20 micro-islands and presented them to residents, agencies, and governments so they could create a tailored micro-island plan for their community. Residents used their knowledge of local conditions, personnel, equipment and resources they expect to have at the time of the emergency to plan their response. County emergency management coordinated these local plans with neighboring micro-islands to avoid duplication of efforts.

Grays Harbor Coastal Future's Project: The Grays Harbor County Coastal Futures project, Oregon State University, was mentioned by a number of participants as a new, innovative way to identify strategies for addressing impacts to coastal communities. The project is developing "Alternative Futures"

assessments and 'Knowledge to Action Network' consisting of stakeholder teams to co-produce information in order to better understand opportunities and challenges of various management strategies to address climate change impacts in Grays Harbor County.

There were also a number of entities identified that are actively involved in work that is related to resilience. Those frequently mentioned included:

- Washington Coastal Marine Resource Committees (MRCs)
- Washington Coastal Marine Advisory Council (WCMAC)
- Willapa Erosion Control Action Network (WECAN)
- Washington Coastal Restoration Initiative (WCRI)
- Washington Sea Grant
- Washington State University Extension
- Washington State Conservation Districts
- Grays Harbor Resilience Coalition (GHRC)
- County Emergency Management
- Surfrider Foundation



Coastal Tribes Leadership

Along the coast and within the area of this assessment, there are five Indian reservations: Makah, Quileute, Hoh, Quinault, and Shoalwater Bay. The coastal tribes were frequently mentioned and seen as inspiring examples of resilience. Many participants mentioned the self-organizing capacity, the incorporation of sea level rise and tsunami hazard information into long-term adaptive planning, development of climate action plans and emergency preparedness plans, and reliance on a diversity of local ecosystem services.

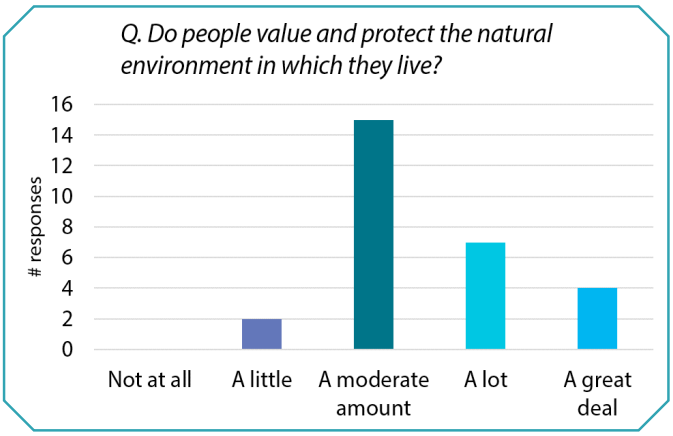
Many participants appreciated the direct leadership provided by coastal tribes through convening tribal and non-tribal community meetings to discuss concerns and projects, problem solve, and develop relationships related to local and regional issues. Participants also said the planning for and relocation of villages and critical infrastructure out of the tsunami zone and areas vulnerable to sea level rise are some of the most significant resilience actions being taken on the coast. Many saw these efforts as examples of effective utilization of technical information and analysis, courage, effective decision-making, creativity, collaborative governance, and models for planning.

Natural Environment and Resources

Participants talked about how the health of land and marine systems has a direct effect on natural resource industries, tourism, coastal economies, housing, health, culture, and identity. They states that natural resource industries are an important part of the culture and the identity of the coast. For example, according to participants, the shellfish aquaculture industry employs over 3,000 people and contributes over $270 million annually to Washington's economy.

Except for widely dispersed small communities, the coast is largely unpopulated, relatively undeveloped and a great deal of the coast, especially in the North is protected. Participants commented that the coastal ecosystems are more intact than in some locations and the ecosystem services that the coastal

natural environment provides contributes to resilience. Past and current efforts to restore and protect the natural environment were seen as assets. Another asset that participants highlighted was that people who live and/or work on the coast often have intimate knowledge of how the environment has changed over time.



Place-Based Knowledge and Relationship

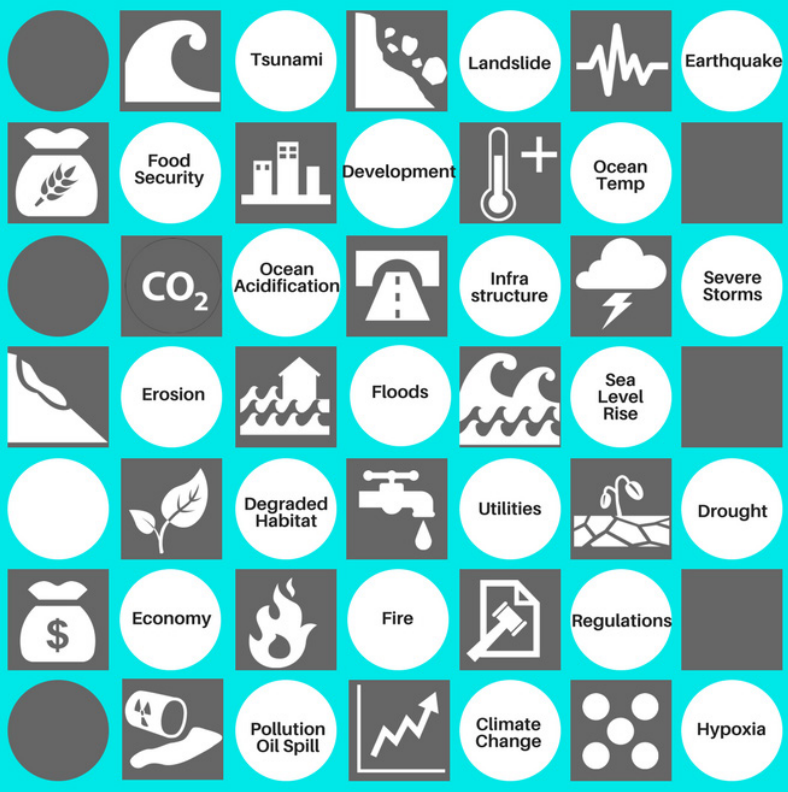
Many participants talked about the resourcefulness of coastal communities and tribes, their ability to implement projects with big impacts that had little funding, and ability to be creative and innovative with limited resources. Participants often talked about coastal communities having a culture and deep-rooted traditions of helping one another in times of crisis. Participants also often talked about their love for the coast and shared stories and knowledge about the natural environment. Having an intimate knowledge of place was frequently mentioned as an asset that contributes to resilience and the ability to respond to threats and times of hardship.

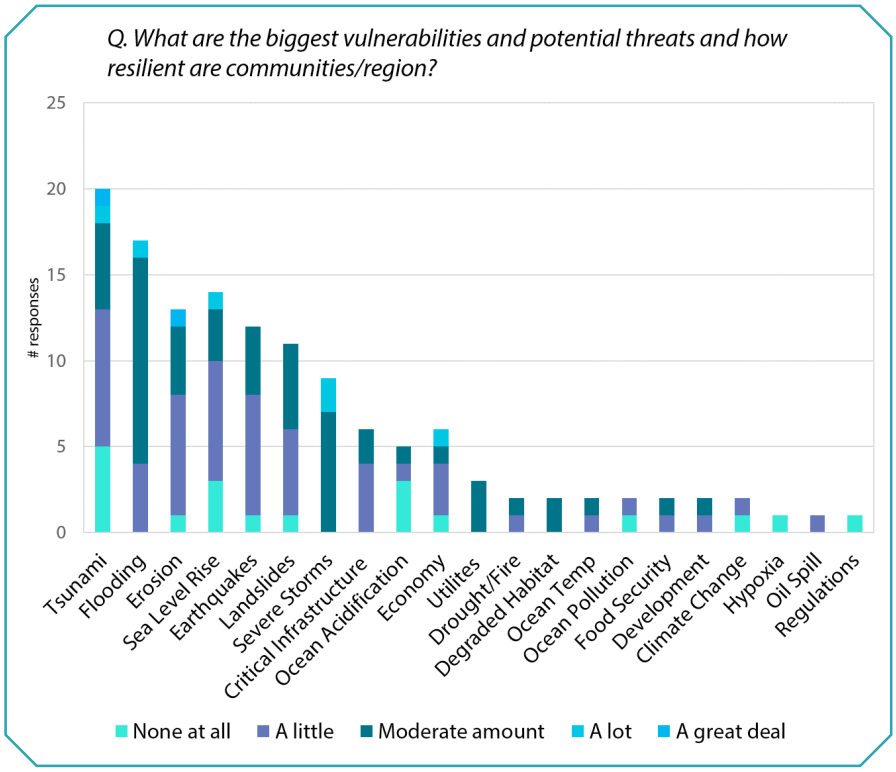
Vulnerabilities and Natural Hazard Threats

Earthquake and Tsunami

As part of the pre-interview questionnaire participants were asked to identify vulnerabilities and natural hazard threats facing the coast and coastal communities that impact resilience. The majority of participants identified earthquake, tsunami, and erosion as the top hazards. Sea level rise, flooding, landslides, extreme weather events, and ocean acidification were also frequently listed.

Vulnerabilities included physical and communication infrastructure, coastal economies, health and wellbeing, and governance capacity and resources. According to participants, erosion, sea level rise, and flooding are currently having a direct impact on roads, natural areas, critical infrastructure and facilities, and coastal economies.





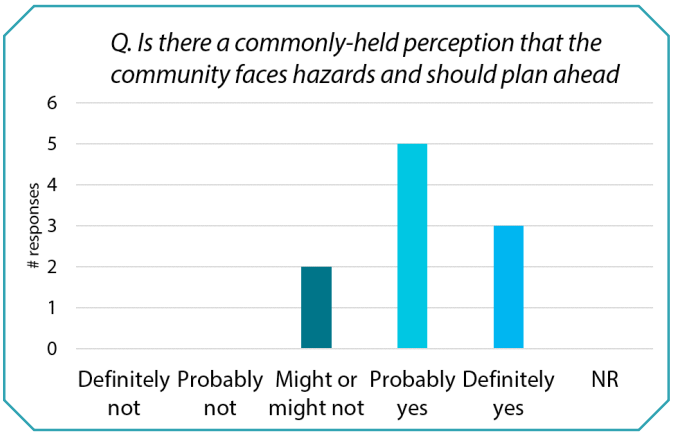
The majority of participants listed earthquake and tsunami as the top hazard for the coast and frequently talked about the potential devastating impact of a Cascadia Subduction Zone Earthquake (CSZE). This 9.0+ earthquake would cause a number of other potentially catastrophic events, including a large tsunami, landslides and liquefaction (a phenomenon in which soil loses its strength and ability to support structures and buildings). According to participants, Pacific and Grays Harbor Counties will be significantly impacted by a tsunami and liquefaction. Many feared that a tsunami event will eliminate entire communities in Aberdeen, Ocean Shores, Long Beach, Hoquiam, Westport, Cosmopolis, and the Makah, Quileute, Hoh, Quinault, and Shoalwater Bay Reservations. Participants from these communities said it was unlikely that most of the people in their community, themselves included, would be able to evacuate and reach high ground before the first tsunami wave hit. Given the lack of tsunami-evacuation structures and earthquake resistant buildings and schools, it is possible that entire generations could be lost.

Participants also mentioned that many of the roads connecting coastal communities will likely be damaged and inaccessible to emergency responders. Until roads are repaired or additional access routes created, it could be months before responders are able to deliver food, water, fuel, and other emergency supplies. Because of limited access, inoperable telecommunications systems, possible poor weather, and other preparedness issues, many more people are likely to die in the days and weeks after the event. Many participants talked about needing to be prepared to shelter in place for 30 days or more following a major event.

Erosion – Wind and Wave

Erosion was frequently listed as a major threat to the coast and coastal communities, particularly in Grays Harbor and Pacific County. Many talked about erosion issues in North Cove, nicknamed Washaway Beach, which was said to be eroding at over 100 feet per year. Participants talked about the loss of homes, buildings and businesses, and the immediate threats to State Highway 105 and multimillion dollar industries such as cranberry production. A number of stories were shared to emphasize the direness of the situation and showcase community self-reliance when it comes to addressing erosion. For example, participants talked about having to move their graveyard across the highway because coffins were washing out to sea. Others talked about homeowners pilling up rocks to armor against waves, and one home, surrounded by ocean on three sides, was talked about as a symbol of hope that the community can be saved.

Many participants wanted to see more emphasis on identifying long-term solutions but stressed the need for short term fixes to address areas at immediate risk from erosion. Some were concerned that shoreline protection regulations and requirements were too inflexible and limited long-term solution options. Others acknowledged that the cost to halt erosion would be great and noted the need for greater federal support to implement long-term solutions. Some were concerned that the cost to address erosion would be greater than the total value of the infrastructure and land, and that state and federal agencies would not be able to make a case to invest. Others suggested incorporating the economic value of natural resource industries and tourism into analysis and listed economic studies and projects being done by Washington Sea Grant and as part of the state's Marine Spatial Planning as examples of where such information could be found.



Severe Storms and Flooding

Severe storms and flooding were threats frequently mentioned by participants living in both the north and south coast. Many indicated they felt moderately resilient to the impacts of severe storms, due to the frequency of these events, as discussed already in the paragraphs above.

Ocean Acidification

Ocean Acidification – the increase in the acidity of the ocean over an extended period - was a concern frequently mentioned by participants. According to participants, the Washington coast is especially vulnerable to ocean acidification and the effects have already been seen in shell development in some marine organisms, including the native mollusks harvested by tribes. According to participants, recent research suggests that Dungeness crab and bony fish will also be impacted by ocean acidification. Some indicated it would be difficult, if not impossible, to create resilience given the scale of what the possible impacts of ocean acidification will be. Others were concerned about whether the coast would be able to adapt in time given the fact that impacts were already being seen. Many were concerned about the imapct on coastal economies and food security. Participants identified the shellfish industry as an example of innovation and adaptation.

Coastal Economies

According to participants, coastal communities are highly dependent on natural resources industries, recreation, and tourism. Job opportunities can be limited due to the remoteness of areas and limited diversity of the job sector. Participants talked about how many of these industries are vulnerable to sea level rise, erosion, flooding, ocean acidification, drought, and fire. For example, environmental changes and stressors, such as ocean acidification, pose significant threats to shellfish aquaculture production.

Physical and Communication Infrastructure

Participants identified a wide range of vulnerable physical infrastructure including schools, buildings, roads, bridges, and utilities. Emergency management's ability to access and evacuate people during an event was a key concern of many participants. Many talked about how communities on the coast are relatively isolated and how the geography in combination with limited access routes leaves communities

vulnerable. Much of the coast is only accessible by one main road. In many spots along the coast bridges and roads are likely to fail in the event of an earthquake or tsunami and are vulnerable to disruption by landslides, flooding, erosion, and sea-level rise. Many were concerned about the lack of access routes to facilitate evacuation and how this will limit the number of people able to evacuate in the event of a tsunami. In particular, participants were concerned about communities that do not have access to high ground, the ability of elderly and disabled individuals to evacuate in time, and the substantial increase in loss of life if such an event were to occur during the height of the tourism season.

Participants identified the lack of broadband access and cellular communication gaps on the coast as a major impediment to resilience. Many were concerned about the risks associated with poor to no communication between emergency management teams during a major hazard event, as well as the impacts on day-to-day functions, including governance, education, and healthcare. Participants talked about a lack of resources or incentives for improving cell service and commercial development of broadband infrastructure. Others talked about the impact of geographic isolation and physical constraints. For example, portions of Clallam and Jefferson counties are geographically isolated, with the Olympic Mountain Range to the east and the Pacific Ocean to the north and west. To access the west side, residents must drive around the Olympic National Park.

Governance Capacity and Resources

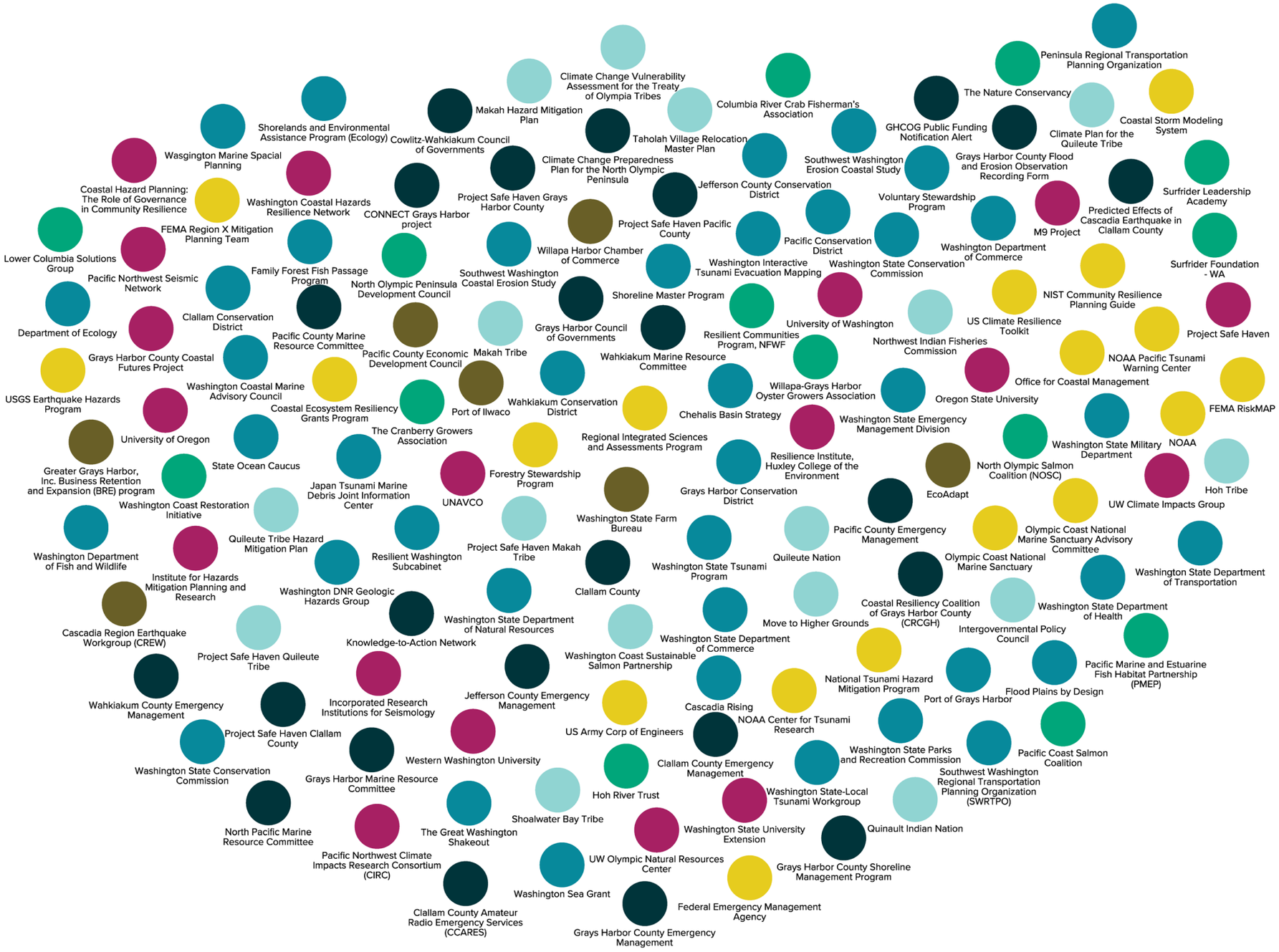
Many also noted that severe capacity constraints and economic challenges are affecting the ability to provide necessary services, plan for development, and prepare for emergencies. For example, it was stated that there is often just one staff person per county or tribe that manages emergency preparedness. To prepare for and mitigate against hazards, participants frequently said that a sense of urgency and political attention is needed. Many talked about how funding for disaster prevention is rarely provided prior to an actual disaster. For individuals and communities on the coast who are taking the initiative to prepare for the worst, it is difficult to prepare year after year when outside assistance is not forthcoming.

Participants frequently emphasized that coastal communities and tribes are often dependent upon grants to fund projects, yet there is limited grant funds available and capacity for grant writing and administration. There was concern that proposed cuts to federal agencies may impact grant opportunities. Participants also frequently said there is limited capacity for planning, project development and implementation, revenue generation, and fund raising.

Participant Perspectives: What Existing Efforts Support Resilience?

Participants were asked if they were aware of or have participated in any efforts that contribute to resilience and the entity or entities leading those efforts. Participants were also asked if other efforts currently exist that could be expanded to include the topic of resilience. The Assessment Team compiled a list of efforts and entities identified by participants during this assessment (Appendix F) and created the following visual. This list and visual are not meant to be comprehensive but rather the start of an inventory that can be built upon and used to better understand what entities and efforts could be involved in resilience efforts, how these efforts and entities are connected, and where there might be opportunities for resource coordination and partnerships.

- Federal
- Tribal
- State
- County/Local
- NGO
- University
- Private



Participant Perspectives: What Would Resilience Look Like & What is Needed?

Participants were asked to share their vision for coastal resilience and the milestones that would indicate success. Many viewed success as multifaceted. Some saw success as better ecosystem health and positive actions towards addressing global scale environmental challenges like impacts of climate change. Others focused on safer physical infrastructure and more strategic city planning to balance a healthy environment, development, and jobs. Many also stated that an indicator of success would be people and communities' continued ability to live and work along the Washington coast.

Participants were also asked a number of questions to identify what kind of support they think is needed to strengthen community, tribe, ecological and coast-wide resilience and what efforts would be required in order to achieve success. Most frequently stated was an urgent need for sustained action informed by local knowledge as well as increased funding opportunities to support these measures. There was wide-spread agreement among participants that tribal and non-tribal coastal communities lacked the necessary funding and capacity to provide sufficient staffing for planning, project initiation and implementation, grant writing and administration, and other forms of securing resources to support resilience projects locally and coast-wide. There was also agreement that additional technical assistance is required to analyze and interpret scientific information regarding hazards, risks and threats and to identify appropriate measures needed to take to improve coastal resilience.

Many participants stressed that improving and diversifying the local economies is an essential component of resilience. They also mentioned that to strengthen resilience as well as to improve emergency preparedness, efforts are needed to improve public health, medical care, food security and access to healthy food, and to address drug addiction.

