



# The Quest to Support Community Resilience in the Face of Coastal Hazards and Natural Disasters

COMMENTARIES AND  
LETTERS TO THE  
EDITOR

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## ABSTRACT

Educating the public and other stakeholders about natural hazards and prompting them to take action can be challenging. In an effort to address coastal natural hazards and foster community resilience, Oregon Sea Grant has developed strategies and tools for a variety of audiences that address these scary issues in engaging and innovative ways. This article highlights a few of the programs and tools that Oregon Sea Grant has developed and challenges readers to join the effort to increase resilience throughout the nation.

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The State of Oregon's Department of Land Conservation and Development (ODLCD) has identified six natural hazards that are common in Oregon: floods, landslides, earthquakes, tsunamis, coastal erosion, and wildfires. These hazards can be divided into two kinds, chronic and acute. Chronic hazards are more local in occurrence and impact, more frequent, and limited in scope and severity; however, damage to life and property can be substantial (ODLCD 2022a). Chronic hazards include river and ocean flooding from storms, bluff and beach erosion, landslides on steep slopes, and wildfires. These hazards, combined with increased development, create threats for Oregon's coastal communities. Climate change can also amplify these hazards. As global temperatures rise and extreme weather intensifies, coastal areas experience more frequent and longer forest fires, flooding, and increased coastal erosion (ODLCD 2022b). Oregon communities are also subject to acute hazards like earthquakes and resulting tsunamis, which can be catastrophic. According to researchers, there is a 37 percent chance that a major earthquake will occur in Oregon over the next 50 years, triggering a significant tsunami that would result in serious loss of life if communities and individuals are not adequately prepared. In the event of a Cascadia Subduction Zone earthquake and tsunami, many coastal populations are predicted to become isolated into "islands" due to landslides, liquefaction of sediment, and damaged infrastructure like bridges and highways, hampering emergency response in these communities and leading to additional fatalities (OOEM 2022).

Working with government agencies and other partners, Oregon Sea Grant has long been involved in helping prepare coastal communities for natural hazards. From funding relevant research and a coastal hazards extension agent position, to creating tools for a variety of audiences, Oregon Sea Grant is committed to understanding acute and chronic coastal and marine hazards and supporting the development of resilience strategies. Reducing community vulnerability to impacts of hazards and of climate change requires engagement of scholars, policy and decision makers, and community members at every level. Furthermore, "bottom-up" interventions that focus on the engagement of communities in increasing their own resilience are critical, as communities often differ significantly in culture, infrastructure, and risks to various hazards (NRC 2021). As hazards are scary in nature and impact a diverse group of stakeholders, Oregon Sea Grant seeks to be diverse and innovative in the education and outreach approaches employed to address these issues.



**Figure 1** Participants following *Tsunami Quest* directions learn about vertical evacuation and obtain a clue from a sign.

One way Oregon Sea Grant educates the public about earthquake and tsunami safety is through the development of *Tsunami Quests* (Figure 1). Educational, clue-directed hunts known as "Quests" have been engaging public audiences of all ages since 2007 when the first *Oregon Coast Quests* book was produced. Since then, nine editions have been released and sold online and at booksellers throughout the state. Thousands of participants engage in Quests annually as they are well-suited activities for residents, tourists, families, and school groups. Quest participants follow maps and written directions, collect hidden clues, and learn about special coastal places and topics along their journey. These self-guided adventures allow lifelong learners to explore parks, trails, and other outdoor spaces in new ways at their own pace.

At the end of each interpretive Quest, participants find a hidden box containing a logbook to sign and a hand-carved stamp to mark their accomplishment.

In 2016, Oregon Sea Grant first used Quests as a tool to help the public learn and talk about tsunami safety. Friends and family members following Tsunami Quest directions learn about basic earthquake and tsunami safety as they seek and find evacuation signs and other clues that indicate the location of high ground. So far, six Tsunami Quests have been created in communities along the Oregon Coast, and each provides a unique, fun, and empowering way to learn about a scary topic while practicing walking an evacuation route. Some Tsunami Quests were made by state park rangers or museum educators, and others were made by student groups, but all Quest-builders worked with local emergency managers to become experts as they learned about tsunami safety and practices in their local communities. Tsunami Quests are available free online and at various host sites in hard copy form (science centers, state parks, etc.) and can be completed by participants at their own pace, at any time.