Overall, participants saw the need for improved partnerships between federal, tribal, state, and local governments and agencies, researchers, and communities; expansion of the scope of existing efforts; and integration of efforts informed by coast-wide strategies. While there have been and currently are numerous groups and planning efforts that are focused on aspects of resilience, as listed in the previous section, many participants stated there needs to be a well-defined shared focus and corresponding resilience strategies. Many participants said current efforts have the potential to make significant impacts towards improving resilience, but that they are underfunded. To enhance the impact of these efforts, participants recommended additional funding and a more cohesive coast-wide initiative that would help to integrate efforts, create shared strategies, and ensure that impacts from local projects have positive ripple effects and minimize negative consequences on other coastal initiatives.

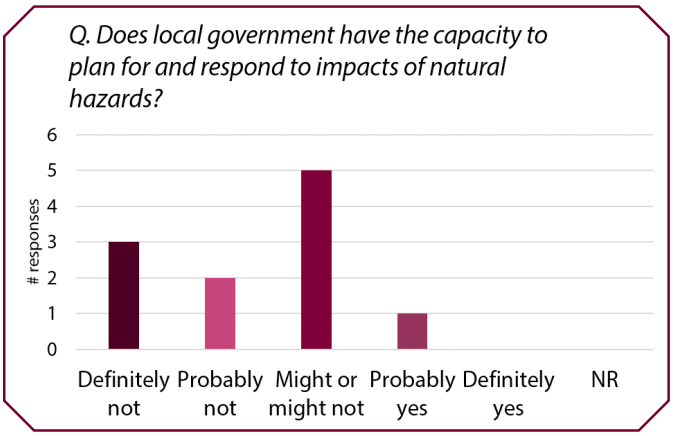
What is Needed

Funding, Support, and Resources

Nearly all participants emphasized the need to increase the local capacity for grant writing and administration for a wide range of potential projects from emergency preparedness to ecological restoration and infrastructure mitigation. Participants also expressed a need for assistance with identifying and scoping grant opportunities, and collaboration on projects and grants between tribes, communities, and businesses.

To strengthen resilience, many participants said efforts should build on and support existing local projects along the coast. Numerous participants talked about the importance of supporting existing

groups that are already oriented towards resilience initiatives and recommended minimizing the creation of new organizational structures, unless creating a new entity would 1) build funding and grant writing capacity, 2) help integrate existing and future efforts, 3) and/or assist with supporting a coast-wide initiative.



Participants called out the need for additional funding for the State Emergency Management Division, and an increase in the commitment of funds from State agencies for high priority projects. They also highlighted their desire for State and federal agencies to increase their focus on adaptation and resilience and to add staff capacity.

Integration and Coordination of Existing and Future Efforts

Participants talked about how, in addition to individual projects, there is a strong need for some type of coast-wide initiative that would help to develop shared goals and strategies, integrate efforts, and facilitate coordination and collaboration along the coast. Participants also talked about the need to identify priority projects coast-wide. In addition to broader coordination along the coast, a number of tribal representatives expressed their desire to increase coordination between coastal tribes, communities, local government, and state government.

Given current capacity constraints, participants often talked about the challenges of addressing day-to-day tasks and how any effort to elevate and integrate resilience efforts coast-wide would require dedicated and funded positions. Some suggested creating a team of people on the coast, who could help share information and coordinate efforts between tribes, researchers, government agency staff, elected officials, businesses, NGOs, planning groups, and community members. This team could provide assistance in grant finding, grant writing and development of projects. When asked what entities may already be playing this type of role or may have the expertise and mission to do so, participants frequently mentioned Washington Sea Grant, Washington State Department of Ecology, Washington State University Extension, Washington State Emergency Management Division, Conservation Districts, and tribes.

Many participants also expressed the need for improved coordination and communication amongst governmental agencies, particularly state and federal agencies. It was suggested that there could be agency "road shows" where agencies jointly spend a week or so in different coastal locations to learn about local efforts and provide site-specific technical information sharing and assistance. Participants also talked about creating more opportunities for the State Emergency Management Division and local emergency managers to engage in resilience efforts more broadly.

Resilience Definition, Assessment, and Metrics

During group interviews, participants noted that while some definitions of resilience were similar, there was not a shared understanding of the conditions that support resilience. Many participants in individual and group interviews expressed that shared understanding among people who are involved in coastal resilience efforts and coast-wide strategies is needed. Based on this shared awareness, some suggested it would be helpful for communities or groups to assess their relative resilience and identify

place-based initiatives that could strengthen resilience. Others suggested developing indicators or metrics for resilience to help track progress and changing conditions.

Improved Relationships, Political Leadership and Will

Participants often talked about a lack of statewide attention and awareness regarding the current and potential impacts of erosion, flooding, landslides, earthquakes, tsunami and other threats. To address these issues, participants suggested a more focused effort to more effectively convey the stories of the coast through videos, news reports, tours with elected officials, and social media. Some mentioned a need for increased leadership and the political will to act more urgently to address issues that are threatening the coast. Participants also recommended increased interaction of state, federal, and tribal representatives with coastal communities in order to further build relationships and trust between these entities. Participants also suggested increasing efforts to engage media entities to report on coastal issues and efforts. There were also recommendations to increase opportunities for local elected representatives and tribal government representatives to work together across tribal, municipal and county lines.

In addition to these insights, there was also concern and frustration expressed about what a number of participants saw as a significantly disproportionate amount of political attention and resources going towards efforts that would support resilience in the Puget Sound region. Some suggested bridging or showing how the coastal and Puget Sound efforts are connected. Others suggested Floodplains by Design as an example of a public/private collaborative effort that could serve as a model for coast resilience efforts.

Many talked about how the coastal tribes are engaged in large efforts to move their villages and infrastructure to higher ground and out of the tsunami zone. Many non-tribal participants expressed an interest in learning from the tribes about their approaches to addressing hazards in order to inform resilience efforts coast-wide.

What Does Resilience Look Like?

Governance

Participants agreed that good governance starts with smart planning and the political will to start planning for the future, now. Many shared a vision for better federal, tribal, state, and local relationships and leadership that would lead to increased information sharing, networking, and collaborative coast-wide efforts. Suggestions to achieve improved and coordinated governance included more on-the-ground efforts like state agency employees working in the field, state agency employees working more frequently with people out on the coast, or a collaborative effort to implement a better information and data collecting system to store data in a centralized location that people can easily access.

Several participants said that they would see sufficient funding for regulatory and voluntary efforts and greater support for voluntary incentive-based programs as opposed to regulation that might be used to achieve the same behavior changes.

Some participants said they would see increased leadership capacity of state agencies and university entities in order to support local decision-making, open dialogue, and technical assistance to support counties and local entities in meeting various planning and regulatory requirements. Others shared examples of various recent efforts of local mayors, city, county, and tribal leaders to convene key parties in their communities to identify joint actions to addressing issues facing the community. Participants suggested local leadership continue such efforts and expand them to include conversations about resilience.

Physical Infrastructure and Infrastructure Redundancy

The majority of participants commented that there needs to be improvements in the ability of infrastructure to provide life safety, withstand impacts from natural hazards, and support basic functions along the coast. Participants identified various examples of infrastructure that are in poor condition. Participants talked about needing to prioritize investment for critical infrastructure and the urgency for mitigation and improvement. Many said local revenue was insufficient to adequately fund infrastructure projects and that significant investment from state and federal agencies would be needed. Many also said that additional funding and partnerships to provide for local innovation and improved planning for prevention, preparedness, and recovery was needed.

Participants identified a variety of specific infrastructure vulnerabilities; some having to do with the likely lack of fuel in the event of an earthquake to run generators (for example, for the radio station – the main source of communication) or for wells (a main source of fresh water). Many noted that having access to broadband, widespread cell phone coverage, and adequate communications systems for emergency response was lacking and was essential for economic development, research, information sharing, convening, and the ability for emergency responders as well as residents to communicate during emergencies.

Participants were also concerned about the lack of tsunami safe havens and dependable evacuation routes. Most participants desired expediency and funding from the State to rebuild schools and move them to secure their ability to provide a safe place to go in a tsunami. Some suggested the State develop a funding plan and cited funding measures passed in Oregon in 2015 where the Oregon Legislature committed $175 million for school retrofits and another $125 million for matching grants to school districts that pass bond measures.

What Does Resilience Look Like?

Physical Infrastructure

Participants defined successful resilience efforts in terms of physical infrastructure, building, and planning. Some said resilience would look like minimal loss of infrastructure and resources. Others said there would be protections to ensure no property loss. Yet, others said they would no longer see hard armoring to protect threatened property, but instead more natural armoring practices.

Many talked about a future with more safe haven structures and vertical evacuation structures. In terms of private real estate and home ownership, participants said there would be support programs that incentivize homeownership and responsible development. For example, support programs could compensate homeowners for their losses or there would be accessible and more affordable flood insurance that does not exceed the average mortgage cost.

Many also said that in the future, developments would no longer be permitted in areas considered vulnerable to sea level rise, erosion, or where possible, tsunamis. Some talked about ensuring that permitting processes, building code regulations, and shoreline master plans take into account sea level rise projections and that they allow for greater flexibility of these processes to allow them to be adaptable to the specific circumstances of the area.

Many interviewees defined a future where implementing built solutions that achieve multiple benefits is a common solution to considering the environmental side of hazards protection. Some of these multiple benefit projects included: multiple use parks that also double as flood retention areas, infrastructure that attracts economic development and also protects the environment, safe haven towers that could be used by tourists as a viewing spot, working waterfronts that are secure from coastal hazards and also act as economic drivers in the community, and other efforts that allow communities to improve habitat and reduce hazards. Other ideas that were mentioned to achieve minimal loss of infrastructure and private property were: armoring and flood proofing that does not require reinvestment long-term, and low-tech ways of building up eroded areas.

In addition, many participants identified the need to build other structures along the coast that can provide a safe haven in the event of a tsunami. They frequently talked about the strategies identified as part of Project Safe Haven and ways to build structures for multi-benefit use, for example as viewing platforms for tourists or conference centers.

What Does Resilience Look Like?

Economy

Participants' vision for economic success included job creation and job growth as well as people working and spending their salaries locally. This was also tied to keeping younger generations in the community. Most participants described a future with more options and diversity of industries and jobs, while also ensuring that natural resource industries important to the economy and identity of the coast are able to maintain and prosper. Others indicated that if coastal resilience efforts were successful in the future they would see growth in recreation and tourism that supports local economies, the ability for coastal residents to start and maintain businesses, and that businesses would be locating themselves on the coast. Many participants talked about recreation and tourism as a key element of coastal economies and that in the future it would be a sustainable and reliable source of jobs and revenue.

Community Well-Being

Participants talked about community well-being in terms of minimal loss of human life or infrastructure following a hazard event and about addressing current health related issues such as opioid addiction, obesity, food security and assess to healthy food, among others. Others talked about community well-being in terms of increased community involvement and engagement, such as increased participation in earthquake practice drills, more new people serving on various groups or committees, and greater participation in various volunteer efforts. One challenge participants identified regarding community engagement had to do with difficulties reaching a common understanding of what the hazard risks are and what actionable steps can be taken to mitigate those risks. Another was the need for increased education to coastal tourists and residents regarding coastal issues, like erosion and flooding, and increased efforts in the communities and along the coast to address these issues.

Participants were also concerned that some emergency plans and response efforts depended on the functionality of roads and bridges that would be destroyed or inaccessible in a Cascadia earthquake and tsunami. Participants expressed the need to more accurately analyze maps and information that identifies potential impacts to roads, bridges and tsunami gathering points and use that information to update emergency plans. They expressed the need to utilize potential scenarios for community drills and to truth check whether assumptions are correct and change emergency plans accordingly.

Ecological Systems Integrity

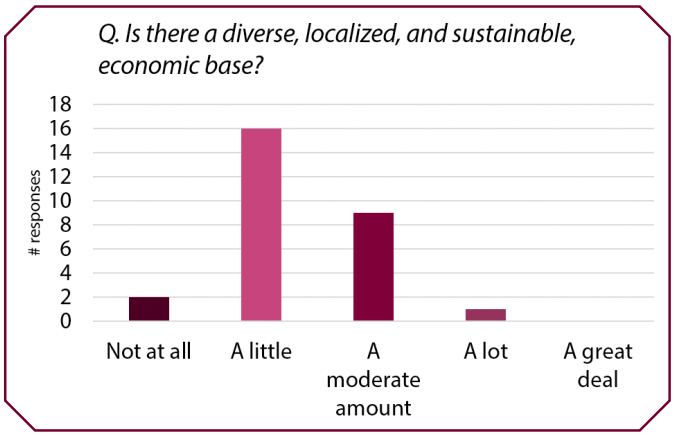
Participants passionately talked about the importance of healthy ecological systems not only to support non-human natural systems, but for community sustainability. There was widespread recognition that ecological systems need to remain as intact as possible and that it is important that development, restoration, mitigation, and other efforts take into account changing natural conditions and how these changes impact natural resource based economic activity.

Representatives from one tribe expressed a need to develop opportunities for tribal elders to share their experience with regenerating ecological systems and that this wisdom along with science may inform how to approach current issues.

Research, Technical Information and Assistance

Participants frequently stated that there is a need for locally relevant technical information and analysis that is communicated in formats useable by local planners and community members and that technical assistance is readily available. There was interest in having a system that centralizes technical information. There were numerous suggestions that improved coordination among

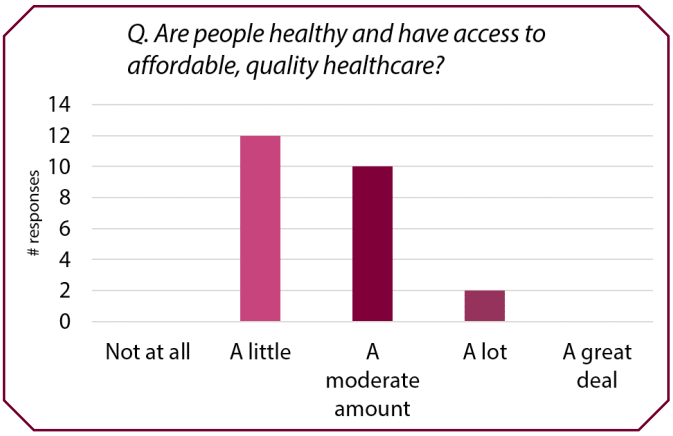
state agencies was needed and there needed to be greater consistency and clarity about planning and regulatory requirements. Nearly all participants, tribal and non-tribal talked about needing scientists, researchers, and engineers to inform their planning efforts as well as identify and implement projects. Participants talked about needing data for improved modeling of potential threats and vulnerabilities.



Some participants expressed a need for more accurate projections for sea level rise and site specific mapping of erosion, landslides, and flooding and assistance for local planners to be able to incorporate such information into planning. There was also interest in creating planning principles related to resilience that can inform planning efforts.

Participants from coastal group interviews frequently requested additional outreach from university researchers, university and private engineers, and agency scientists and technical staff to know what research related work and projects were being conducted and how it might be applicable to resilience efforts. It was also expressed that local involvement in decisions about research and in conducting research would be helpful. It was suggested that a coordinated research agenda among universities, governmental agencies, NGOs, and others was needed. Another suggestion was to create a coast research lab that integrates science, policy, and project implementation. Many said that more funding is needed for research related efforts and for developing and implementing projects based on assessment findings and existing research.

There were a number of examples of individuals who have volunteered large amounts of time to identify, collect, synthesize, and disseminate technical information especially related to emergency preparedness and response. Participants talked about volunteer efforts, such as those organized by Clallam County Emergency management, and the need to replicate such efforts in other coastal communities and counties. Participants also talked about how the type of hazard information that exists is not universally known, adaptable to specific areas, or available. Participants suggested increasing the utilization of hazard information for community and county emergency preparedness and planning efforts as well as for potential project development.



Economic Opportunities and Community Well-Being

Many participants spoke about the ability of a community to thrive as a key metric of resilience. Participants talked about economic development needing to be at the forefront of any effort to build resilience and that economic development efforts need to integrate ecological health with human activity. Participants emphasized the need for more diversified economic activity and more thought given to how best to ensure that businesses are able to be passed down to the next generation or transitioned to new ownership. Participants also talked about needing to increase focus on strategies

and programs to retain local youth as they transition into the working world. They also stated the need to engage multiple entities in problem solving around the lack of and/or high cost of flood insurance and how that impacts the ability to sell and maintain housing stock.

In regard to community well-being, food security and healthy food access, opioid addiction, and access to medical care were frequently mentioned concerns. Some suggested that enhanced strategies were needed both to address immediate food related needs as well as to ensure access to food and food storage for emergency preparedness. A number of participants talked about challenges communities are facing when it comes to drug and substance abuse and opioid addiction. They commented that it is difficult for communities to thrive in the midst of high addiction rates and that people will be highly vulnerable in the event of a major natural disaster.

Participants also brought up the need for improved emergency planning in regards to medical care and prescriptions. There is little redundancy and accessibility to medical care and it was suggested there be increased focus on coordination and preparation.

Outreach, Education, Leadership Development, and Engagement

The need for increased outreach and engagement was brought up by a number of participants. Some said additional resources were needed to increase efforts that engage and inform non-English speaking residents about emergency preparedness and other community planning efforts. Participants also talked about needing more opportunities for youth development and involvement in community life. For example, the development of a youth climate change leadership program, or a youth survival skills summer camp.

It was noted by many participants that there are a number of very knowledgeable individuals who have been involved in a wide range of efforts over years who are depended upon for "institutional knowledge" and experience. Some were concerned about the lack of redundancy in leadership and what will happen when these individuals retire. Suggestions included developing a mentoring program to share expertise and experience, supporting organizations such as Surfrider Foundation that offer leadership development programs, and that the coastal MRC's could play a role in capturing expertise and mentorship.

Grays Harbor College was brought up as a place that could provide additional educational opportunities including the possibility of summer student labs that could assist communities with assessments.

Planning

The need for additional assistance with finding resources for increased emergency preparedness and recovery planning and preparation was

What Does Resilience Look Like?

Planning

Many participants described successful coastal resilience efforts as the ability to effectively plan ahead and to minimize future damage to infrastructure and human health. Participants described successful planning efforts as those that were inclusive and transparent, flexible and tailored to the specific context and needs of the area, and that focuses on both the present and the future. There were concerns about the ability to implement plans given the lack of stable funding and resources, in particular for emergency management.

Participants often talked about the concept of multiple benefits needing to be part of planning efforts or criteria for coastal development projects. To build resilience, participants suggested agreed upon goals and prioritized efforts to achieve resilience be developed for the coast. They also talked about a more holistic approach to planning and projects that coordinated project efforts, resources, and investments coast-wide.

frequently mentioned. This included additional emergency preparedness and recovery planning related a Cascadia earthquake and tsunami happing during the height of tourism season and efforts to better prepare hotels and businesses for this scenario.

Also frequently stated was the need for increased planning capacity for local and regional governments to be able to identify and incorporate new and changing conditions particularly related to land use policy and planning, and infrastructure design. With increased capacity for planning, participants talked about how it would provide more opportunities to collaborate with and learn about other cities, counties, and tribes planning efforts.

Many participants said planning principles and frameworks related to resilience and longer planning horizons would be helpful to guide planning processes. With longer planning horizons, participants talked about how future conditions, such as sea level rise, could be considered. Participants also identified the need for better integration between State and local planning efforts identifying examples where protocols and planning parameters are unrealistic given the limited staff, resources, and capacity.

Participants also stressed the importance of having tailored assistance from state agency staff that are based in the communities or regions. This assistance was considered essential and foundational to inform local planning and decision-making. Participants stated that a key role of state agencies and other institutions such as Washington State University Extension and Washington Sea Grant is to serve as "integrators" of information, best practices, efforts, and planning principles. Participants talked about needing to maintain existing "on-the-ground" assistance and increasing planning assistance on the coast.

Coast-wide Advocacy

A number of participants said more unified coast-wide advocacy related to resilience is needed where individual communities not only focus on the specific needs of their area, but also support addressing issues coast-wide. Some participants expressed a need for increased training related to effective advocacy including coalition building, conflict resolution, collaborative governance, and facilitation. To support this advocacy, participants suggested developing, supporting, and improving various mechanisms for information exchange, such as cell and broadband coverage.

Regulatory Adaptability

Participants talked about how current regulations are unable to flex and keep pace with the changing conditions that are impacting the coastal landscape, such as erosion. To be resilient, some participants said more adaptive regulatory approaches were needed. Others suggested more flexibility to tailor regulations to the unique circumstances of the area. Participants stated that creating more adaptive approaches would require cross-jurisdictional and cross-disciplinary partnerships and coordination.

A Call To Action

Photo courtesy of
Integrity Structures LLC

A Call To Action

The coast and coastal communities exhibit important elements of resilience, including demonstrable grit, self-reliance, and a relatively strong sense of community. However, many, if not most, participants in this assessment stated the coast and coastal communities are not as resilient as they would like to be. Ecological, economic and social stresses over time have impacted communities and the coastal natural environment, and renewed urgency, energy, creativity, and resources are needed to strengthen the conditions for community and ecological resilience.

The ability for coastal communities and the environment to thrive into the future will require the ability and will to support and design novel local approaches and new partnerships that incorporate the complexity and unique aspects of life in each place. It will require increased collaboration and a willingness to envision new potential and to address conflicts. It will also be important to strengthen and create the local conditions and assets that enhance the ability to adapt to change. Improving resilience will require a commitment to the ecological, economic, and social health of the coast and the recognition that the health of the coast is an important component of the well-being of the whole State.

In addition to the challenges and opportunities that are brought on by changing conditions there is a sobering reality that the coastal communities and environment face potentially catastrophic impacts from a Cascadia earthquake and tsunami. To prepare for and to mitigate against these life-threatening hazards will be a critical component of coastal resilience efforts.

The following recommendations, developed by the Assessment Team are intended to provide guidance, suggest ideas, and stimulate action on coastal resilience efforts. In most cases, recommendations do not specify an entity or entities to be responsible for carrying out that action. This is purposeful in that there are multiple possibilities for initiating, leading, and implementing actions. Community members and leaders, governments, nonprofit organizations, community-based groups, researchers, educational institutions, philanthropists, businesses, individuals, and more all have a role to play in building resilience.

Guiding Principles

During this assessment, the Assessment Team identified key principles that emerged from the interviews that could be used by decision-makers at all levels to help guide the development of coastal resilience efforts. The Assessment Team used these guiding principles to inform the recommendations provided in this report:

- Start with place: understand, honor, and support the unique ecology, culture, social dynamics, and history of each place, acknowledging that the coast is not homogenous.
- Supplement needs-based approaches with focus on community assets.
- Acknowledge, map, and leverage assets whenever possible.
- Support the agency and self-efficacy of coastal communities by building on locally-driven efforts, encouraging local innovation and connectivity, and maximizing the potential for local people to carry out and sustain resilience efforts.
- Recognize the time and resource constraints of small communities, local governments, and tribes.
- Prioritize actions that improve life safety and address basic needs.
- Use a systems approach when identifying, planning, designing, and evaluating efforts.

This includes:

- Using longer-term planning horizons;
- Identifying interconnections;
- Considering patterns, trends and changing conditions;
- Challenging individual and group assumptions;
- Not being bound by how things were approached in the past;
- Breaking down silos and working across disciplinary and sectorial boundaries;
- Addressing multiple objectives whenever possible; and
- Taking into account the ripple effects of an effort.

- Design and, in some cases, require infrastructure projects to provide multiple benefits.
- Incorporate the support and diversification of local coastal economies as a key element in planning and project design.
- Increase opportunities for coordination of effort, learning, cross-fertilization, and trust building among all involved parties.
- Support and expand the work of existing groups instead of only creating new groups.
- Identify and implement modest "wins" to create momentum and build a sense of collective self-efficacy.
- Minimize bureaucracy and unnecessary hoops.
- Broaden engagement to include low-income and minority residents.
- Look for opportunities to address gaps in communication and coordination among tribal, federal, state, and local entities.

Recommendations and Key Leveraging Actions

The recommendations in this section are based on analysis of what was heard and learned from interviews, exploration of and experience with similar resilience efforts, and the Assessment Team's expertise in effective collaborative governance and organizational systems and structures.

The recommendations and key leveraging actions in this report are intended to improve the conditions for resilience on the coast. Improving resilience is an ongoing process and will require adaptation to conditions that continually evolve over time. Participants in the assessment identified a wide range of needs, ideas, and suggestions for ways to strengthen coastal resilience. The Assessment Team looked for patterns and themes within their responses and considered what might be useful for helping to increase resilience. While this assessment was limited in scope, it does provide insight for next steps.

As part of the recommendations, the Project Team identified Key Leveraging Actions. These leveraging actions have the potential to meet multiple objectives, lead to significant and enduring improvements, and leverage greater impact for the relative amount of effort. Some of these leveraging actions were chosen because they begin to address core issues, such as life safety and the availability of habitable land. For example, rebuilding coastal schools that also provide evacuation facilities for tsunamis could protect generations of children and community members; or intensifying efforts to address erosion, wind and wave impacts on communities could contribute to creating the essential foundation for livability.

Following each Key Leveraging Action are insights and additional recommendations to be considered. The recommendations are intended to stimulate the next generation of resilience work and discussion among entities involved in these efforts.

1. Establish A Coast-Wide Resilience Initiative To Enhance And Integrate Efforts

Key Leveraging Action: Create an integrated coast-wide effort to strengthen coastal resilience that is staffed by Washington Sea Grant, Washington State University Extension, Washington State Department of Ecology, and Washington State Emergency Management Division.

There are significant capacity constraints at the local level. The small numbers of local government staff do not allow for additional planning efforts that could improve local conditions and better prepare the community for future events. Likewise, universities and agencies often have limited resources or ability to collaborate effectively with local communities.

Parties involved in coastal resilience efforts would benefit from uniting around a common definition and vision of resilience. A coast-wide approach would elevate existing resilience efforts, mobilize new efforts, and weave together local initiatives while providing a systems approach to issues, risk analysis, project evaluation, and shared strategy development. The initiative could be developed in a way that builds on the efforts and leadership of coastal tribes, Conservation Districts, government agencies, existing organizations, communities, group, and individuals while also providing a vehicle to bridge government, non-governmental, and academic analysis and research. To support the initiative there needs to be a core group of people who partner together as integrators, provide backbone services, and work as a team in addressing resilience issues coast-wide. This would require funding for four positions to create a "Coastal Hazards Organizational Resilience Team" (COHORT). The COHORT would establish a formal partnership that would assist in aligning key resources and expertise, spearheading cross-fertilization of ideas, enhancing collaboration, and coordinating strategic investment in projects and programs.

The COHORT could assist in implementing a number of the following recommendations:

- Increase the capacity for securing grant funding by helping to develop and write new grant proposals and supporting grant administration. These individuals would also work to proactively coordinate with government officials, nonprofits and foundations to identify funding opportunities as well as opportunities for collaboration that can enhance the likelihood of securing grant awards.
- Develop a shared concept of resilience and work collaboratively with existing entities to develop coast-wide strategies for resilience while enhancing existing efforts and communicating these projects to officials and others.
- Create a data clearinghouse and develop criteria for identifying what data is helpful for emergency preparedness, resilience planning, policymaking, outreach, and project development for coastal communities. This data should also be accessible for use by local entities.
- Develop a joint research agenda and system for tracking findings that are accessible to communities, by ensuring that relevant scientific and technical information is communicated in formats that local governments can use and apply to local conditions.
- Engage and increase outreach about community and coastal resilience and emergency preparedness efforts.
- Encourage cross-sector collaboration among government agencies, researchers, and communities while communicating to decision-makers what is needed to increase the resilience of the coast and coastal communities.

- Assist with a coast-wide risk assessment and risk reduction analysis while working with existing groups (e.g. Department of Natural Resources, The Nature Conservancy, WCMAC, WECAN, MRC) to identify priority actions.
- Support coastal community resilience by focusing on the development of efforts that integrate economic development, ecological regeneration, emergency preparedness, community well being, and governance.
- Provide delivery mechanisms for funding.

2. Support And Enhance Local Efforts To Strengthen Resilience

Key Leveraging Action: Through State funding, provide at least $50,000 each in additional funding to coastal tribes, Marine Resource Committees, and Conservation Districts to stimulate additional locally driven resilience efforts. As part of the funding mechanism, provide parameters and guidance so that the funding is utilized for resilience-related projects.

There are a number of tribal and non-tribal community and regional organizations focused on or contributing to aspects of community and ecological resilience. These locally based entities have the potential to expand their focus and increase their impact on coastal resilience. Some of these locally based entities have established State funding mechanisms already in place, have organizational alignment to resilience efforts, and were identified through the assessment as leaders for community efforts (for example, MRCs). Additional funding would stimulate local agency and innovation and leverage community resources to support locally driven efforts.

There are additional ways to maximize the contribution and success of local coastal resilience efforts. Local efforts need continuing support to develop the capabilities of community leaders through training in collaboration skills, such as facilitation, conflict resolution, group decision-making, collaborative governance, and coalition building. It is important to see these skills as a backbone for community engagement and collaborative action and ensure that sufficient training opportunities exist. Existing entities including Washington State University Extension, Washington Sea Grant, and Surfrider Foundation, and others may be providing training opportunities for these types of skills.

On the coast, many community leaders wear multiple "hats" being involved in numerous roles, groups, and efforts. Many of these individuals have had significant impact on coastal and tribal communities, and are core to providing historical and institutional knowledge needed to inform future work. These individuals function as lynchpins, and play critical roles that are not always being replicated. For continuity and effectiveness of existing resilience efforts, it is important to recognize this lack of leadership "redundancy" and to consider ways to transfer the knowledge, relationships, and expertise of these individuals to the next generation of local leaders. One way to do this might be to develop a coastal mentorship program, in which local experienced leaders on these issues are paid to mentor and engage up-and-coming leaders in coastal resilience efforts. While the concept would require further exploration, Surfrider Foundation's leadership program may be an ideal platform for incorporating this idea.

There are also opportunities to enhance and support local youth leadership development that is focused on the issues that their communities are dealing with related to resilience. It would be beneficial to identify ways to enhance existing programs, like 4-H or emergency preparedness education in schools.

Also, new initiatives could be developed such as a tribal climate action youth leadership program and a youth survival skills program.

3. Enhance Well-Being And Consider New Approaches To Economic Development

Key Leveraging Action: Consider integrating approaches to economic development that are based on regenerative planning and development and informed by local cultural, social, ecological and political dynamics.

Community resilience on the coast will be strengthened by efforts that support the prosperity and health of people through increased employment opportunities across diverse sectors and industries. Since the health natural environment is integral to primary coastal economies such as tourism, fishing, and agriculture, new approaches to economic development could be considered that are place-based and incorporate efforts to increase and preserve ecological, economic, and social health. Regenerative planning and development is an approach to land use, community and economic development and the built environment that engages communities in utilizing place sourced ecological, cultural, political, and economic history, dynamics, and characteristics to define unique, local opportunities. It is a process that considers the complexity and interface between people and natural systems and assists communities in utilizing that understanding to improve the local economy and health of the community (Appendix G).

Key Leveraging Action: Undertake community food security assessments and develop food and health-related action plans and initiatives to address food security and access needs.

Understanding and addressing food security and healthy food access is vital to strengthening community resilience as well as improving the ability for people to survive in the event of an earthquake or other natural disaster. It is difficult to plan for a disaster if food is not readily available on a daily basis. Food security means that people have access, at all times, to enough and healthy food for an active, healthy life. This includes readily available, nutritionally adequate, culturally appropriate and safe food. Improving food security can also improve overall public health.

Access to quality healthcare on many parts of the coast is an issue. Health care facilities can be far away for many residents. Health, in general, is a concern as local health risk factors and conditions such as poverty, obesity, substance abuse, chronic disease, limited physical activity, poor nutrition, and premature death describe the need for health interventions. In order to enhance community well-being, it is important to support public health efforts and continue to address key public health issues.

Key Leveraging Action: Convene a diverse group of interests to focus on insurance issues facing coastal property owners and to develop recommendations.

In the context of this assessment numerous concerns were raised about the impacts of erosion, flooding, and difficulty in getting insurance coverage for increasingly at-risk housing. It could be helpful to convene a diverse group of interests including, but not limited to, local and state elected officials, the Washington State Insurance Commissioner, insurers, federal government representatives, other appropriate government agencies, real estate brokers, housing advocates, and property owners to develop solutions around insurance issues facing coastal property owners.

4. Support Improved Understanding And Application Of Resilience For Planning, Policy, And Strategy Development

Key Leveraging Action: Invest in activities that deepen understanding of resilience and create practical tools that allow for a consistent application of resilience principles.

Participants in coastal resilience efforts would benefit from having a shared understanding of resilience and tools for practically applying resilience in a variety of settings. Some materials are available that explain resilience and provide tools for communities and professionals to apply it, but the development of tools for rural communities is still evolving (Appendix H). Expert assistance may be needed to help translate resilience concepts into the development of resilience strategies that are specific to place.

The following are targeted examples of how this key leveraging recommendation could be implemented:

- Invest in the development of resilience planning principles, policies, and/or screens for use by state agencies, tribes, and/or local governments. This could include principles for long-term decision-making. At the local level, governments can be supported to adopt local planning principles that incorporate a resilience lens. A resilience lens could, for example, provide guidance for more resilient planning, design, and construction of buildings and infrastructure. This could help to reduce the siting of potentially problematic new construction, increase the redundancy of critical systems, and prioritize multiple benefit approaches.
- Support training in resilience and systems thinking to deepen levels of understanding and potential application among the diverse actors engaged in coastal resilience efforts, while also creating a shared understanding of resilience.
- Conduct professionally facilitated community resilience assessments that result in actionable strategies. Methods to assess community resilience are still at a relatively early stage of development, but there are a few promising models that could be adapted to serve the needs of coastal communities.
- Assess how government regulations hinder or support resilience. This could involve interviewing the members of coastal communities to understand their specific issues and how they are impacted by government regulation. This would enable better understanding on all sides regarding how specific regulations may be hindering or helping more resilient approaches. Regulations can then be reviewed to determine if it is possible to restructure them to be more conducive to coastal resilience.

5. Develop An Advocacy Strategy For The Coast

Key Leveraging Action: Develop narratives and design a campaign through video, print, social, and professional media outlets that communicate the compelling stories of coastal communities.

Coastal communities and tribes have stories capable of inspiring potential collaborations and coalitions around coastal resilience. These stories also have the capacity to inform the conversation around issues such as climate change, ocean acidification, sea-level rise, erosion, and emergency preparedness at the

local, state, national, and even international level. More effective communications along the coast could serve as a vehicle for individuals across the state and nation to begin identifying commonalities as well as differences, and together leverage innovative local efforts to more effectively address issues.

Coastal communities could benefit from greater alignment and coordination around shared issues and build political capital by developing collaborative advocacy strategies. These strategies could include identifying ways to build partnerships and develop coastal champions in other parts of Washington State. These efforts may benefit from additional opportunities for training in coalition building and political advocacy.

6. Increase Support For And Learn From Coastal Tribes' Resilience Efforts

Key Leveraging Action: Identify what is needed to support the implementation of relocation efforts, climate action plans, and hazard mitigation plans, and prioritize meeting those needs.

The coastal tribes are at the forefront of resilience efforts. Each of the five coastal tribes is actively planning for climate change impacts, hazard mitigation, and for relocating villages, infrastructure, businesses, and community facilities. Many of the participants in this assessment saw the coastal tribes as leaders of coastal resilience efforts and tribal approaches as possible models for other vulnerable coastal communities. While it is not clear whether such approaches would be easily transferable to other coastal communities, it could be worth engaging tribes in serving as a resource and partner to inform other coastal resilience efforts.

7. Increase Capacity For Emergency Preparedness, Planning, And Recovery Efforts

Key Leveraging Action: Increase funding for State and Local Emergency Management and increase state focus on coastal preparedness, mitigation, recovery, and resilience.

State Emergency Management Division is essential to providing guidance and coordination to coastal communities. Given the nature of the threats and their potential impacts on Washington state, emergency preparedness and recovery planning create an important foundation for efforts to strengthen coastal resilience. Currently, planning and program development along the coast are seriously constrained by lack of capacity, resources, and by planning requirements that sometimes don't reflect the local realities. Instead of being siloed, it is vital that the interrelationship between emergency management and emergency preparedness, thriving communities, community cohesion and agency, and ecological vitality and restoration be acknowledged.

To address this gap, it would be helpful to add one additional planning position per county and tribe to focus on recovery planning and resilience initiatives, and collaborate with the COHORT and other coastal emergency managers. Depending on available resources, short-term positions could be considered to assist in in implementing additional upfront work needed to increase opportunities and coordination. Carrying out drills and raising awareness about the risks and possible impacts of coastal natural hazards and threats has the potential to impact tourism if these efforts give visitors the impression that they are at greater risk while visiting the coast. However, well-executed plans and drills could also give visitors confidence that a plan is in place in the event of a disaster. Given the large numbers of tourists and coastal visitors, (more than 4 million annually) and the importance of them to the local economy, this is worth consideration.

Emergency preparedness could also be enhanced by additional funding for supplies, engagement and coordination of volunteers including the CERT Program, increased outreach and education to coastal residents and tourists about hazards and emergency preparedness, increased planning for areas that have high tourism, and the development and communication of plans for access to medical supplies and assistance in the event that communities or residents are isolated in an emergency. Also, additional efforts could be made to proactively map community assets, resources, and certifications that would be useful in the event of an acute disaster. This could include pre-credentialing contractors, identifying heavy equipment and operators, and other skills and equipment in the community.

Key Leveraging Action: Utilize the work of Clallam County Emergency Management as a model for emergency preparedness planning for coastal counties and provide support for the enhancement and implementation of plans.

There are important volunteer-driven emergency preparedness efforts taking place on the coast. Of note, there is extensive emergency preparedness planning taking place in Clallam County that are based on overlaying the potential impacts of a Cascadia earthquake, tsunami, major landslides, wind and wave damage, flooding, and projections of sea level rise on the roads and critical infrastructure. This is helping to identify key priorities for prevention/mitigation, and is providing knowledge towards organizing local preparedness efforts. There is an important opportunity to replicate or scale this effort to other parts of the coast. At a minimum, sharing of this approach and information should be a priority.

8. Improve And Invest In The Life Safety, Reliability, And Redundancy Of Critical Infrastructure

Key Leveraging Action: Expedite efforts to get coast-wide broadband, improved cell phone coverage, and satellite communications for emergency response. Convene the relevant public and private entities, including those who are currently working on this issue, to identify strategies and solutions to barriers.

Improved communications infrastructure is critical for building social capital, economic development, public health, emergency preparedness and response, and education. Currently, there is not adequate cell phone coverage and widespread access to the Internet along much of the coast. This constraint prevents new business development, reduces student abilities to learn, limits access to health information (for example: telehealth, telepsychiatry, email correspondence with health providers, on-line self help), prevents groups from organizing, and hinders communications for emergency responders as well as community leaders and members in the case of an emergency.

Bolstering emergency communications along the coast would include making certain that radio communications, radio stations, back-up generators, and emergency fuel storage tanks have the ability to function in an emergency. There may be a need to increase satellite communications and ham radio capability for emergency response and to develop a coordinated emergency communications plan for the coast, if not already completed.

Key Leveraging Action: Prioritize the development and implementation of funding mechanisms and plans to rebuild or retrofit coastal schools or buildings near schools as multi-use earthquake ready facilities that include tsunami evacuation safe havens.

Many coastal schools are in vulnerable locations and are not built to withstand the impact of a major earthquake or tsunami. As such, major hazards like these have the potential to cause widespread loss of life if they occur when school is in session. Creating tsunami safe havens at or near schools can increase survival rates for not only children and staff, but also provide safety for tourists and local residents. These retrofits or rebuilds can also serve as other community assets, such as a commercial kitchen could be used for business incubation, community meeting rooms, or storage areas for emergency supplies and shelter. Coastal communities will need financial and technical support to rebuild or retrofit schools and other multipurpose safe-havens. The Ocosta Elementary School outside Westport has raised awareness and interest among the coastal communities and could serve as a model for community engagement and design for the next generation of projects like this along the coast. Also identifying the next school retrofit/rebuild project and working to expedite its construction can continue this momentum.

Key Leveraging Action: Expedite the development of priorities and actions to address coastal erosion, and identify funding options and support existing collaborative efforts.

Erosion is having a significant impact on a number of coastal communities. Support for existing collaborative efforts that are focusing on long-term, solution oriented projects, such as WECAN and the CRCGH is needed. Funding for projects that offer short-term fixes may be needed in the interim, while the resources and capacity to develop long term solutions is being built. These groups may serve as a model for other coastal communities facing similar impacts.

9. Increase Opportunities For Collaboration, Coordination, And Partnerships

Key Leveraging Action: Convene a coastal resilience funding task force. The task force could include tribal, federal, and state representatives, nonprofits, businesses, and philanthropic entities to explore creative options and partnerships for funding and coordinating investments.

Identifying and securing diverse funding options for local and coast-wide initiatives and actions will be needed to build resilience. One approach would be to develop a funding task force to identify funding, create new partnerships, and develop creative strategies and new revenue possibilities. Another approach would be to create a community resilience fund, perhaps in collaboration with foundations and nonprofits. Tourists and tourism might be able to play a larger role in helping to generate revenue. Vertical evacuation structures, if built for multiple purposes, could possibly provide revenue and entice corporate sponsorship.

Key Leveraging Action: Secure adequate funding for technical experts and programs to gather and analyze data. Develop multi-disciplinary technical assistance "advisory teams" that can be configured based on need to work directly with communities on specific issues.

There are opportunities for improved coordination and communication between local, state, tribal, and federal governments and researchers. State and federal agencies could identify additional opportunities for effective interaction with local coastal communities and a more collaborative approach, particularly in areas where there may be shared interests, for example in natural resource conservation or in emergency management and recovery. The State Ocean Caucus could play a role in increasing coordination. The COHORT could play a role in helping to identify grant opportunities, and to better coordinate agencies to develop and implement joint strategies. Ecology or another entity could lead an effort to develop multi-disciplinary technical advice teams. It would be helpful to enhance efforts to translate scientific data and findings so that they are relevant and actionable for local communities.

This would include improving the usability of information about hazards, threats and impacts to the coast and developing strategies to inform residents about critical issues and opportunities. An annual or biannual "roadshow" would allow technical advisors to provide current information to coastal residents and residents to ask questions and develop relationships with government agency staff and researchers.

Key Leveraging Action: Increase interdisciplinary and cross-sector collaboration and utilize existing efforts to share information about the work communities and researchers are undertaking.

There are also opportunities to increase collaboration and the sharing of information about current efforts related to resilience. The Washington Coastal Hazards Resilience Network blog is one example where information about current projects and efforts happening on the coast can be shared. There are also opportunities for existing groups, such as the Marine Resource Committee's and WCMAC to expand their focus to include resilience. Researchers have an important role to play in building understanding and working with governments and communities to practically apply these resilience concepts. Additional ideas include hosting a coastal resilience summit that looks at best practices; hosting an elected leaders forum to create common understanding of coastal issues and discuss coordinated approaches; and hosting study tours to connect local leaders, emergency managers, and coastal port staff in Washington State and other parts of the world that are addressing similar issues. Additional opportunities for collaboration could also be explored between the UW Olympic Natural Resource Center, WSU, Grays Harbor College, and Peninsula College to develop programs, studio labs, and internships that focus on coastal resilience.

10. Advance Coastal Protection And Restoration

Key Leveraging Action: Explore opportunities to increase flexibility of regulatory approaches and support voluntary and collaborative efforts.

One challenge for advancing coastal protection and restoration while supporting community resilience is the uncertainty on the timing and predictability of the changes and the ability of the regulatory environment to adapt with these changing conditions and uncertainty. Building resilience will require focusing on adaptation, embracing more flexible regulatory approaches, and increasing opportunities for agencies to work collaboratively with the entities impacted by regulations. Voluntary and collaborative approaches may provide greater flexibility, creativity, and ability to resolve conflicts.

Identifying resilience attributes, developing resilience metrics, and applying this understanding to coastal protection and restoration projects will also aid in building resilience. Risk assessment and reduction tools, for example, the RISC-KIT developed in Europe or the Nature Conservancy coastal resilience tools could be used to identify high priority areas to focus effort and resources and could provide valuable information to community planners and leaders.

Appendix

Appendix A.

WA Coastal Resilience Assessment Interview Participant List

Dan Abramson	University of Washington on College of Built Environments
Paula Akerlund	Ocosta School District
Ben Andrews	Fire District 3
Rufus Arnold	Makah Tribe
Carrie Backman	WSU Extension, Wahkiakum Marine Resource Committee
Jeremy Bartheld	Pacific County resident
Liliana Bastian	WA Department of Ecology
Robert Bearden	City of Westport, Mayor
Nick Bird	Ocean Shores Public Works
Joel Blake	Shoalwater Bay Tribe
Molly Bogeberg	The Nature Conservancy
Ann Bostrom	University of Washington
Mike Bruner	Grays Harbor Tourism
Jim Buck	Clallam County Emergency Management, Volunteer
Ron Cameron	Clallam County Sheriffs Office
Nicholas Carr	Office of Rep. Derek Kilmer
Brian Cochrane	Washington Conservation Commission
Susan Connivy	Ocean Shores resident
David Cottrell	Grayland Drainage District #1
Cheryl Crester	Pacific County resident
Tim Crose	Pacific County Department of Community Development
Garrett Dalan	The Nature Conservancy
Penny Dalton	Washington Sea Grant
Kevin Decker	Washington Sea Grant
Casey Dennehy	Surfrider
Cathie DesJardin	US Army Corps of Engineers
Crystal Dingler	City of Ocean Shores, Mayor
Maie Dudley	Pacific County resident
Rob Duff	Office of the Governor
Randy Dutton	Navy (retired)
Paul Dye	Washington Sea Grant
Nicole Faghin	University of Washington/Sea Grant
Bob Freitag	Institute for Hazards Mitigation Planning and Research; Project Safe Haven
Dru Garson	Greater Grays Harbor Inc
George Glasso	NOAA-Olympic Coast National Marine Sanctuary
Guy Glenn	Port of Ilwaco and Port of Chinook
Eric Grossman	US Geological Survey
Franklin Hanson	University of Washington
Diane Harris	Pacific County resident

Richard Harris	Pacific County resident
Dave Hawthorne	Pacific County resident
Jessica Helsley	WA Coast Sustainable Salmon Partnership
Kristina Hollatz	Grays Harbor Marine Resource Committee
Joe Holtrop	Clallam Conservation District
John Hunter	North Pacific Marine Resource Committee
LeAnne Jacob	Wahkiakum Marine Resource Committee
George Kaminsky	WA Department of Ecology
Larry Kerns	Shoalwater Bay Tribe
Katie Krueger	Quileute Tribe
Bill Labiosa	US Geological Survey
Tim Lawrence	Washington State University, Island County
Michael Levkowitz	WA Department of Ecology
Randy Lewis	Port of Grays Harbor
Brian Lynn	WA Department of Ecology
Khalid Marcus	Hoh Tribe
Stacey McClain	WA Emergency Management Division
Scott McDougall	Pacific County Emergency Management
Key McMurry	Key Environmental Solutions, LLC
Bob Merrill	North Cove resident
Joe Meyer	Greater Grays Harbor Inc.
Dave Michalsen	US Army Corps of Engineers
Ian Miller	Washington Sea Grant
Charlene Nelson	Shoalwater Bay Tribe
Corey Niles	WA Department of Fish and Wildlife
Mike Nordin	Grays Harbor Conservation District, Pacific Conservation District
Tom Opstad	Aberdeen School District
Dan Orr	Clallam County Fire District
Rich Osborne	University of Washington Olympic Natural Resource Center
Kim Patten	Washington State University Extension - Pacific County
Randolf Peck	Ocean Shores resident
Doug Peters	WA Department of Commerce
Kelly Peterson-Lalka	Grays Harbor Tourism
Shane Phillips	Mott MacDonald Group
Holly Plackett	Grays Harbor Marine Resource Committee
Robert Parnell	City of Westport, Councilman
Mark Plackett	Grays Harbor Marine Resource Committee
Tami Pokorny	North Pacific Coast Marine Resource Committee
Frank Porembski	Pacific County resident
Gleih Porembski	Pacific County resident
Vickie Raines	Grays Harbor County Commission
Carol Roalkvam	WA Department of Transportation
Kelly Rupp	LeadToResults, LLC
Jeff Sawyer	WA Department of Transportation

Rob Schanz	WA Department of Transportation
Fawn Sharp	Quinault Indian Nation
Gwen Shaughnessy	National Oceanic and Atmospheric Administration
Brian Sheldon	Northern Oyster Company
Vladimir Shepsis	Coast and Harbor Engineers
Jill Silver	North Pacific Marine Resource Committee
Ken Smoak	Willapa Erosion Control Action Network
Steve Spencer	Shoalwater Bay Tribe
Carol Stibble	Pacific County resident
Chiggers Stokes	North Pacific Marine Resource Committee
Bobbak Talebi	WA Department of Ecology
Jean Thomas	Pacific County resident
Jodie Toft	The Nature Conservancy
Theresa Ueland	Shoalwater Bay Tribe
John Vidale	University of Washington
Brynne Walker	WA Emergency Management Division
Chuck Wallace	Grays Harbor County Emergency Management
Tim Walsh	WA Department of Natural Resources
Charles Warsinke	Quinault Indian Nation
Nick Wood	Grayland Cranberry Growers
Blaine Zechenelly	Clallam County Fire District 3

Appendix B.
Individual Interview Questions

WASHINGTON STATE UNIVERSITY

THE WILLIAM D. RUCKELSHAUS CENTER

UNIVERSITY OF WASHINGTON

Coastal Resilience Assessment
Interview Questions

Background

Coastal entities in Grays Harbor County, in partnership with the office of US Rep. Derek Kilmer and the Washington State Department of Ecology (Ecology), are exploring long-term resilience opportunities in response to growing concerns about erosion, flooding, and landslides; the number and severity of storms; predictions about rising sea levels; and the chance of a large earthquake triggering a tsunami. Since January of 2016, Ecology has been partnering with the Office of US Representative Derek Kilmer, cities of Ocean Shores and Westport, the Quinault Indian Nation, Grays Harbor County Emergency Management, the Port of Grays Harbor, and other state and federal agency partners to create the Grays Harbor Resilience Coalition (Coalition).

Staff from Rep. Kilmer's Office and Ecology contacted the William D. Ruckelshaus Center (Center) seeking independent facilitation services, originally around convening the Coalition partners to develop a 2017-2019 biennial budget request for coastal resilience projects. Over a series of conversations, the Center suggested that—while the Coalition as presently constructed may decide to continue pursuing a short-term budget request specific to Grays Harbor County— given the coast-wide scope of these issues and the shared interest in increasing the resilience of coastal communities, this appears to be an opportune time to begin developing a coast-wide approach. To ensure a path forward that will be embraced by and meet the needs of both "top-down" and "grass roots" interests, the Center suggested an assessment consisting of a series of interviews with key parties conducted by a neutral third party, to identify approaches, processes, structures, and resources to support long-term resilience for the Washington coast and coastal communities.

Assessment Purpose and Description

The purpose of the assessment is to explore opportunities that support long-term resilience to natural hazards for the Washington coast and coastal communities. The assessment will examine the dynamics, interests, challenges, and opportunities related to coastal resilience in Washington State. The Center is conducting individual or group interviews to begin to map the "coastal resilience system" and to identify approaches, processes, structures, and resources needed to enhance and support coast-wide resilience efforts. The assessment is neutral – neither the Center nor the interviewers have a stake in the outcome.

As an individual or representative of an organization with a particular role or interest in, or knowledge of coastal resilience, you have been identified as a candidate for an individual interview. We hope you will agree to participate, or assist by identifying the most appropriate person(s) to speak with us.

Interviews take approximately 90 minutes. A pre-interview survey will be provided to be

completed in advance of the interview. The survey will take approximately 15 minutes to fill out. Other than the interview and survey, no additional time is required to participate in the assessment. A copy of the interview questions is provided in advance of the interview (see below). Participation in both the interview and the survey is voluntary. Interviewees can choose at any time during the interview and the survey to decline to answer a question or end the interview and survey. Interviewees will be asked prior to beginning the interview to confirm that they are willing to participate. These questions have been reviewed by Washington State University's Office of Research Assurances, which has found that the assessment is exempt from the need for Human Subjects Internal Review Board (IRB) review.

The information gathered from interviews will be summarized in an assessment report, including recommendations and constructive next steps forward. Specific statements will not be attributed to individual interviewees. Interviewees may request and consent to be quoted and their names attributed to their responses in the final report. They will be given an opportunity to review their attributed responses before published in the final report. A list of names of individuals interviewed and that participated in the assessment will be provided as an appendix in the report. Participation in an interview is not contingent on having one's name published in the final report. An interviewee can request to not have their name listed. The report will be available to all who participated in the interview process. The assessment is expected to be completed by the end of February 2017.

More information about the Center is available at: http://ruckelshauscenter.wsu.edu/about/.

Interview Questions

Background

1. Please tell us about your background, affiliation, involvement, and interests with respect to coastal resilience.
2. How do you define resilience to existing and future natural hazards (flooding, erosion, landslides, earthquake and tsunamis, and the influence of rising sea levels)?
3. Would you say your community is resilient? In what ways? In what ways is it not?
    a. How do people describe your community, particularly in terms of how it confronts change or adversity? How do people in your community feel about the future? What words or phrases do they use to talk about the future?

Community/Region

4. Imagine it is sometime in the future (10 years onward) and coastal resilience efforts in your community/region have been successful. How would you know? What would you see (or not see) happening?

5. What are the resources or assets in your community that will help achieve this level of success?
6. What would need to happen to achieve this level of success in your community/region?
7. What do you see as the biggest vulnerabilities and potential threats for your community?
    a. How resilient is your community to these vulnerabilities and potential threats (1-Not at all, 2- A little, 3- A moderate amount, 4- A lot, 5- A great deal)? On what factors do you base your score?
8. How resilient is your community to significant natural hazards (earthquakes, tsunami, storms/storm surge, landslides, etc.) (1-Not at all, 2- A little, 3- A moderate amount, 4- A lot, 5- A great deal)? On what factors do you base your score?
9. How resilient is your community to the influence of climate change (1-Not at all, 2- A little, 3- A moderate amount, 4- A lot, 5- A great deal)? On what factors do you base your score?

What's Happening and What's Needed

10. How strongly does each of the following statements reflect your community (On a scale of 1-5, where 1 does <u>not</u> reflect your community, 3 somewhat reflects, and 5 strongly reflects your community)? What additional comments do you have based on your responses?
    a. We have a strong civic culture, in which residents are actively engaged in local affairs
    b. Most people feel a strong connection to this place
    c. We have a history of self-sufficiency and of successfully confronting adversity
    d. We have a diverse, localized, and sustainable economic base
    e. Most people are able to support themselves and their families comfortably
    f. People are healthy and have access to affordable, quality healthcare
    g. We have strong links to other places, communities, and people
    h. We have strong connections among individuals in the community such as family, community groups, work groups, religious groups...
    i. We are inclusive and welcoming of diverse peoples and voices in our community
    j. We are able to make decisions and take actions in our community that improve local well-being
    k. Our built environment, including infrastructure, is designed to minimize danger, loss of life, and destruction of property as well as enable evacuation and eventual recovery in the event of a natural disaster

l. We have effective community-based organizations that help to address local needs
m. We value and protect the natural environment in which we live

11. Do the following statements reflect your community's attitudes, resources, and relationships (1-Definitely not, 2- Probably not, 3- Might or might not, 4- Probably yes, 5- Definitely yes)? If yes, why? If no, why not?
    a. People generally agree that the community faces significant threats from natural hazards and that there is a need to plan ahead for them
    b. Local government has the capacity to plan for and respond to the impacts of natural hazards
    c. Assistance is available from outside the community
    d. Community members have a positive view of and/or relationship with public agencies at the municipal, county, state, and federal levels

Coast-Wide

12. Imagine it is sometime in the future (10 years onward) and coastal resilience efforts for the entire coast have been successful. How would you know? What would you see (or not see) happening?
13. What are the existing coast-wide resources or assets that will help achieve this level of success?
14. What would need to happen to achieve this level of success for the entire coast?
15. What do you see as the biggest vulnerabilities and potential threats coast-wide?
    a. How resilient is the entire coast to these vulnerabilities and potential threats (1- Not at all, 2- A little, 3- A moderate amount, 4- A lot, 5- A great deal)? On what factors do you base your score?
16. How resilient is the entire coast to significant natural hazards (earthquakes, tsunami, storms/storm surge, landslides, etc.) (1-Not at all, 2- A little, 3- A moderate amount, 4- A lot, 5- A great deal)? On what factors do you base your score?
17. How resilient is the entire coast to the influence of climate change (1-Not at all, 2- A little, 3- A moderate amount, 4- A lot, 5- A great deal)? On what factors do you base your score?
18. Are you aware of, or have you participated in, any efforts to address community and coastal resilience?
    a. What is the status of these efforts?
    b. What first motivated these efforts?

   c. Who provided (provides) leadership?
   d. Are these efforts connected? If so, how?
   e. What is working well and why? What is not working well and why?
   f. What are the outcomes and impacts of these efforts?

19. What other forums currently exist for coordination and collaboration on key issues for the coast? Would resilience be a topic that might align? If not, why not?
20. Does your community need support to be more resilient? What kind of support? Who could best provide it?
21. What are important things to do to ensure resilience for your community and the entire coast in terms of:
    a. The environment?
    b. The economy?
    c. Physical infrastructure?
    d. Community development?
    e. Governance?
22. Who are the key entities that need to be involved in addressing coastal resilience? What would be their key roles and responsibilities?
23. Are additional organizational structures needed to address coastal resilience? If so,
    a. What would be the purpose?
    b. How would you structure it?
    c. Who would be involved?
    d. What resources would be needed?

Wrap up

24. Do you have additional thoughts or ideas about how to support long term resilience for WA coast and coastal communities?
25. Is there anyone else we should interview? Why is it important to speak to him/her?
26. What should we have asked that we did not?
27. Do you have any questions for us?

Appendix C.
Assessment Online Questionnaire

Block 1

Coastal Resilience Assessment Background

Coastal entities in Grays Harbor County, in partnership with the office of US Rep. Derek Kilmer and the Washington State Department of Ecology (Ecology), are exploring long-term resilience opportunities in response to growing concerns about erosion, flooding, and landslides; the number and severity of storms; predictions about rising sea levels; and the chance of a large earthquake triggering a tsunami. Since January of 2016, Ecology has been partnering with the Office of US Representative Derek Kilmer, cities of Ocean Shores and Westport, the Quinault Indian Nation, Grays Harbor County Emergency Management, the Port of Grays Harbor, and other state and federal agency partners to create the Grays Harbor Resilience Coalition (Coalition).

Staff from Rep. Kilmer's Office and Ecology contacted the William D. Ruckelshaus Center (Center) seeking independent facilitation services, originally around convening the Coalition partners to develop a 2017-2019 biennial budget request for coastal resilience projects. Over a series of conversations, the Center suggested that—while the Coalition as presently constructed may decide to continue pursuing a short-term budget request specific to Grays Harbor County— given the coast-wide scope of these issues and the shared interest in increasing the resilience of coastal communities, this appears to be an opportune time to begin developing a coast-wide approach. To ensure a path forward that will be embraced by and meet the needs of both "top-down" and "grass roots" interests, the Center suggested an assessment consisting of a series of interviews with key parties conducted by a neutral third party, to identify approaches, processes, structures, and resources to support long-term resilience for the Washington coast and coastal communities.

Assessment Purpose and Description

The purpose of the assessment is to explore opportunities that support long-term resilience to natural hazards for the Washington coast and coastal communities. The assessment will examine the dynamics, interests, challenges, and opportunities related to coastal resilience in Washington state. The Center is conducting individual and group interviews to begin to map the "coastal resilience system" and to identify approaches, processes, structures, and resources needed to enhance and support coast-wide resilience efforts.

As an individual or representative of an organization with a particular role or interest in, or knowledge of coastal resilience, you have been identified as an interview candidate. This pre-interview survey is to be completed in advance of the interview. You will have an opportunity during your interview to discuss your responses and share additional information. Participation in this survey is voluntary. You may choose at any time to decline to answer any or all questions or end the survey.

The information gathered from this assessment will be summarized in an assessment report, including recommendations and constructive next steps forward. Specific statements and survey responses will not be attributed to individual interviewees.

A list of names of individuals interviewed and that participated in the assessment will be provided as an appendix in the report. Participation in an interview is not contingent in having one's name published in the final report. The assessment is expected to be completed by the end of February 2017.

More information about the Center is available at: http://ruckelshauscenter.wsu.edu/about/.

If you wish to participate in this survey, please select "agree". If you do not wish to participate in this survey, please select "disagree". After making your selection, please click "Next Page".

Agree ○ Disagree ○

Questions

Background

1. How do you define resilience to existing and future natural hazards (flooding, erosion, landslides, earthquake and tsunamis, and the influence of rising sea levels)?

Community/Region

2. What community(ies) on the coast are you part or work with?

3. What are the biggest vulnerabilities and **potential threats** for the community(ies)/region?

Please list vulnerabilities and potential threats in the numbered boxes below.

	How resilient is the community(ies)/region to these vulnerabilities and potential threats?					On what factors do you base your response? -
	None at all	A little	A moderate amount	A lot	A great deal	
1	○	○	○	○	○	
2	○	○	○	○	○	
3	○	○	○	○	○	
4	○	○	○	○	○	

	How resilient is the community(ies)/region to these vulnerabilities and potential threats?					On what factors do you base your response? -
	None at all	A little	A moderate amount	A lot	A great deal	
5	○	○	○	○	○	

4. How resilient is the community(ies)/region to significant natural hazards?

	How resilient is the community(ies)/region?					On what factors do you base your response? -
	None at all	A little	A moderate amount	A lot	A great deal	
Earthquakes	○	○	○	○	○	
Tsunami	○	○	○	○	○	
Storms/storm surges	○	○	○	○	○	
Landslides	○	○	○	○	○	
Other	○	○	○	○	○	

5. How resilient is the community(ies)/region to the influence of climate change?

None at all	A little	A moderate amount	A lot	A great deal
○	○	○	○	○

5a. On what factors do you base your response?

Coast-Wide

6. What are the biggest vulnerabilities and **potential threats** coast-wide?

Please list vulnerabilities and potential threats in the numbered boxes below.

	How resilient is the entire coast to these vulnerabilities and potential threats?					On what factors do you base your response? -
	None at all	A little	A moderate amount	A lot	A great deal	
1	○	○	○	○	○	
2	○	○	○	○	○	
3	○	○	○	○	○	
4	○	○	○	○	○	
5	○	○	○	○	○	

7. How resilient is the entire coast to significant natural hazards?

	How resilient is the entire coast?					On what factors do you base your response? -
	None at all	A little	A moderate amount	A lot	A great deal	
Earthquakes	○	○	○	○	○	
Tsunami	○	○	○	○	○	
Storms/storm surges	○	○	○	○	○	
Landslides	○	○	○	○	○	
Other	○	○	○	○	○	

8. How resilient is the entire coast to the influence of climate change?

None at all	A little	A moderate amount	A lot	A great deal
○	○	○	○	○

8a. On What factors do you base your response?

What's Happening and What's Needed

9. How strongly do each of the following statements reflect the community(ies)/region?

	Not at all	A little	A moderate amount	A lot	A great deal	What additional comments do you have for each rating?
a. There is a strong civic culture, in which residents are actively engaged in local affairs	○	○	○	○	○	
b. Most people have a positive sense of place and identity	○	○	○	○	○	
c. There is a history of self-sufficiency and of successfully confronting adversity	○	○	○	○	○	
d. There is a diverse, localized, and sustainable, economic base	○	○	○	○	○	
e. Most people are able to support themselves and their families comfortably	○	○	○	○	○	
f. People are healthy and have access to affordable, quality healthcare	○	○	○	○	○	
g. There are strong links to other places, communities, and people	○	○	○	○	○	

	Not at all	A little	A moderate amount	A lot	A great deal	What additional comments do you have for each rating?
h. There are strong connections among individuals in the community such as family, community groups, work groups, religious groups...	○	○	○	○	○	
i. People are inclusive and welcoming of diverse peoples and voices, particularly traditionally marginalized ones	○	○	○	○	○	
j. People are able to make decisions and take actions in your community that improve local well-being	○	○	○	○	○	
k. The built environment, including infrastructure, is designed to minimize danger, loss of life, and destruction of property as well as enable evacuation and eventual recovery in the event of a natural disaster	○	○	○	○	○	
l. There are effective community-based organizations that help to address local needs	○	○	○	○	○	
m. People value and protect the natural environment in which they live.	○	○	○	○	○	

10. Do the following statements reflect the community(ies)/region attitudes, resources, and relationships?

	Definitely not	Probably not	Might or might not	Probably yes	Definitely yes
a. There is a commonly-held perception that the community faces hazards and should plan ahead	○	○	○	○	○
b. Local government has the capacity to plan for and respond to impacts of natural hazards	○	○	○	○	○
c. Assistance is available from outside the community	○	○	○	○	○

	Definitely not	Probably not	Might or might not	Probably yes	Definitely yes
d. A positive relationship exists between community members and public agencies (local and beyond).	○	○	○	○	○

Wrap Up

11. Additional thoughts or comments?

The William D. Ruckelshaus Center

Appendix D.

Assessment Group Interview Questions

WASHINGTON STATE UNIVERSITY

THE WILLIAM D. RUCKELSHAUS CENTER

UNIVERSITY OF WASHINGTON

Washington Coastal Resilience Assessment Forum

South Campus Center (SOCC) Rm. 316

The University of Washington, Seattle, WA

December 8, 2016 1:30pm – 4:00pm

AGENDA

PURPOSE: To gather information and insight from university and private researchers about approaches, processes, structures, and resources needed to enhance and support resilience efforts for the Washington coast and coastal communities.

1:30pm WELCOME & INTRODUCTIONS

1:45pm RESILIENCE DEFINITION

1. How do <u>you</u> define resilience to existing and future natural hazards (flooding, erosion, landslides, earthquake and tsunamis, and the influence of rising sea levels)?
    a. What are the key conditions for resilience?

2:00pm RESOURCES, ASSETS, & VISION

2. Would you say the coast is resilient? In what ways and what locations and communities? In what ways is it not and what locations and communities?
3. Imagine it is sometime in the future (10 years onward) and coastal resilience efforts for the entire coast have been successful. How would you know? What would you see (or not see) happening?
4. What are the existing coast-wide resources or assets that will help achieve this level of success?
5. What would need to happen to achieve this level of success for the entire coast in terms of:
    a. The environment?
    b. The economy?
    c. Physical infrastructure?
    d. Community development?
    e. Governance?
6. Who are the key entities that need to be involved in addressing coastal resilience? What would be their key roles and responsibilities?
    a. What is the role of local communities?

3:00pm CURRENT EFFORTS

7. What efforts are you aware of or have you participated in to address community and coastal resilience? How are these efforts connected?

8. What other efforts currently exist on key issues for the coast where resilience would be a topic that might align?

3:30pm FUTURE EFFORTS

9. Are additional efforts, organizational structures, coordination, collaboration, and/or research needed to address coastal resilience? If so,
    a. What would be the purpose?
    b. How would you structure it?
    c. Who would be involved?
    d. What resources would be needed?

4:00pm WRAP UP

WASHINGTON STATE UNIVERSITY

THE WILLIAM D. RUCKELSHAUS CENTER

UNIVERSITY OF WASHINGTON

Washington Coastal Resilience Assessment Forum

Department of Ecology SW Regional Office, Room RS2-20

300 Desmond Dr., Lacey, WA

January 12, 2017 1:30 – 4:00pm

AGENDA

PURPOSE: To gather information and insight from state and federal agencies about approaches, processes, structures, and resources needed to enhance and support resilience efforts for the Washington coast and coastal communities.

1:30 pm WELCOME & INTRODUCTIONS

1:45 pm RESILIENCE DEFINITION

1. How do <u>you</u> define resilience to existing and future natural hazards (flooding, erosion, landslides, earthquake and tsunamis, and the influence of rising sea levels)?
    a. What are the key conditions for resilience?

2:00 pm RESOURCES, ASSETS, & VISION

2. Would you say the coast is resilient? In what ways and what locations and communities? In what ways is it not and what locations and communities?
3. Imagine it is sometime in the future (10 years onward) and coastal resilience efforts for the entire coast have been successful. How would you know? What would you see (or not see) happening?
4. What are the existing coast-wide resources or assets that will help achieve this level of success?
5. What would need to happen to achieve this level of success for the entire coast in terms of:
    a. The environment?
    b. The economy?
    c. Physical infrastructure?
    d. Community development?
    e. Governance?
6. Who are the key entities that need to be involved in addressing coastal resilience? What would be their key roles and responsibilities?
    a. What is the role of local communities?

3:00 pm CURRENT EFFORTS

7. What efforts are you aware of or have you participated in to address community and coastal resilience? How are these efforts connected?

8. What other efforts currently exist on key issues for the coast where resilience would be a topic that might align?

3:30 pm FUTURE EFFORTS

9. Are additional efforts, organizational structures, coordination, collaboration, and/or research needed to address coastal resilience? If so,
    a. What would be the purpose?
    b. How would you structure it?
    c. Who would be involved?
    d. What resources would be needed?

4:00 pm WRAP UP

WASHINGTON STATE UNIVERSITY

THE WILLIAM D. RUCKELSHAUS CENTER

UNIVERSITY OF WASHINGTON

Washington Coastal Resilience Assessment Group Interview

North Pacific Coast Marine Resource Committee Meeting

January 17, 2017 4:00 – 6:00pm

Washington Coastal Resilience Assessment Project Background

Coastal entities in Grays Harbor County, in partnership with the office of US Rep. Derek Kilmer and the Washington State Department of Ecology (Ecology), are exploring long-term resilience opportunities in response to growing concerns about erosion, flooding, and landslides; the number and severity of storms; predictions about rising sea levels; and the chance of a large earthquake triggering a tsunami. Since January of 2016, Ecology has been partnering with the Office of US Representative Derek Kilmer, cities of Ocean Shores and Westport, the Quinault Indian Nation, Grays Harbor County Emergency Management, the Port of Grays Harbor, and other state and federal agency partners to create the Grays Harbor Resilience Coalition (Coalition).

Staff from Rep. Kilmer's Office and Ecology contacted the William D. Ruckelshaus Center (Center) seeking independent facilitation services, originally around convening the Coalition partners to develop a 2017-2019 biennial budget request for coastal resilience projects. Over a series of conversations, the Center suggested that—while the Coalition as presently constructed may decide to continue pursuing a short-term budget request specific to Grays Harbor County— given the coast-wide scope of these issues and the shared interest in increasing the resilience of coastal communities, this appears to be an opportune time to begin developing a coast-wide approach. To ensure a path forward that will be embraced by and meet the needs of both "top-down" and "grass roots" interests, the Center suggested an assessment consisting of a series of interviews with key parties conducted by a neutral third party, to identify approaches, processes, structures, and resources to support long-term resilience for the Washington coast and coastal communities.

The purpose of the assessment is to explore opportunities that support long-term resilience to natural hazards for the Washington coast and coastal communities. The assessment will examine the dynamics, interests, challenges, and opportunities related to coastal resilience in Washington State. The Center is conducting individual or group interviews to begin to map the "coastal resilience system" and to identify approaches, processes, structures, and resources needed to enhance and support coast-wide resilience efforts. The assessment is neutral – neither the Center nor the interviewers have a stake in the outcome.

The information gathered from interviews will be summarized in an assessment report, including recommendations and constructive next steps forward. Specific statements will not be attributed to individual interviewees. Interviewees may request and consent to be quoted and their names attributed to their responses in the final report. They will be given an opportunity to review their attributed responses before published in the final report. A list of names of individuals interviewed and that participated in the assessment will be provided as an appendix in the report. Participation in an interview is not contingent on having one's name published in the final report. An interviewee can request to not have their name listed. The report will be available to all who participated in the interview process. The assessment is expected to be completed by the end of February 2017.

Washington Coastal Resilience Assessment Group Interview
North Pacific Coast Marine Resource Committee Meeting
UW Olympic Natural Resources Center (ONRC), 1455 S Forks Ave., Forks WA
January 17, 2017 4:00 – 6:00pm

AGENDA

PURPOSE: To gather information and insight about approaches, processes, structures, and resources needed to enhance and support resilience efforts for the Washington coast and coastal communities.

WELCOME & INTRODUCTIONS

RESILIENCE DEFINITION & VISION

1. How do <u>you</u> define resilience to existing and future natural hazards (flooding, erosion, landslides, earthquake and tsunamis, and the influence of rising sea levels)?
    a. What are the key conditions for resilience?
2. Would you say the coast is resilient? In what ways and what locations and communities? In what ways is it not and what locations and communities?
3. Imagine it is sometime in the future (10 years onward) and coastal resilience efforts in your community/region have been successful. How would you know? What would you see (or not see) happening?
4. Does your community need support to be more resilient? What kind of support? Who could best provide it?

RESILIENCE DEFINITION & VISION DEBRIEF

CURRENT & FUTURE EFFORTS

5. What efforts are you aware of or have you participated in to address community and coastal resilience? How are these efforts connected?
6. What other efforts currently exist on key issues for the coast where resilience would be a topic that might align?
7. Are additional efforts, organizational structures, coordination, collaboration, and/or research needed to address coastal resilience? If so,
    a. What would be the purpose?
    b. How would you structure it?
    c. Who would be involved?
    d. What resources would be needed?

WRAP UP

WASHINGTON STATE UNIVERSITY

THE WILLIAM D. RUCKELSHAUS CENTER

UNIVERSITY OF WASHINGTON

Washington Coastal Resilience Assessment Group Interview

WSU Long Beach Research and Extension Unit
2907 Pioneer Road, Long Beach, WA 98631
January 25, 2017 2:00 – 5:00pm

Washington Coastal Resilience Assessment Project Background

Coastal entities in Grays Harbor County, in partnership with the office of US Rep. Derek Kilmer and the Washington State Department of Ecology (Ecology), are exploring long-term resilience opportunities in response to growing concerns about erosion, flooding, and landslides; the number and severity of storms; predictions about rising sea levels; and the chance of a large earthquake triggering a tsunami. Since January of 2016, Ecology has been partnering with the Office of US Representative Derek Kilmer, cities of Ocean Shores and Westport, the Quinault Indian Nation, Grays Harbor County Emergency Management, the Port of Grays Harbor, and other state and federal agency partners to create the Grays Harbor Resilience Coalition (Coalition).

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Washington Coastal Resilience Assessment Group Interview

Washington Coastal Resilience Assessment Group Interview
WSU Long Beach Research and Extension Unit
2907 Pioneer Road, Long Beach, WA 98631
January 25, 2017 2:00 – 5:00pm

AGENDA

PURPOSE: To gather information and insight about approaches, processes, structures, and resources needed to enhance and support resilience efforts for the Washington coast and coastal communities.

WELCOME & INTRODUCTIONS

RESILIENCE DEFINITION

1. How do <u>you</u> define resilience to existing and future natural hazards (flooding, erosion, landslides, earthquake and tsunamis, and the influence of rising sea levels)?
    a. What are the key conditions for resilience?

VISION, RESOURCES, & EFFORTS

2. Would you say the coast is resilient? In what ways and what locations and communities? In what ways is it not and what locations and communities?
3. Imagine it is sometime in the future (10 years onward) and coastal resilience efforts in your community/region have been successful. How would you know? What would you see (or not see) happening?
4. What are the existing resources or assets that will help achieve this level of success?
5. What efforts are you aware of or have you participated in to address community and coastal resilience? How are these efforts connected?
6. What other efforts currently exist where resilience would be a topic that might align?

FUTURE EFFORTS

7. Does your community/region need support to be more resilient? What kind of support? Who could best provide it?
8. Are additional efforts, organizational structures, coordination, collaboration, and/or research needed to address coastal resilience? If so,
    a. What would be the purpose?
    b. How would you structure it?
    c. Who would be involved?
    d. What resources would be needed?

WRAP UP

WASHINGTON STATE UNIVERSITY

THE WILLIAM D. RUCKELSHAUS CENTER

UNIVERSITY OF WASHINGTON

Washington Coastal Resilience Assessment Group Interview
Grays Harbor College, Schermer Building Room 4331
1620 Edward P. Smith Drive, Aberdeen, WA 98520
January 26, 2017 2:00 – 5:00pm

Washington Coastal Resilience Assessment Project Background

Coastal entities in Grays Harbor County, in partnership with the office of US Rep. Derek Kilmer and the Washington State Department of Ecology (Ecology), are exploring long-term resilience opportunities in response to growing concerns about erosion, flooding, and landslides; the number and severity of storms; predictions about rising sea levels; and the chance of a large earthquake triggering a tsunami. Since January of 2016, Ecology has been partnering with the Office of US Representative Derek Kilmer, cities of Ocean Shores and Westport, the Quinault Indian Nation, Grays Harbor County Emergency Management, the Port of Grays Harbor, and other state and federal agency partners to create the Grays Harbor Resilience Coalition (Coalition).

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AGENDA

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WELCOME & INTRODUCTIONS

RESILIENCE DEFINITION

1. How do <u>you</u> define resilience to existing and future natural hazards (flooding, erosion, landslides, earthquake and tsunamis, and the influence of rising sea levels)?
    a. What are the key conditions for resilience?

VISION, RESOURCES, & EFFORTS

2. Would you say the coast is resilient? In what ways and what locations and communities? In what ways is it not and what locations and communities?
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5. What efforts are you aware of or have you participated in to address community and coastal resilience? How are these efforts connected?
6. What other efforts currently exist where resilience would be a topic that might align?

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7. Does your community/region need support to be more resilient? What kind of support? Who could best provide it?
8. Are additional efforts, organizational structures, coordination, collaboration, and/or research needed to address coastal resilience? If so,
    a. What would be the purpose?
    b. How would you structure it?
    c. Who would be involved?
    d. What resources would be needed?

WRAP UP

WASHINGTON STATE UNIVERSITY

THE WILLIAM D. RUCKELSHAUS CENTER

UNIVERSITY OF WASHINGTON

Washington Coastal Resilience Assessment Group Interview
Shoalwater Bay

Assessment Project Background

Coastal entities in Grays Harbor County, in partnership with the office of US Rep. Derek Kilmer and the Washington State Department of Ecology (Ecology), are exploring long-term resilience opportunities in response to growing concerns about erosion, flooding, and landslides; the number and severity of storms; predictions about rising sea levels; and the chance of a large earthquake triggering a tsunami. Since January of 2016, Ecology has been partnering with the Office of US Representative Derek Kilmer, cities of Ocean Shores and Westport, the Quinault Indian Nation, Grays Harbor County Emergency Management, the Port of Grays Harbor, and other state and federal agency partners to create the Grays Harbor Resilience Coalition (Coalition).

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As an individual or representative of an organization with a particular role or interest in, or knowledge of coastal resilience, you have been identified as a candidate for a group interview. We hope you will agree to participate, or assist by identifying the most appropriate person(s) to speak with us.

Group interviews take approximately 3 hours. A pre-interview survey will be provided to be completed in advance of the interview. The survey will take approximately 15 minutes to fill out. Other than the group interview and survey, no additional time is required to participate in the assessment. Participation in both the group interview and the survey is voluntary. Interviewees can choose at any time during the interview and the survey to decline to answer a question or end the interview and survey. Interviewees will be contacted prior to the group interview via email and asked to confirm that they are willing to participate. These questions have been reviewed by Washington State University's Office of Research Assurances, which has found that the

assessment is exempt from the need for Human Subjects Internal Review Board (IRB) review.

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RESILIENCE DEFINITION

1. How do you define resilience to existing and future natural hazards (flooding, erosion, landslides, earthquake and tsunamis, and the influence of rising sea levels)?
    a. What are the key conditions for resilience?

VISION, RESOURCES, & EFFORTS

2. Would you say the coast is resilient? In what ways and what locations and communities? In what ways is it not and what locations and communities?
3. Imagine it is sometime in the future (10 years onward) and coastal resilience efforts in your community/region have been successful. How would you know? What would you see (or not see) happening?
4. What are the existing resources or assets that will help achieve this level of success?
5. What efforts are you aware of or have you participated in to address community and coastal resilience? How are these efforts connected?
6. What other efforts currently exist where resilience would be a topic that might align?

FUTURE EFFORTS

7. Does your community/region need support to be more resilient? What kind of support? Who could best provide it?
8. Are additional efforts, organizational structures, coordination, collaboration, and/or research needed to address coastal resilience? If so,
    a. What would be the purpose?
    b. How would you structure it?
    c. Who would be involved?
    d. What resources would be needed?

Appendix E.

Clallam County Emergency Management Community Preparedness

Included with permission, 4/24/17

FEMA Award

Community Preparedness Champions

Problem Statement -
Clallam County Washington is the northwestern most county in the lower 48 states. It is part of Washington State's Homeland Security Region 2. Its habitable zone is a strip of land located on the Olympic Peninsula bounded on the west by the Pacific Ocean, on the north by the Strait of Juan de Fuca, and by the Olympic Mountains on the south. Precipitation falling on the county drains north and west from the mountains across the habitable area via numerous deeply incised valleys. It is the home of approximately 75,000 people. The Cascadia Subduction Zone lies 130 miles off the west coast.

FEMA's HITRAC studies predict that a Cascadia Subduction Zone Earthquake (CSZE) will devastate Clallam County and the entire Pacific Coast from San Francisco to the north end of Vancouver Island, BC. It is predicted to produce a magnitude 9.2 mega-quake sometime in the next 100 years. Ground shaking is expected to last more than 5 minutes causing a tsunami approximately 40 to 60 feet high. It will flood the county's Pacific coast and coastal valleys 15 minutes after the quake. It will also flood the Strait of Juan de Fuca's shores and coastal valleys with frightening results as it overwhelms water front areas. One emergency management expert likened this earthquake impact to Hurricane Katrina times 10, -- all at once. This study and the impending Cascadia Rising Exercise focused Clallam County's attention on the need to prepare for a Cascadia Subduction Zone Earthquake (CSZE).

Clallam County has an area of 2,671 square miles (932 square miles are ocean or Strait). Highway 101 is the only land supply route to/from the county. Most of the population (75%) is located on both sides of the eastern 30 miles of Highway 101. The rest of the population is spread out along the remaining 65 miles of HWY 101 and the 60 miles of HWY 112. These two highways are the only transportation routes that traverse the county. HITRAC predicts 80% of these roadways and all of the bridges will be destroyed by the quake, liquefaction, landslides and the ensuing tsunami. Numerous communities will be isolated. With no intact highways, residents will be unable to travel more than a few miles. Self-evacuation will be impossible. It is estimated that the North Olympic Peninsula (Jefferson and Clallam Counties) receives 600 trailer truck loads of supplies each day via the Hood Canal Floating Bridge. Expected damage to the floating bridge will cut that supply line for months. So, all relief supplies will have to arrive by air or sea. Experts estimate that under the best circumstances it will take at least one month to restore a sustainable distribution system to supply essentials to our residents.

In light of this dire scenario, the Clallam County Emergency Management Department called on a group of expert volunteers to assess the CSZE impact on the community. The volunteers developed detailed assessments called “Ground Truths” of all aspects of the county’s infrastructure. The “Ground Truths” were compiled and cross referenced with Washington’s Department of Natural Resources ground shaking, liquefaction, landslide and tsunami hazard maps and Department of Transportation and county bridge maps. The resulting damage assessment confirmed HITRACs dire scenario. Multiple failures of critical infrastructure will divide the county into at least 20 isolated communities. Besides roads and bridges; county EOCs, fire stations, police stations, schools, airport buildings, hospitals, senior citizen/DD living facilities, cell and radio towers, water, sewage, electrical and fuel facilities will be destroyed or damaged. Mutual aid will be impossible within or between counties. Communication among the fragmented communities will only be possible via ARES/RACES for several days or weeks. Emergency services will be unable to respond as they normally would. County expert volunteers, in conjunction with the Washington National Guard labeled these isolated communities as “micro-islands.” This fractured micro-island environment is reflected in Chart 1.

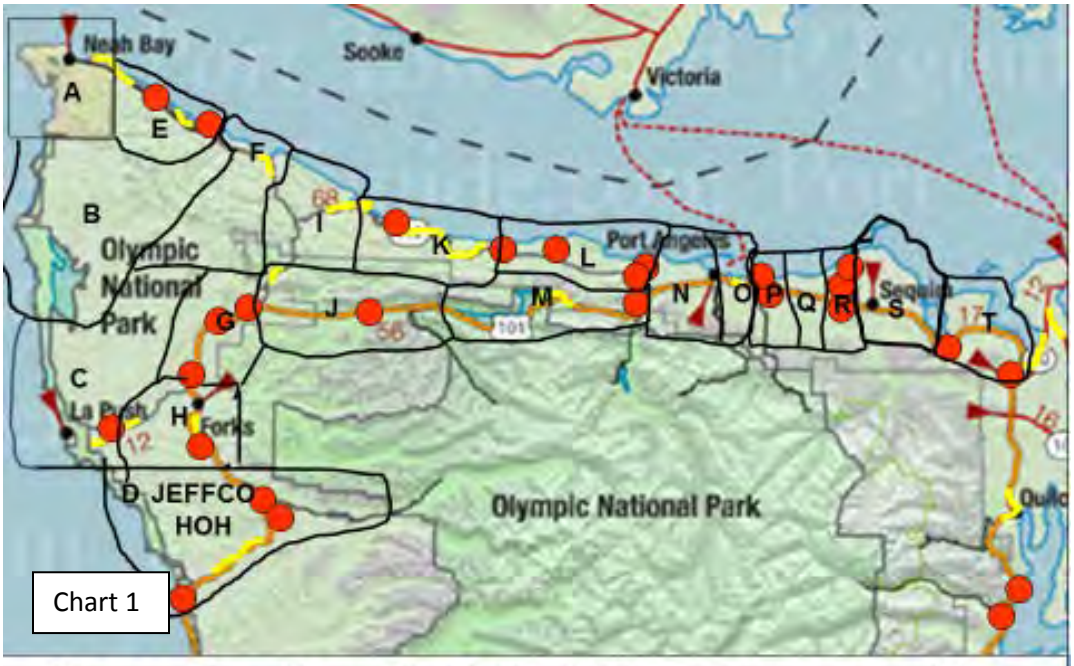


Chart 1 (Red Dots indicate major bridges lost or landslides closing road system)

How can Clallam County embrace FEMA’s problem solving model which assumes a social continuity, coordination and cooperation approach for centralized county level

EOC control to simultaneously manage 20 different disaster areas using only ARES/RACES communications, AND/OR little or no ability to access micro-islands for a period of 30 days?

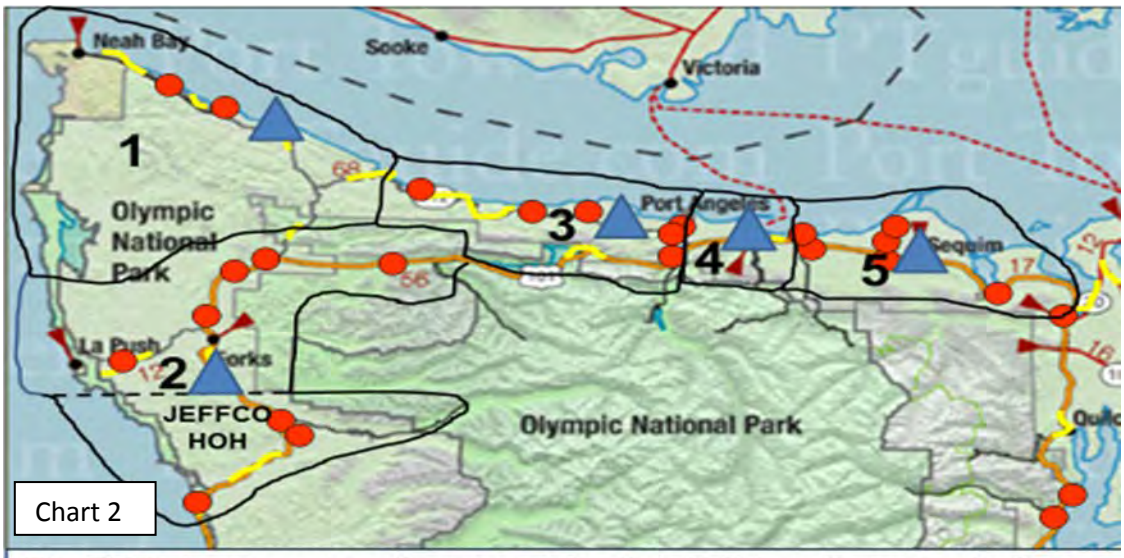
Resolution – Clallam County has embraced a de-centralized pre-planned approach adapted to meet our seismic emergency and also readily applicable to an “all hazard” emergency such as a wildfire or oil spill. Clallam County’s “area command” plan developed to plan and manage the CSZE disaster has now shifted focus to a de-centralized emergency management approach.

Project/Program Description –

Clallam County’s plan focuses on a distributed emergency management approach. In order to implement the plan, county volunteers scouted all 20 micro-islands and prepared very detailed damage assessment maps of each. These maps were presented to residents, agencies, and city governments so they could create a tailored micro-island plan for their community. Residents used their knowledge of local conditions, personnel, equipment and limited resources they expect to have on hand at the time of the emergency to plan their response. County emergency management coordinated these local plans with neighboring micro-islands to avoid duplication of effort and identify critical infrastructure that residents could help repair.

The Washington National Guard spent 4 days touring the micro-islands in December 2015. Local residents showed them at risk highways, bridges, neighborhoods and infrastructure. These included an 800 man maximum security prison that will be cutoff for weeks as well as an intact WWII B-29 airfield with a 2 foot thick concrete runway they were unaware of. The county also showed facilities that could be used for LZs, responder base camps, shelters and CPODs. The Guard incorporated lessons learned on the visit into their plans for Cascadia Rising and the Washington FEMA Region 2 earthquake response plan. Clallam County included information gathered during the tour in its all hazards annex to the CEMP.

Span of control limitations make it necessary to group the micro-islands into five Area Commands (See Chart 2). In accordance with NIMS/ICS, each Clallam County micro-island is designated as an ICS division with an alpha-numeric label (A-Alpha, B-Bravo, etc.) and a recognizable regional name (Neah Bay, Forks, etc).



The EMD plan organizes the micro-islands into 5 Area Commands. Area Command Centers in Clallam Bay, Forks, Joyce, Port Angeles and Sequim manage rescue and response and report to the county EOC.

In the event of a CSZE, designated local emergency management leaders are pre-approved by a formal ‘‘delegation of authority” (required by NIMS) to take charge of the disaster at each Area Command. The delegation of authority authorizes the designees to implement and manage the micro-island plans in their Area Command. The designees understand that micro-island plans incorporate information from the county that will require them to accomplish some objectives needed to support the total county response plan, i.e. opening roads between the airport and Olympic Medical Center.

The plans are to be implemented at the micro-island level even if communications with the EOC is impossible. This effort is intended to shorten the initial “chaos” period after the CSZE. Following NIMS/ICS, each micro-island will report to its appropriate Area Command Center. The Area Command will oversee rescue and response within their delegation of authority for their assigned micro-islands. Each Area Command will report to the EOC so the EOC maintains situational awareness, prioritizes resources and prepares to integrate state and federal resources as they arrive.

The work required to carry out this plan will require trained personnel. Emergency Management is in the process of mobilizing and training 1,500 volunteers in the areas of CERT, shelter teams, ARES/RACES and CPOD teams. To ensure continuity several agencies have been assigned to mentors each program through the FEMA training process (ARES/RACES- Sheriff’s Department, CERT – Fire Districts, Shelter Teams including faith based groups – American Red Cross, CPOD – City or County Government).

Result/Impacts – The project began in the summer of 2015 and is expected to be fully implemented in all areas of the county by the summer of 2017, the work done so far is significantly transforming how the county and its citizens view preparedness. Awareness of a Cascadia event is reaching 40-50% level in the community (vs. 10-15% in 2012) and is projected to reach above 80% by the time full implementation in 2017. Below are some of the key events and changes that have resulted from the work done so far:

1. The micro-island damage projections for the impact of a seismic event has greatly increased individual public awareness.
2. Interest in emergency preparedness by non-government organizations has also increased dramatically as citizens now relate to how the quake will impact their neighborhoods.
3. Based on the "Ground Truths" work, the Washington National Guard scheduled *its first 4 day tour of any county* to view the conditions they would encounter during their response in *Clallam County*. The National Guard has stated in their report that Clallam County has taken the most progressive approach of any Washington county in its planning for a CSZE event.
4. Cascadia Rising 2016 will see Clallam County conduct "live" exercises of the plan with on-the-ground National Guard and DOD resources in addition to tabletop and notional responses to injects.
5. Government entities in the county are making plans to move facilities and equipment to safer locations and out of tsunami zones.
6. Volunteer boating organizations are starting to organize boat rescue off the beach rather than waiting for naval or coast guard helicopters to arrive.
7. Area Commands are stockpiling supplies, developing shelter plans, and identifying local resources and skills.
8. Area Commands are arranging to move people and supplies across water obstacles instead of waiting for helicopters or bridges to be re-built by using local construction and transportation equipment in their areas to clear roads, build water crossings and haul supplies.
9. Micro-island information is being vetted and recorded in the Area Command plans which are being incorporated in to the Clallam County Comprehensive Emergency Response Plan.

Appendix F.
List of Existing Efforts Identified During the Assessment

Title	Website
Cascadia Region Earthquake Workgroup (CREW)	http://www.crew.org
Cascadia Rising	https://www.fema.gov/cascadia-rising-2016
Chehalis Basin Strategy	http://chehalisbasinstrategy.com/
Clallam Conservation District	http://clallamcd.org/about-the-district/
Clallam County	http://www.clallam.net/
Clallam County Amateur Radio Emergency Services (CCARES)	http://www.olyham.net
Clallam County Emergency Management	http://www.clallam.net/EmergencyManagement/
Climate Change Preparedness Plan for the North Olympic Peninsula	http://www.noprcd.org/about2
Climate Change Vulnerability Assessment for the Treaty of Olympia Tribes	https://quileutenation.org/natural-resources/climate-change/
Climate Plan for the Quileute Tribe	https://quileutenation.org/natural-resources/climate-change/
Coastal Ecosystem Resiliency Grants Program	http://www.habitat.noaa.gov/funding/coastalresiliencyprojects.html
Coastal Hazard Planning: The Role of Governance in Community Resilience	https://wsg.washington.edu/research/coastal-hazard-planning-the-role-of-governance-in-community-resilience/
Coastal Resiliency Coalition of Grays Harbor County (CRCGH)	
Coastal Storm Modeling System	https://walrus.wr.usgs.gov/coastal_processes/cosmos/
Columbia River Crab Fisherman's Association	
CONNECT Grays Harbor project	http://www.ghcog.org/planning.html
Cowlitz-Wahkiakum Council of Governments	http://www.cwcog.org/administration.htm
Department of Ecology	http://www.ecy.wa.gov/
EcoAdapt	http://www.ecoadapt.org/about
Family Forest Fish Passage Program	http://www.dnr.wa.gov/fffpp
Federal Emergency Management Agency	https://www.fema.gov/
FEMA Region X Mitigation Planning Team	https://www.fema.gov/region-x-about-us
FEMA RiskMAP	http://www.ecy.wa.gov/programs/sea/floods/riskmap_fema_projects.html
Flood Plains by Design	http://www.floodplainsbydesign.org/
Forestry Stewardship Program	https://www.fs.fed.us/cooperativeforestry/programs/loa/fsp.shtml
GHCOG Public Funding Notification Alert	http://www.ghcog.org/index.html
Grays Harbor Conservation District	https://graysharborcd.wordpress.com/
Grays Harbor Council of Governments	http://www.ghcog.org/index.html
Grays Harbor County Coastal Futures Project	http://explorer.bee.oregonstate.edu/Topic/GraysHarbor/ProjectOverview.aspx
Grays Harbor County Emergency Management	http://www.co.grays-harbor.wa.us/info/dem/Index.asp
Grays Harbor County Flood and Erosion Observation Recording Form	http://explorer.bee.oregonstate.edu/Topic/GraysHarbor/FloodMap.aspx
Grays Harbor County Shoreline Management Program	http://ghcsmp.org/index.html
Grays Harbor Marine Resource Committee	http://www.co.grays-harbor.wa.us/info/pub_svcs/mrc/index.html
Greater Grays Harbor, Inc. Business Retention and Expansion (BRE) program	http://www.graysharbor.org/newsroom/business-retention-and-expansion-program.php
Hoh River Trust	http://www.hohrivertrust.org/about
Hoh Tribe	http://hohtribe-nsn.org/

Incorporated Research Institutions for Seismology	https://www.iris.edu/hq/about_iris#vision
Institute for Hazards Mitigation Planning and Research	http://mitigate.be.uw.edu/
Intergovernmental Policy Council	http://sanctuaries.noaa.gov/news/features/0107_octribes.html
Japan Tsunami Marine Debris Joint Information Center	https://disasterdebris.wordpress.com/
Jefferson County Conservation District	http://www.jeffersoncd.org/
Jefferson County Emergency Management	http://www.jeffcoeoc.org/
Knowledge-to-Action Network	http://explorer.bee.oregonstate.edu/Topic/GraysHarbor/ProjectOverview.aspx
Lower Columbia Solutions Group	https://lowercolumbiasolutions.org
M9 Project	https://hazards.uw.edu/geology/m9/
Makah Hazard Mitigation Plan	
Makah Tribe	http://makah.com/
Move to Higher Ground	http://quileutenation.org/tsunami-legislation/
National Tsunami Hazard Mitigation Program	http://nws.weather.gov/nthmp/
National Tsunami Warning Center	http://www.tsunami.gov/
NIST Community Resilience Planning Guide	https://www.nist.gov/topics/community-resilience/community-resilience-planning-guide
NOAA	http://www.noaa.gov/
NOAA Center for Tsunami Research	http://nctr.pmel.noaa.gov/index.html
NOAA Pacific Tsunami Warning Center	http://www.tsunami.gov/
North Olympic Peninsula Development Council	http://www.noprcd.org/
North Olympic Salmon Coalition (NOSC)	http://nosc.org/
North Pacific Marine Resource Committee	http://wdfw.wa.gov/about/volunteer/mrc/county_northpacific.html
Northwest Indian Fisheries Commission	http://nwifc.org/
Office for Coastal Management	https://coast.noaa.gov/about/
Olympic Coast National Marine Sanctuary	http://olympiccoast.noaa.gov/welcome.html
Olympic Coast National Marine Sanctuary Advisory Committee	http://olympiccoast.noaa.gov/involved/sac/sac_welcome.html
Oregon State University	http://oregonstate.edu/
Pacific Coast Salmon Coalition	
Pacific Conservation District	https://pacificcd.wordpress.com/
Pacific County Economic Development Council	http://pacificedc.org/
Pacific County Emergency Management	http://www.co.pacific.wa.us/pcema/
Pacific County Marine Resource Committee	http://pacificcountymrc.com/
Pacific Marine and Estuarine Fish Habitat Partnership (PMEP)	http://www.pacificfishhabitat.org
Pacific Northwest Climate Impacts Research Consortium (CIRC)	http://pnwcirc.org/circ
Pacific Northwest Seismic Network	https://www.pnsn.org/
Peninsula College	http://pencol.edu/
Peninsula Regional Transportation Planning Organization	https://www.wsdot.wa.gov/partners/prtpo/
Port of Grays Harbor	http://www.portofgraysharbor.com/about/index.php
Port of Ilwaco	http://www.portofilwaco.com/
Predicted Effects of Cascadia Earthquake in Clallam County	http://paba.org/wp-content/uploads/2016/09/Jim-Buck-Cascadia-earthquake.pdf
Project Safe Haven	https://catalyst.uw.edu/workspace/wiserjc/19587/116498
Project Safe Haven Clallam County	https://catalyst.uw.edu/workspace/wiserjc/19587/116498

Project Safe Haven Grays Harbor County	https://catalyst.uw.edu/workspace/wiserjc/19587/116498
Project Safe Haven Makah Tribe	http://mil.wa.gov/uploads/pdf/emergency-management/haz_safehavenreport_makahquileute.pdf
Project Safe Haven Pacific County	https://catalyst.uw.edu/workspace/wiserjc/19587/116498
Project Safe Haven Quileute Tribe	http://mil.wa.gov/uploads/pdf/emergency-management/haz_safehavenreport_makahquileute.pdf
Quileute Tribe	http://www.quileutenation.org/government/tribal-council
Quileute Tribe Hazard Mitigation Plan	https://quileutenation.org/natural-resources/climate-change/
Quinault Indian Nation	http://www.quinaultindiannation.com/
Regional Integrated Sciences and Assessments Program	http://cpo.noaa.gov/ClimateDivisions/ClimateandSocietalInteractions/RISAProgram/AboutRISA.aspx
Resilience Institute, Huxley College of the Environment	https://huxley.wwu.edu/ri/resilience-institute
Resilient Communities Program, NFWF	http://www.nfwf.org/resilientcommunities/Pages/home.aspx
Resilient Washington Subcabinet	http://mil.wa.gov/emergency-management-division/resilient-washington-subcabinet
Shoalwater Bay Tribe	http://www.shoalwaterbay-nsn.gov/home/about-the-tribe/
Shorelands and Environmental Assistance Program (Ecology)	http://www.ecy.wa.gov/programs/sea/shorelines/index.html
Shoreline Master Program	http://www.ecy.wa.gov/programs/sea/shorelines/smp/
Southwest Washington Coastal Erosion Study	http://www.ecy.wa.gov/programs/sea/swces/index.htm
Southwest Washington Erosion Coastal Study	http://www.ecy.wa.gov/programs/sea/swces/
Southwest Washington Regional Transportation Planning Organization (SWRTPO)	http://www.rtc.wa.gov/
State Ocean Caucus	http://www.ecy.wa.gov/programs/sea/ocean/oceangroup.html
Surfrider Foundation - WA	https://washington.surfrider.org/
Surfrider Leadership Academy	https://washington.surfrider.org/surfrider-leadership-academy-washington-coast/
Taholah Village Relocation Master Plan	http://www.quinaultindiannation.com/planning/projectinfo.html
The Cranberry Growers Association	
The Great Washington Shakeout	http://www.shakeout.org/washington/partners/
The Nature Conservancy	http://www.nature.org/
UNAVCO	https://www.unavco.org/
University of Oregon	http://uoregon.edu/
University of Washington	https://www.washington.edu/
US Army Corp of Engineers	http://www.usace.army.mil/
US Climate Resilience Toolkit	https://toolkit.climate.gov/
USGS Earthquake Hazards Program	https://earthquake.usgs.gov
UW Climate Impacts Group	https://cig.uw.edu/
UW Olympic Natural Resources Center	http://www.onrc.washington.edu/
Voluntary Stewardship Program	http://scc.wa.gov/vsp/
Wahkiakum Conservation District	https://cowlitzcd.wordpress.com/
Wahkiakum County Emergency Management	http://www.co.wahkiakum.wa.us/dem.html
Wahkiakum Marine Resource Committee	http://wdfw.wa.gov/about/volunteer/mrc/county_wahkiakum.html

Wasgington Marine Spacial Planning	http://www.msp.wa.gov/
Washington Coast Restoration Initiative	http://www.washingtonnature.org/marine/coastalrestoration/main/
Washington Coast Sustainable Salmon Partnership	http://www.wcssp.org
Washington Coastal Hazards Resilience Network	http://www.wacoastalnetwork.com/
Washington Coastal Marine Advisory Council	http://www.ecy.wa.gov/programs/sea/ocean/advisorycouncil.html
Washington Department of Commerce	http://www.commerce.wa.gov/
Washington Department of Fish and Wildlife	http://wdfw.wa.gov/about/
Washington DNR Geologic Hazards Group	http://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards-and-environment
Washington Interactive Tsunami Evacuation Mapping	http://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/tsunamis/evacuation
Washington Sea Grant	https://wsg.washington.edu/
Washington State Conservation Commission	http://scc.wa.gov/about-the-commission/
Washington State Conservation Commission	http://scc.wa.gov/
Washington State Department of Commerce	http://www.commerce.wa.gov/
Washington State Department of Health	http://www.doh.wa.gov/
Washington State Department of Natural Resources	http://www.dnr.wa.gov/
Washington State Department of Transportation	http://www.wsdot.wa.gov/
Washington State Emergency Management Division	http://mil.wa.gov/emergency-management-division
Washington State Farm Bureau	http://wsfb.com/what-is-farm-bureau-2/
Washington State Military Department	http://mil.wa.gov/washington-state-military-department
Washington State Parks and Recreation Commission	http://parks.state.wa.us/281/Parks
Washington State Tsunami Program	http://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/tsunamis
Washington State University Extension	http://extension.wsu.edu/
Washington State-Local Tsunami Workgroup	http://mil.wa.gov/emergency-management-division
Western Washington University	https://www.wwu.edu/about/
Willapa Harbor Chamber of Commerce	http://willapaharbor.org/
Willapa-Grays Harbor Oyster Growers Association	

Appendix G.
Regenerative Planning and Development

Regenerative Community Development

A systemic approach grounded in a deep understanding of "Place"

Regenerative design and development is a whole systems approach grounded in an understanding of 'Place' as a living system. It applies powerful frameworks and processes, built on ecological principles, to addresses complex socio-ecological urban challenges and economic development at scale. Developmental in essence, regenerative work aims at evolving the capacity and capabilities of all the stakeholders involved while creating relationships that leverage existing assets and generate value in the long-term. The approach taps the native genius and creativity of people by helping them reconnect to the uniqueness of place. The purpose is to unleash the potential inherent in a place and develop mutually-beneficial relationships that aim at raising the value produced while increasing the human, social, environmental, financial and produced capitals. This approach augments and integrates the efforts of planners, governing bodies, community organizers, business alliances, neighborhood activists, educators, and other stakeholders in the long-term health of a community.

The regenerative approach to community development begins with an uncovering of the 'Story of Place'— a transformative change process that aims at developing a deep understanding of a community/neighborhood from a socio-ecological perspective. The outcome for the community is a deep sense of connection to the Place and greater understanding and alignment to the potential of design and development work and its contribution to the health and sustainability of the neighborhood. The Story of Place reveals opportunities for projects and initiatives that can stimulate the regeneration of the Place.

Regeneration versus Sustainability

While sustainability focuses on maintaining a steady state, or at the very least doing less damage to the environment, regeneration focuses on learning, innovation, and developing the means to continually increase the vitality, viability and evolution of a place by creating beneficial interrelationships that improve the resilience and ability of a community to adapt and survive in dynamic and challenging conditions.

Regenerative Principles

"Only living systems regenerate."

The essence of regenerative work is to re-awaken the spirit and soul of 'Place' within a community, in a way that brings greater meaning to any endeavor, so that the community is able to fulfill its unique vocation over time.

Socio-Ecological Unity — All living entities in natural and human systems work as an integrated, conscious and evolving living system: the whole of life.

Place-Sourced Potential — A place is considered a living system having a unique essence and identity as well as aspirations. Regenerative work is grounded in a rich patterned understanding of place and in a vision of the value-adding role a place plays within its larger environment. All solutions should be tailored to the specific potential and needs of a neighborhood community.

Regenerative Capabilities — Regenerative development aims at creating self-reliant and self-sustaining communities that build mutually beneficial partnerships to keep innovating and evolving.

Value-Adding Processes — A community realizes its potential and fulfills its vocation when its activities are grounded into the identity of place and deliver on-going value to the whole system within which the community is embedded, thereby contributing to the development of a rich and healthy local economy.

Multiple Capitals — For each dollar invested, the regenerative design and development approach considers how to deliver value across five capitals: human, social, ecological, financial, and manufactured/produced.

The Regenerative Approach

- Engages the community and stakeholders in a participative and co-creative process of discovery and decision-making that promotes developmental learning.
- Builds on the unique and distinctive understanding of a Place and its potential and does not develop "one size fits all" solutions to problems.
- Develops place-based solutions to problems.
- Is holistic and systematically integrated.
- Is transformative and aims at facilitating the development of new behaviors that support systemic and long lasting change.

The Benefits of the Approach

Beyond increasing the vitality, viability and evolutionary capability of a place, the regenerative approach:

- Helps a community develop a shared identity grounded in the 'spirit' of a place.
- Increases community members' engagement, ownership and stewardship.
- Uncovers points of leverage where interventions' impact is maximized.
- Facilitates the development of integrated solutions and entrepreneurial ideas.
- Delivers a coherent place-based story, frameworks, principles and guidelines to guide the direction of projects and support fundraising.
- Assists in the identification of place-based metrics and indicators of well-being.
- Supports individual and institutional capacity development.

The regenerative approach was created by the Regenesis Group in Santa Fe, NM. To learn more visit: www.regenesisgroup.com

Soma Integral Consulting collaborates with Regenesis to deliver regenerative services to communities in the world.

For more information, contact Beatrice Benne: beatrice@soma-integral.com or call 503.866.0928

soma integral consulting

Appendix H.
Resilience Resources

1. Resilience Thinking: Sustaining Ecosystems and People in a Changing World, Walker, Brian and Salt, Island Press, Washington, DC, 2009.

2. Community Resilience and Environmental Transitions, Geoff A. Wilson, Taylor and Francis, 2013.

3. "Bounce Forward: Urban Resilience in the Era of Climate Change", Island Press and the Kresge Foundation.

4. "Exploring Community Resilience in Times of Rapid Change", CarnegieUK Trust and Fiery Spirits Community of Practice, 2011.

5. "Strengthening Neighbourhood Resilience: Opportunities for Communities and Local Government", Community Social Planning Council of Greater Victoria, Transition Victoria, Fraser Basin Council's Smart Planning for Communities Program, and Canadian Centre for Community Renewal.

6. The Rockefeller Foundation, www.100resilientcities.org

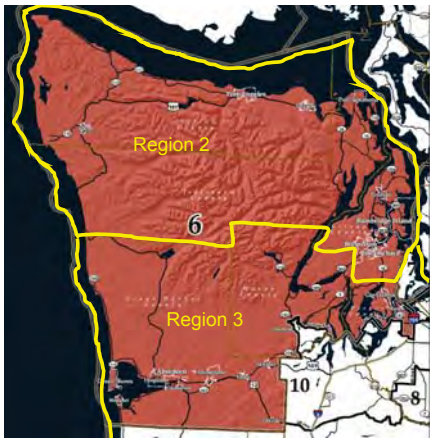
Appendix I.

Additional Considerations and Information Provided By Interview Participants

Impacts of Cascadia Subduction Zone Event on the 6th Congressional District

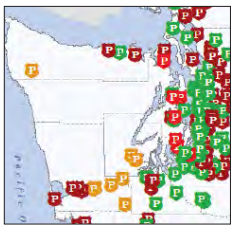
Provided by Jim Buck

Included with permission, 4/24/17



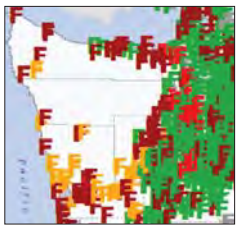
Matter of Time

LAW ENFORCEMENT AND FIRE SERVICES



48% of police facilities will be unusable.

5% will be capable of 50% capacity.



Significantly reduced fire fighting capability west of Shelton.

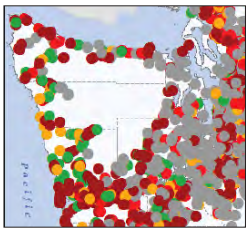
Damage to highways, bridges, and communications renders mutual aid agreements impractical.

no damage *completely destroyed*

HIGHWAYS AND BRIDGES

There will be no surviving ground routes to the county.

80 % of the roads will suffer pavement failures over 3"

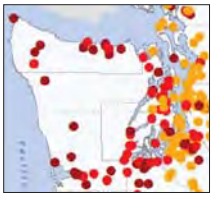


100% of coastal area bridges will be out of service for days.

50% of coastal bridges will be destroyed or unusable.

no damage *completely destroyed*

COMMUNICATIONS



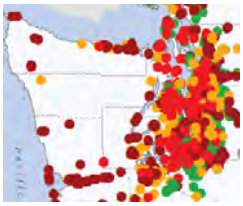
After the CSZE, the county will experience phone, cell phone, internet, radio and TV outages lasting for months.

It may take days or weeks to restore 33% of coastal communications facilities.

67% may need to be replaced.

no damage *completely destroyed*

SCHOOLS



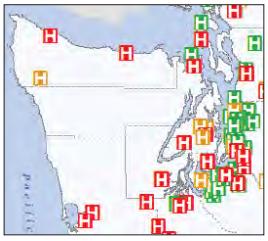
Nearly 100% of schools west of I-5 corridor will suffer complete or severe damage and will be unusable.

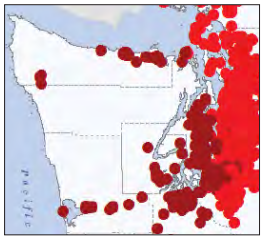
Students in class at the time of the event will be at risk.

NOTE: All of these schools are part of the National Sheltering System. Their loss indicates a corresponding reduction in sheltering capacity.

no damage *completely destroyed*

HOSPITALS & NURSING HOMES



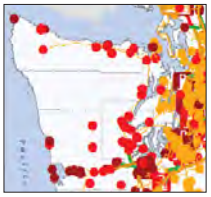


93% of hospital capacity west of I-5 will require full or partial evacuation.

No senior/DD living facility capacity remains west of the I-5 corridor.

no damage *completely destroyed*

UTILITIES



ELECTRICAL GRID

100% will be severely damaged or destroyed.

It may take up to 1 year to restore service to 90 % of the current demand.

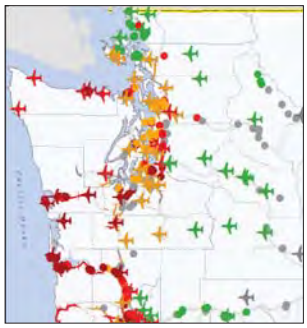
WATER AND SANITARY SEWER

100% of water systems will be severely damaged or destroyed. 67% of water may be restored as power is repaired. 33% must be rebuilt.

44% of sewer systemsmay be restored as power is repaired. 56% must be rebuilt.

no damage *completely destroyed*

AIR TRANSPORTATION



Most airport structures* west of the I-5 corridor suffer complete to severe damage.

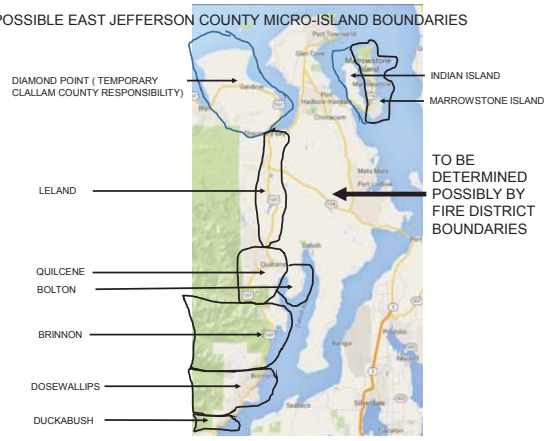
Most airport structures* along the I-5 corridor suffer severe to moderate damage.

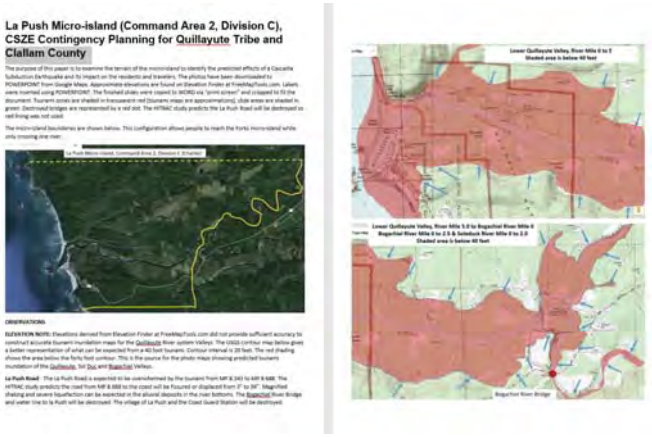
*high probability runways intact

no damage *completely destroyed*

Clallam Communities become micro-islands (Divisions).

POSSIBLE EAST JEFFERSON COUNTY MICRO-ISLAND BOUNDARIES





Given the loss of roads/bridges, an air-bridge is the fastest way to bring help

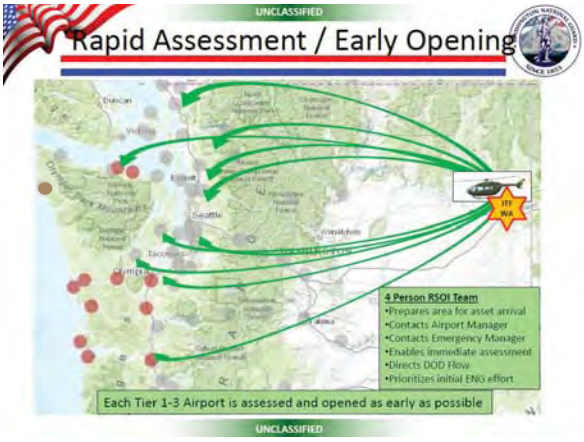
The Tiered Air Base Concept

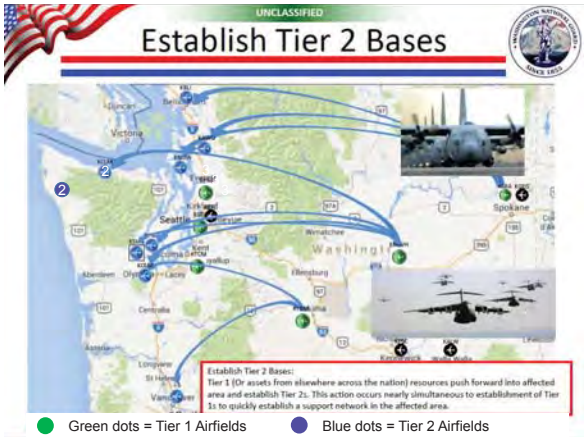
Tier 1 Airbase – 747/C-5A capable with ground support and logistics facilities (SEATAC)

Tier 2 Airbase – C17/C130 capable with ground support and logistics facilities (Fairchild and Quillayute NAS)

Tier 3 Airbase – Small plane and helicopter capable (Sekiu, Sequim, Forks, Port Townsend and Diamond Point)

Tier 4 – Helicopter capable (a helicopter landing zone)





Survivable Airfields – Fairchild (Port Angeles), Sekiu, Diamond Point, Port Townsend, and Quillayute NAS are above the tsunami zone and on good soil that might limit damage to the runways. They might be immediately available after the Cascadia event.while the others require repairs:

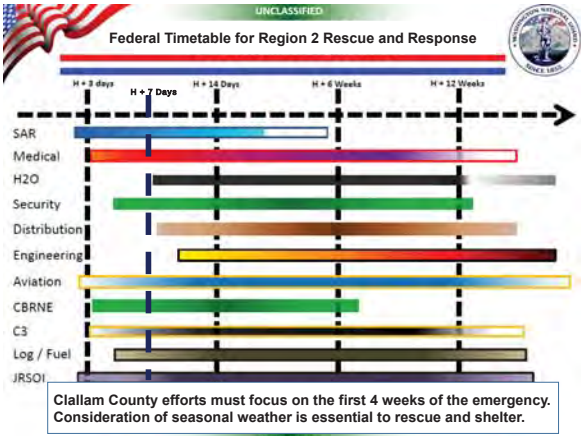
Doubtful Airfields

SEATAC – Compaction failure - loss of 3rd runway and ½ 2nd runway, terminal and handling facilities severely damaged
Paine/Everett – Severe runway damage - Liquefaction - no handling facilities
Boeing Field – Runway destroyed - Liquefaction
Bellingham – Runway destroyed - Liquefaction
Arlington – Runway destroyed - Liquefaction
Whidbey NAS – Severe runway damage – Liquefaction, tsunami
USCG Port Angeles –Runway destroyed – Liquefaction, tsunami
McCord – loss of 1/3 runway to Clover Creek fill failure
Fort Lewis – Limited OK
Olympia – Limited OK
Shelton – Limited OK
Toledo – Runway destroyed, liquefaction
Bowerman, Hoquiam – Runway destroyed, tsunami
Ocean shores – Runway destroyed, tsunami
Satsop – Runway destroyed, liquefaction, tsunami
Portland International – Runway destroyed – Liquefaction/high water

Fairchild/Quillayute runways operational for up to C-17s

FAA /DOD/ FEMA funds to improve possibly the only survivable runways in western WA
Why Fairchild ? – Strategic Military Importance plus Civilian supply base
Possibly home of only air cover to protect the Strait of Juan de Fuca
4 Nuclear aircraft carrier groups at Bremerton and Everett
NW Air Defense Identification Zone (ADIZ) radar station at Neah Bay
13 Nuclear Subs at Bangor and Bremerton
Naval Weapons Depot at Indian Island
Torpedo facility at Keyport
Strategic fuel facility at Keyport
Growler and Anti-sub Squadrons at Whidbey Island NAS
Army assets at Fort Lewis
Air Force assets at McCord
Prepositioned ships at Tacoma
Bremerton Navy Base

Why Quillayute? – in addition to the above,
Close proximity to Washington Coast and Olympic Peninsula communities for immediate rescue/response actions
Decongests Puget Sound Air Traffic by sending coastal missions to more effective airfields.



Clallam County efforts must focus on the first 4 weeks of the emergency. Consideration of seasonal weather is essential to rescue and shelter.

EMD Plan for William F. Fairchild Tiered Airbase

The airfield is on good ground above the tsunami zone. It's proximity to government facilities and businesses along with ample fenced areas make it the logical choice for the county logistics base.

Federal Assets

Assist in prepositioning low cost/free surplus military equipment down to fire district level.

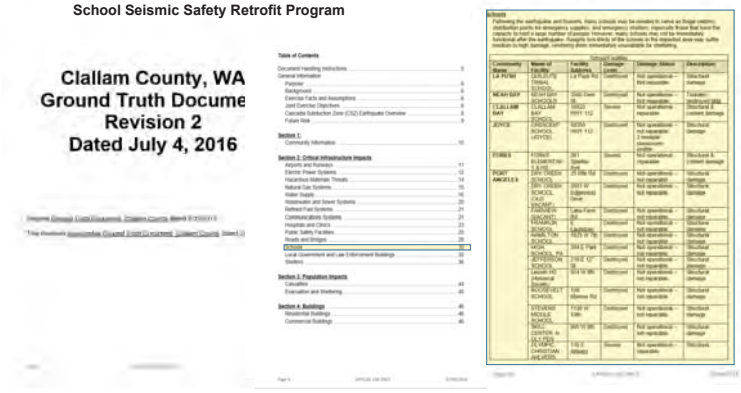
Items include but are not limited to;

Field kitchens, cots, sleep systems, tents, generators, field hospitals, vehicles, constructions supplies.

Assist in funding maintenance of surplus military equipment down to fire district level.

Assist in prepositioning National Pharmaceutical stockpiles in secure locations such as Boise and Moses Lake.

School Seismic Safety Retrofit Program



Bonneville Power Administration

BPA is reluctant to discuss how it will respond to the Cascadia Earthquake with Clallam County PUD. Clallam County PUD wants to enter an MOU that permits it to assist reconstruction of BPA mainline when the earthquake occurs.

What we need from Congress - How you can help

Tell FAA to treat Fairchild/Quillayute NAS as strategic assets. The runways needs to be strengthened to handle C-17s. FAA/DOD/FEMA funds need to be appropriated to get it done.

Rescue helicopter assets for region 2 are limited to the 3 USCG helicopters assigned to Port Angeles. One is on ready standby and should stay at the station. The other 2 and their maintenance facility need to move to Fairchild to avoid destruction during the tsunami.

Require Defense Reutilization and Marketing Office (DRMO) to give counties, cities, fire districts priority for free military surplus equipment so the equipment can be prepositioned in communities where needed.

Move some national stockpile assets to secure locations in western Washington.

A school (critical infrastructure) seismic safety grant program to harden schools to protect students and shelter victims after the event.

Insist BPA cooperate with 6th Congressional PUDs to create a contingency plan for power restoration.

Thank you for meeting with us.

Comments from Randy Dutton
Included with Permission 4/17/17

1/30/17

FEMA'S INUNDATION MAP: Ocean Shores and Westport peninsulas will be swept over and the roads leading out are inadequate for evacuation. Hundreds or thousands will drown. DOT should reinforce and widened the road to four lanes to allow dedicated evacuation with a separated and wide pedestrian way so people don't block cars (assuming its passable). Houston did that with its Interstate for hurricane evacuation, why not here? The roads also should be reinforced to prevent the inflow and outflow tsunami flows from eroding breaks in the Peninsula and segmenting it into islands. In a bizarre decision, the current evacuation plan for Ocean Shores is to direct people to travel 15.5 miles to an assembly area, which undoubtedly will be downwind from the toxic smoke of Harbor fires. Trying to get to that assembly area, takes people from safe high ground (around Hogan's Corner) through miles of threatened low ground. Many will drown from the tsunami, die from exposure, shock, health failure, or panic.

According to ex-Rep Jim Buck, a participant in Cascadia Rising, FEMA's map is wrong in how far the tsunami will travel. As an engineer with hydrology experience, he claims the wave will be up to 40 feet high, not the 30 foot height claimed by FEMA and the flooding will rise all the way to Oakville. But most county residents don't know that! There are many pieces of heavy equipment in the path of a tsunami that may extend far beyond what FEMA predicated. If that's the case, the owners may not know and might not take precautions to get their family, their livestock, their equipment to higher ground. Why isn't the Army National Guard center in Central Park an EOC? It's a natural spot considering Central Park is the first town on the Chehalis that won't be devastated by the tsunami. And right next to it is an area where helicopters can land, and a flat area that, with a little dozing, could accommodate C-130s. Because it's west of the Hwy 12 Wynoochee River bridge Central Park is well positioned to support the Aberdeen / Hoquiam logistics. As to FEMA's Lines of Effort, there are a number of missed opportunities.

FUEL: With a number of portable siphon pumps (I purchased one for about $120), workers could repurpose fuel from damaged vehicles, thus changing the chart to H+1 (versus FEMA's H+6), providing gas to homeowners with generators, pumps, and potable wells; and diesel to heavy equipment operators. With fuel we can save people and property. We can operate rescue equipment; pump potable water; keep food fresh and frozen; move people and materials along sections of road that aren't heavily damage; use privately owned heavy equipment to make temp patches on infrastructure; keep communications equipment operating; etc. In Grays Harbor County I've seen no contingencies on getting power to the gas stations or in getting fuel to maintain essential services. According to a member of the GH County Road Department, they no longer have stocked fuel of their own, rather they get fuel from MASCO, and most of their facilities will be hit by the tsunami. There are no published plans at any level to provide a portable capability to recover and repurpose the fuel from the thousands of damaged / destroyed vehicles and boats that will inevitably result from the earthquake and tsunami. I propose the state or FEMA provide the equipment, plans, and training to first responders have a portable electric siphon device similar to a GasTapper http://www.gastapper.com/store/c1/Featured_Products.html. With these inexpensive pumps, gasoline and diesel can be siphoned from vehicle and boat tanks at a fast rate. Survival will be measured in hours. Immediately after a megaquake, there will thousands of refugees and some of them can be put to work processing the vehicles. Give them a purpose. Removing the fuel will also render the vehicles less toxic to the watershed. Fuel can be used to motivate property owners to operate their generators to provide well water, refrigeration space, vehicle transport, etc. The county would also need a very large number of empty gas / diesel containers.

H2O: In Grays Harbor County, we don't need to import water, we just need to pump it locally and move it to where it's most necessary. At H+0 we can coordinate those with uncontaminated wells just outside the tsunami zone to set up 'Water Stations'. If we promise homeowners security and fuel, I'm sure people would be happy to help. That would provide H2O at H+0 (instead of FEMA's H+10). Every county should have a printed list and map of all potable water wells located just outside the tsunami zone. With power, these wells can keep refugees hydrated and give them a chance to get clean and decontaminate. Such stations should be set up all along the roadways where people may gather or be traveling. Large signs pointing to 'Aid Stations' will give people hope and direction, critical in the first few hours and days. Water containers should be made available for people to fill and take with them. Stations could also be used to track people and their movement so we can start situating refugees in less damaged homes, know where to send assets, help survivors connect with relatives outside the disaster zone, etc. Such actions will also serve to help keep people informed and calm.

SECURITY: FEMA has H+6. That can be dramatically reduced to perhaps H+1. Every community currently has a federally vetted pool of possible security. Concealed Carry Permit holders (such as myself) have been screened through the FBI database. Use these people as a pool, and provide basic training, written instructions, and a laminated CCP card, in advance as to what authority and limitations they would have. By providing an auxiliary, we can help prevent gangs and militias from forming. FEMA's H+6 is too late. With a prepared plan, it could go into effect at H+0 after the megaquake, and perhaps even before the tsunami hits. There is a lot of food in the harbor, but once policing ends, fewer people with food will want to share. Instead, use the concealed carry permit holders as a first start to 'vet' potential temporary deputies. Since the background check has already been done, the next step is for the Sheriff to augment training now with 'actions and limitations'. The cost of waiting is increased vigilantism, paranoia over intruders.

DISTRIBUTION: Why not have a cadre of officials trained in contingency contracting who can be helo'ed into the field and contract for materials, equipment, and services in the affected areas? That was the basis of the Navy's Contingency Contracting Team Units (CTUs) under the Expeditionary Logistics Support Force (ELSF) (I was XO of a CTU for two years). Even after the devastation, there will be numerous people with heavy equipment, construction material, food and livestock, buildings that can house refugees, and water and sanitation. But they may fear violence and looting, or may assume the government already has plans. With the vagaries as to when relief may come, many people won't want to 'give away' their resources, but knowing they're being paid a fair price may change their minds. For example, without existing law and order, a cattle rancher will set guards to protect his herd from poachers, but with order, would likely willingly sell his stock, which then could be butchered and distributed to the hungry.

LAWS: What are the laws involving people siphoning gas from damaged vehicles if that fuel is to provide assistance? What liability falls upon the person with 'good intentions'? We know there are some laws involving rendering first aid, but they probably don't extend to scavenging and scrounging supplies after a megaquake and tsunami. Yes, some people will do things regardless of laws, but many others will hesitate or resist because of liability fears. SAR: Cascadia Rising didn't discuss drones used for search and rescue. And some unmanned helicopters (Kamen's K-max) now can be programmed to deliver supplies and fight fires (which will be blazing in the Harbor). Zipline http://flyzipline.com/press is a case in point where the company has delivery drones that aren't being used in US exercises, but rather in Rwanda. Why not for the benefit of Western Washington where the coast will be cut off?
http://www.nytimes.com/2016/04/05/technology/drones-marshaled-to-drop-lifesaving-suppliesover- rwandan-terrain.html?_r=0

There also is a valuable need of hovercraft. The waters of Grays Harbor will be virtually impassable because of tsunami debris in the water, but SAR hovercraft can cruise over some of it.
http://hovercraft.com/content/index.php?main_page=index&cPath=1_79 "The 19XR-SAR rescue hovercraft features a large modular deck layout, zero entry capability and the only stand-up style operator controls available in any rescue hovercraft. The 19XR-SAR can be customized on scene for a variety of search and rescue applications including urban flood rescue, ice rescue, near-coastal rescue and swift water rescue. Its four stroke engines, quiet operation and multi surface capability make our 19XRSAR the most reliable four season rescue hovercraft available today." The Navy could also station a few of their LCACs here (on high ground) because LCACs can ride six feet about the water while carrying heavy equipment. Let's put the equipment where it's needed, not concentrate them five days away. FEMA should be proactively granting money to buy the necessary rescue equipment for all of Western Washington, and seeing about setting up a training school in their use.

COMMUNICATIONS: While shortwave radios are nice, I've seen nothing on using portable Ka band satellite Internet (HughesNet). GH Emergency Communications plans don't include commercial satellite despite its planned use by the Washington State Joint Operations Center (JOC). Most counties have HughesNet, not us. Systems also exist that automatically tracks the satellites so they would be up and running immediately (Skype, VoIP, texting, email) http://www.groundcontrol.com/prod_ig2500_001.htm. Some systems also allow a satellite receiver to rebroadcast as a WiFi hotspot, as would a laptop connected to the satellite Internet. That would allow the county employee to use it for coordination but others to use the hotspot to communicate with the outside. Some people install them on top of their RVs and home trailers; others have portable tripod stands. With knowledge of who has satellite Internet, we can create a county reporting network.

CELL PHONES: The cell phone network in Grays Harbor is inadequate. While Alaska has a plan to cover 100% with cell phone and broadband https://www.fcc.gov/document/fcc-takes-steps-address-broadband-access-alaska, no such actions seems in place for Washington State. According to a GH County Road official, he's frequently out of cell phone

range when driving the county roads. This situation can be improved if senior county officials 'motivate' the cell phone tower managers and cell phone companies to fill in the dead zones. My own property at the end of Geissler Road is in a dead zone, and I'm on the Wynoochee River bluff. Many of the farms and homes in the river valley also don't have cell service. I have offered the local tower managers and Verizon an excellent free tower site that overlooks this large dead zone but to no avail. FEMA should review the coverage maps, and determine what earthquake standard cell phone towers have been constructed and erected, and what can be done to improve their survivability and functionality. The National Guard could be used more effectively. I have two sons in the Washington Air National Guard cyber units, and they tell me that they were unaware of anyone in their units during Cascadia Rising working on reestablishing cell phone or Internet communications. Rather, one son was involved in a 'water riot' crowd control scenario. ANG cyber units could help cell phone tower companies fix the towers, reposition electronics, and help keep towers operational by delivering fuel and servicing the equipment. In some cases, a tower may be inoperable simply because of disconnected cables. While civilians might be prevented from entering a disaster area for days or weeks, ANG members could be used more immediately as 'assistants' or 'guides'.

HOUSING. Many outbuildings, trailers, and greenhouses will survive the megaquake, and can be used to temporarily house refugees. The County should help place the refugees with willing landowners but also identify who and where so as to help protect the landowner from those who plan on taking advantage of goodwill. MANPOWER. With thousands of refugees (residents and tourists) scattered in pockets along broken sections of infrastructure, what are FEMA's plans to utilize this pool of people, many with necessary talent? Establish the procedures now to redirect the fears and hopelessness of these people into helping accelerate the rescue and treatment of injured, reestablishment of lines of communication; searching the debris for reusable material and items that might pose a threat to the environment and people over time. Use county and city personnel as supervisors to manage the volunteers. Know in advance where we would stage the reclamation procedures, and where recovered property might be cleaned and stored.

CAPITAL PROJECTS: FEMA should consider promoting several long-range capital projects that would dramatically increase the survivability of Grays Harbor citizens and the tourists who would be here. Most probably would need federal funding.

1. Airfields. Since ex-Rep Jim Buck, who was part of Cascadia Rising, has written that the tsunami would include rising water levels to the 40 elevation line, all the way to Oakville, one must assume the existing airfields (Hogan's Corner airfield, Elma Airfield, Bowerman Airport, and others) are anticipated to be unusable. But that doesn't mean we're without helicopter and C- 130 landing zones. The Army National Guard facility on Clements Road, off Hwy 12, just outside Central Park is at 160' elevation is an example. It's fortuitously positioned just west of the Hwy 12 Wynoochee River bridge and in the first town east of Grays Harbor that is above the tsunami zone. The 1200' X 1200' private property field next to it would make a great helicopter logistics base. With a little grading into the neighboring clearing, an airfield long enough for a C-130, and space sufficient for many helos and equipment staging. If the two water tanks are still standing, the location would make an excellent 'refugee center'. The white line shows a relative flat elevation where a 3900' runway could be built.

2. Create safe zones for both Ocean Shores and the Westport peninsulas. Give people a safe place to go where they can walk.

a. Just north of the Ocean Shores is high ground of 80+ feet. Request federal funding to purchase the land and an access strip to Highway 109 that starts at 50' elevation. Building wide vehicle, that are reinforced against liquefaction, and walking roads up to this high ground would get people, and those vehicles capable of navigating damaged roads, off the coastal roads which may quickly get inundated. It would also consolidate rescue and coordination. With federal money, we could even relocate Hogan's Airfield to that high ground and have it designed for C130s. Currently, the Ocean Shores evacuation site is located about 15.5 miles away.

b. For the Westport Peninsula, there's an forested island of high ground that almost all above 50 feet, it's max height about 200 feet. Just south of Bay City, just NE of Grayland. Just 6 miles as the crow flies from the end of the Westport Peninsula. There appears to be no roads to it. That should be developed into an 'evacuation park' with a very wide (min 2 lane, and very wide pedestrian lane) access. The park can be multipurpose for recreation and potentially heavy equipment storage.

3. Surplus Equipment. Having served as a department head onboard a Navy LST, I know the capabilities that these and LCACs have. What about staging Navy LCACs (Air Cushion Landing Craft) near the coast, potentially on the north side of

the Westport evacuation park, out of harm's way, so as to provide emergency rescue and transport? LCACs can ride six feet above the debris laden waters and move at high speed. Starting in 2015 some of the LCACs SLEP'ed 30 years ago were to start being retired. I propose to have some of the 'retired' LCACs located here in the Northwest with an Navy (or Army) reserve unit to maintain and exercise with them in a disaster scenario. LCACs also can be used to ferry heavy equipment from LHDs, and fuel from offshore Navy tankers to coastal villages and town. As for LSTs, while many have been sold to other countries for their own needs, two LSTs are mothballed awaiting disposition. Defense Reutilization and Marketing Office (DRMO) usually has numerous surplus landing craft which could acquired by the County for emergency purposes. The Sea Scouts and Maritime Museum might be able to maintain them.

4. Emergency Supplies. Since we know it will take many days before emergency supplies of any significant quantity will arrive in Grays Harbor, why not request GSA to stock a few million MRE (meals, ready to eat) rations, and other emergency supplies (fuel bladders, generators, blankets, etc.), in local warehouses near the coast and Puget Sound area so immediate meals can be provided?

5. Heavy Equipment. What about identifying who has what heavy equipment just outside the tsunami inundation zones so as to be able to employ them to clear infrastructure? For example, I have a bulldozer, and many of my rural neighbors just outside the inundation zone have heavy equipment. We can make temporary patches to local roads and clear landslides and downed trees. But we just need a supply of diesel, and non-ethanol gasoline to keep going. Reminder, ethanol laden gasoline is horrendous for boat motors and other open-cycle engines.

6. Tsunami Inundation Map accuracy. Jim Buck claims DNR has such a list. Do they? Even if so, I doubt they have a complete list. And a lot of that equipment is located within the tsunami inundation zone. Problem is, the FEMA map, which was incorporated into the Cascadia Rising Exercise Guide, and which has been published elsewhere, shows the tsunami ending about Montesano, but Jim Buck claims it'll go all the way to Oakville. Residents on many farms and homes might not be aware they're at risk from a tsunami. Much of the heavy equipment, farm equipment will be damaged or destroyed. The County should proactively inform all potential victims of the risks, and suggest mitigation while also making it easy for such property owners to reduce damage. For example, there is a gravel pit on the Wynoochee River that is about 24' elevation. Gravel will be necessary for repairing our roads but the large equipment to operate the pit may not survive. The County could waive some regulations or make permits easy to move material to create equipment 'platforms' that will keep equipment safe during floods.

7. Roads to safety. What about expanding some of the narrow peninsular roads (Hwy 115 in particular) leading out of peninsulas (think Ocean Shores and Westport) that will be inundated so as to increase the evacuation outflow. As it currently designed, the Ocean Shores neck will be overswept by a tsunami and will push hundreds of bottlenecked cars into Grays Harbor. Even if passable, these narrow roads will have pedestrians walking on it and will be slowing traffic. The current Ocean Shores evacuation assembly area doesn't make sense. In a brochure published by DNR and the Washington Military Department, Camp Murray, http://www.dnr.wa.gov/Publications/ger_tsunami_evac_oceanshores.pdf people are being directed 15.5 miles from Ocean Shores along a route that crosses several low elevation roads and river bridges that will be inundated. Has FEMA consulted on this? "Evacuation Area (off map): From the junction of SR 115 and SR 109, travel east on SR 109 for 5.3 mi and turn left onto Powell Rd. After about 2 mi turn left onto Ocean Beach Rd and proceed about 3.5 mi before turning right onto Kirkpatrick Rd. Go an additional 2.1 mi to Camp Bethel, located at 47 Kirkpatrick Rd" Those are just some of the issues I believe the cities, counties, state, and federal government should consider in regards to saving lives and property.

2/14/17

I wanted to add another issue that would <u>greatly enhance Coastal Resiliency</u>. It's the <u>preservation of databases</u>. When the 'Big One' hits, most datacenters (including those of local and state government) will be damaged, some will be lost, and, even if operable, they likely will have limited backup power for more than a few days. In parts of western Washington State, we're told power might not be restored for months. A solution is for local entities is to use 'cloud based' data services, which could be accessible post-disaster via commercial satellite Internet providers (HughesNet). This would allow continued access of government records during and following a disaster. Also Cloud based services can be less expensive and safer than having one's own IT shop. The politics of losing local IT jobs is not lost on me since my son is pursing a BA in IT Management. "A recent study of U.S. data center energy demand by the U.S. Department of Energy provides an important window on the future of the sector's energy appetite and the direction of its growth. This

study indicated that data center energy demand is growing at a slower rate than previously projected, linked in part to a significant shift in server sales in the U.S. market to the "hyperscale" production and **cloud computing data centers** run by companies featured in this report. Such **facilities are typically operating far more efficiently than most independently operated data centers** due largely to much higher server utilization rates and better data center design, requiring a much smaller percentage of energy spent on cooling and other non-computing power demands." "In 2015, Google's average annual power usage effectiveness (PUE) for our global fleet of data centers was 1.12, compared with the industry average of 1.7—meaning our data centers use nearly six times less overhead energy."
"On average, a Google data center uses 50% less energy than a typical data center…." Alternately, government offices can keep their local servers but also use the Cloud as database backup.

"The digitization of data presents a great many advantages in terms of archiving and managing information. One drawback, however, is the speed and completeness with which your digital data can be lost. Theft, hardware or software malfunction, and random environmental events can all lead to the information that is vital to your life and business being wiped clean in the blink of an eye. Disaster Recovery as a Service (DRaaS) is designed to protect against just such an eventuality. By backing up your data with a third party, DRaaS ensures that you can access it and put it to use even after a catastrophe.

Given our increasing reliance on digital data, DRaaS is a sensible idea for anybody: individuals, SMEs, and large enterprises. Third-party provided DRaaS is especially useful for small organizations that cannot allocate human resources and budgets to such intensive fail-safe initiatives. Providing peace of mind and ensuring that your operations are disrupted as little as possible, DRaaS will more than pay back your investment, not only in peace of mind, but especially if you ever need to use it.

It's important to ensure that the service you purchase will provide what you need from it. Identify what you want backed up, and how much space you'll need; how many machines need to be covered, and how frequently should the information be updated? Think about the sort of customer support you'll want or need, and clarify whether the service will be able to meet these requirements. All these and more are covered in PCMag's expert reviews of Disaster Recovery service providers, and our user reviews allow actual subscribers to share their experiences so you can really understand what an average user experience with these services is!" - http://www.pcmag.com/business/directory/disaster-recovery

2/15/17
Incorporate scalable online education for all K12 schools. Following a megaquake and/or tsunami, most local schools will be destroyed or damaged beyond occupancy. Traditionally, kids who are not homeschooled would have to be evacuated to an unaffected area to continue school, or will fall behind in their education. But evacuation adds stress and cost to families. This doesn't need to be the case. Following a disaster many of the basic classes can be taught as MOOCs (massive open online classes). Online education offers rural and urban children an alternative as long as they can occasionally connect to the Internet to download assignments and upload their work. This helps keep the nuclear family intact. Following the disaster some children might be brought together in local homes or establishments that have connectivity and where available adults with teaching experience can assist.

Borrowing from the Dept of Education Office of Education Technology report: Future Ready Learning Reimagining the Role of Technology in Education
At https://tech.ed.gov/files/2015/12/NETP16.pdf

I propose an 'Education Resiliency' plan to: **Ensure students and educators have broadband access to the Internet and adequate wireless connectivity, with a special focus on equity of access outside of school.** Although connectivity itself does not ensure transformational use of technology to enable learning, lack of connectivity almost certainly precludes it. Working with federal programs such as E-rate through the FCC, as well as with nonprofit partners such as CoSN, EducationSuperHighway, EveryoneOn, and others, states, districts, and post-secondary institutions should make sure technology-enabled learning is available for all students, everywhere, all the time.

Washington State should motivate cellular companies to expand high speed Internet access to all of western Washington. Cell towers will more readily survive a megaquake's damage to infrastructure, and will be brought back online quicker.

Ensure that every student and educator has at least one Internet access device and appropriate software and resources for research, communication, multimedia content creation, and collaboration for use in and out of school.

Only when learners have the tools necessary to complete these activities are they able to realize the potential of education technologies fully. States and districts should make sure such device purchases are funded sustainably with a plan for device refresh.

Support the development and use of openly licensed educational materials to promote innovative and creative opportunities for all learners and accelerate the development and adoption of new open technology–based learning tools and courses. Similar to those leading state and local efforts under way in California, Illinois, and Washington state, administrators and policymakers at all levels and in formal and informal spaces should consider the diversified learning paths and potential cost savings inherent in the use of such openly licensed resources. Brick and mortar schools (the ones that will crumble) need to update their school resources so that ALL material is available online.

Draft sustainability plans for infrastructure concerns that include upgrades of wired and wireless access as well as device refresh plans and sustainable funding sources while ensuring the safety and protection of student data. As state and local education institutions work to bridge the existing digital divide, they concurrently should be drafting plans for the upgrade of infrastructure necessary to meet the needs of increased user demand as well as speeds necessary for the use of evolving technologies. These plans should include specific systems and strategies for protecting student data, be drafted with cross-stakeholder groups, and include special consideration of funding sustainability and possible partners.

Create a comprehensive map and database of connectivity, device access, use of openly licensed educational resources, and their uses across the country. To understand the digital divide better and progress toward bridging it, researchers, state and local officials, and district administrators should work in concert with one another to test connectivity speeds in schools and homes and to identify the kinds of devices to which educators and students have access and the ratios of devices to users within education institutions. The building of such a map and database would allow for the visualization of inequities of access and targeted interventions to alleviate them. In addition, the level of engagement with openly licensed learning materials should be made transparent as an indicator of progress toward equitable access and effective allocation of resources.

http://www.imedicalapps.com/2015/10/study-best-apps-disaster-response-emergency Study finds the best apps for Disaster Response and Emergency Preparedness
Iltifat Husain, MD, Paul Cerrato | October 28, 2015

Dr. Iltifat Husain's *physician take is at the end of this article. A comprehensive review of* ***disaster medicine apps*** *has identified several top choices for clinicians and patients to consider. Out of 219 relevant entries in the field gleaned from a search of the ITunes Store, Daniel J. Bachmann, MD, from the Department of Emergency Medicine, Ohio State University Wexner Medical Center, and colleagues ranked the Community Emergency Response Teams and Federal Emergency Management Agency (FEMA) as the best apps to meet the needs of National Disaster Medical System responders.*

The investigators also ranked several apps from the Centers for Disease Control and Prevention for a variety of fields among their top choices. To meet the needs of HazMat responders, Bachmann et al drew attention to the National Library of Medicine's Wireless Information System for Emergency Responder or WISER app (**reviewed on**iMedicalApps prior). On the other hand, they picked the **American Red Cross** as the group with the most useful applications for natural disasters.

The **FEMA mobile app** includes an interactive emergency kit list, emergency meeting locations that can be stored, and a map of open shelters. It even provides a feature that lets users create global positioning system photo reports that can be inserted in a map for others to see. CDC offers *CDC Influenza* (**reviewed on** iMedicalApps prior), an app that lets clinicians tap into the federal agency's most recent recommendations and flu updates. The app also offers information on diagnosis and treatment, including antivirals. The researchers also included a app called *CDC Blast Injury* in its list of top choices.

The ***WISER*** mobile app for first responders coping with a hazardous materials incident gives users access to the National Library of Medicine Hazardous Substance Data Bank while the **American Red Cross** offers several apps for natural disasters, including *Flood, Hurricane, Wildfire, Earthquake,* and *Tornado.*

While reviewing the available apps in all these specialties, Bachmann and his associates point out that mobile apps come and go, explaining that "In a single week, several new apps will appear and disappear from the iTunes store."

Dr. Iltifat Husain's take: A nice study that looks at essential apps for Emergency Preparedness and those responding to Disasters. The FEMA app is a must have, along with the WISER app and the suite of American Red Cross apps.

FEMA

- Price: Free
- Available on **iTunes**, **Google Play**, **Blackberry World**

Going through the FEMA training is a good way to recognize what's missing. And much is!

The Advanced course 'Rapid Needs Assessment' doesn't even mention apps or texting.

I've attached a list of 50 Emergency Apps, some which are quite clever.

- One gives a person a one-touch 'panic' button to immediately transmit your gps coordinates via email to preselected recipients. Sometimes earthquakes don't take down the cell towers at first.
- Imagine all EM personnel having an app that allows them to locate any other EM personnel.
- Or the app that monitors emergency radio channels;
- Or has medical and survival instruction;
- Or translates to/from English for tourists and non-English speaking residents;
- Or how to handle hazardous material;
- Or where to find the cellphone towers.

There's also another aspect of Grays Harbor Emergency Management I've not seen addressed. That is of saving people during the hours of tsunami debris laden water that is ebbing and flowing. Loose boats, houses, and everything else that can float will be moving seaward, then shoreward. People and pets will be clinging to much of the debris. Their lives may be measured in minutes, hours, or days. Regular rescue boats won't be able to navigate the debris field, but some hovercrafts can, particularly the Navy's LCACs. A smart move would be to have the Navy relocate some of the active duty LCACs to Western Washington state. Assuming there isn't the political will, an alternative could be the use of a few 19XR-SAR rescue hovercrafts. They could pull people from the water and floating debris; bring sailors to take control of adrift boats; fight floating fires. If a hovercraft's capabilities were properly demonstrated there might be enough demand on the west coast a locally built hovercraft that meets our demanding conditions, along with a training school.

P.S. I've also strongly recommended:

SECURITY: Immediately after a disaster a surge of security personnel could help restore safety, security, and evacuation using the FBIvetted concealed pistol license (CPL) holders as a Critical Response Force. This security can come from CPL licensees who opt-in during the renewal process and get some basic training, a laminated ID CPL badge, and limitations and authority along with initial assignment and reporting instructions upon a disaster occurring. FEMA has security at +6, we can do it at +1. This force could mobilize immediately after a megaquake and go to designated areas to assist with traffic control, guarding aid stations, helping direct refugees, distributing food, protect private property, etc. Importantly, an immediate manpower surge would reassure displaced tourists and residents and help direct people to the closest aid station. And more citizens with assets such as potable water wells on generator power will be willing to help if they feel secure. People with CPLs generally are among the safest, most prepared, and most honest citizens who believe in self-reliance. To my knowledge, no county has adopted this suggested system, but I believe our situation of being on our own for weeks, according to FEMA, means we have to establish control at the onset rather than let a disaster fester into anarchy. If implemented it could become an emulated program across the country. The process would start at initial application or renewal of a CPL. Those applicants who opt-in would receive a laminated CPL card with perhaps a pictured badge that also can be hung around the neck on a lanyard. It would have a unique serial number, and a numerical ranking based upon a level of training. For example, a 1 might reflect minimal training; a 2 might show the person attended the requisite lectures or online training; a 3 might show a fully trained member, perhaps former law enforcement or military. Each level would defer to the higher level, and all would defer to active law enforcement or county / city official.

DRONES: New drone technology can allow:

- SAR https://pres.ly/2NII
- Delivery of spare parts, medicines, and radios
- Personnel Evacuation
- Fire fighting (K-Max)

- Remote bridge and road inspection
- Law enforcement
- Tethered emergency cell phone communications

Yet none of those technologies were tested during Cascadia Rising. We need exercise coordinators to get entrepreneurs involved in reducing the impact of natural disasters.

NATIONAL GUARD: The National Guard should be working on helping companies re-establish cell communications and infrastructure. Because contractors will have difficulty accessing a disaster area, the NG should team with tower workers in repairing the towers and keeping the generators refueled. The post-Hurricane Katrina investigation found there was a disconnect between the NG and local law enforcement in credentialing contractors and that delayed repair work. This needs to be resolved before the disaster, not afterward. According to the FCC Post-Katrina investigation https://apps.fcc.gov/edocs_public/attachmatch/FCC-07-107A1.pdf: See, e.g., Senate Report on Katrina at 18-4 (repair workers sometimes had difficulty gaining access to their equipment and facilities because the police and National Guard refused to let crews enter the affected area); Federal Support to Telecommunications Infrastructure Providers in National Emergencies: Designation as "Emergency Responders (Private Sector)", The President's National Security Telecommunications Advisory Committee, Legislative and Regulatory Task Force, at 7 (Jan. 31, 2006) [hereinafter "Jan. 31 NSTAC Report"]. 69 See, e.g., Comments of the Satellite Industry Association at 6 (January 27, 2006) (describing how satellite system repair crews had difficulty obtaining access to the impacted area); Comments of Xspedius Communications, LLC, at 2, 6 (Mar. 6, 2006) [hereinafter "Comments of Xspedius"]. 70 See, e.g., Senate Report on Katrina at 18-4 (citing Committee staff interview of Christopher Guttman-McCabe, Vice President, Regulatory Affairs, CTIA, conducted on Jan. 24, 2006) (industry representatives said that their technicians would benefit from having uniform credentialing that is recognized by the multiple law enforcement agencies operating in a disaster area). 71 See, e.g., Vincent-WLOX-TV Mar. 6 Written Testimony at 5 (stating that a credential that permitted access in one county was sometimes not honored in a different county). 72 See, e.g., Comments of Xspedius at 2-3. 73 See, e.g., Senate Report on Katrina at Findings at 8 (efforts by private sector to restore communications efforts were hampered by the fact that the government did not provide uniform credentials to gain access to affected areas).

COMMUNICATIONS: In preparation for a megaquake and tsunami, FEMA should be working with cell phone companies to fill in the coverage holes (see maps below) and in hardening the towers to survive the violent movement? To what earthquake standard are towers erected? Knowing that telephone lines will come down, cell phone coverage and commercial satellite (HughesNet) will be the most critical means of communications. For some unexplained reason, the JOC has HughesNet but not all counties do (GH County doesn't). FEMA should be funding such inexpensive but critical systems because in the end, it will save lives, reduce panic, reduce overall costs, and show positive results. So far, the cell phone tower companies aren't responding to inquiries.