Oregon Sea Grant staff have also been involved in many public events focused on emergency preparedness and recently sponsored an engaging Community Prepare Fair in June 2022 in one coastal community. Yachats is a self-proclaimed “village” of just under one thousand residents with a median age of 67. The town relies heavily on tourism and during the summer months thousands of visitors temporarily increase the population, most of whom come with few or no supplies that would support them in case of a natural disaster. There is no hospital or clinic in this town and all city offices, stores and restaurants lie within the tsunami inundation zone. In addition, the main road that runs through town (Highway 101) that connects Yachats to larger municipalities is projected to fail during a major earthquake, resulting in an “islanding” effect. Thus, personal and community preparedness will be critical when, and if, a significant natural disaster occurs.



**Figure 2** Visitors and residents learn about coastal hazards and preparedness at the Yachats Community Prepare Fair.

The Yachats Community Prepare Fair was co-designed by Oregon Sea Grant’s Marine Education Manager, who is also a resident and serves on the Yachats Emergency Preparedness Committee, and was intended to attract participants by appealing to a variety of interests and providing skills that can be used in everyday life, not just in disasters. This daylong event coincided with, and was held adjacent to, the very popular Sunday Farmers Market, which attracts hundreds of residents and tourists weekly. A variety of experts and community partners provided presentations, hands-on workshops, and demonstrations on topics such as first aid for people and pets, foraging, wildfire-resistant landscaping, assembling emergency go bags and at-home caches, and other topics that promote resilience (Figure 2). At the event, participants



were encouraged to sign up for alerts, purchase emergency supplies from local vendors, tour existing community caches, and even participate in a Beat the Wave 5K run/walk that led from the ocean to one of the caches/assembly areas on the hillside. Also included in this event was a book reading and signing by local author, Brad Reed, of his recently released novel *Crossing Cascadia*. The book focuses on the aftermath following a major Cascadia Zone earthquake and subsequent tsunami and emphasizes the importance of personal preparation and community to survival and recovery.

Although mitigation, adaptation, and preparedness projects are conducted along the Oregon Coast, information, strategies, and lessons learned are not always effectively shared between stakeholders. Consequently, Oregon Sea Grant developed the *Oregon Coastal Hazards Ready (OCHR) Library & Mapper* (see [bit.ly/OCHR-Mapper](https://bit.ly/OCHR-Mapper)) to further inform the public and support community resilience. The OCHR Mapper is an ArcGIS StoryMap that displays 39 coastal hazards preparedness case studies. This tool is designed to assist individuals, communities, and tribal and local governments as they identify approaches to prepare for acute and chronic coastal hazards. The OCHR Mapper aims to promote and share lessons learned and research efforts done to reduce coastal hazards risks and build resilience in Oregon. For each of the following coastal hazards—flooding and sea level rise, erosion, landslides, earthquakes and tsunamis—there is a description of the hazard, links to additional resources, and an interactive map with the location, photos, and description of projects/case studies. Each case study presents information such as adaptation strategies and actions, lessons learned, team partners, budget, and project resources. In addition, in partnership with the Cascadia Coastlines and Peoples Hazards Research Hub and the Washington Department of Ecology, Oregon Sea Grant led the development of a Pacific Northwest Coastal Hazards Resources Newsletter that is sent monthly to the newly established OCHR Mapper listserv.

It can be difficult to imagine what it might be like to experience a coastal hazard or how the appearance of landscapes could change in an emergency. Thus, Oregon Sea Grant is partnering with OSU Precollege Programs and Teen Community Emergency Response Team (CERT) programs from coastal schools to develop a set of virtual and augmented reality tools and experiences focused on earthquake and tsunami hazards and preparedness. This project will extend beyond traditional unidirectional outreach to include community voice in the process of generating knowledge, building skills, and fostering action, while bringing the issue “to life” for audiences.



**Figure 3** DIVE4OL youth learn from experts about earthquakes and tsunamis so that they can incorporate the information into the AR/VR app they will create.

Funded in 2022, the DIVE 4 Ocean Literacy Coastal Hazards Virtual Reality Experience (DIVE4OL) will result in a *Timelooper Augmented Reality (AR)/Virtual Reality (VR) app*, which is currently being developed, and will incorporate youth voices, focusing on preparation, evacuation, and post-disaster recovery in the event of a large-scale Cascadia subduction earthquake and subsequent tsunami. While some of the app content will come from the existing OCHR project described above, a significant portion of the content is being co-created by Oregon youth,

educators, and experts (Figure 3). The resulting app should be available in the latter part of 2023 and will be free, downloadable through mobile devices, and compatible with existing AR/VR hardware platforms to facilitate dissemination to a wide audience. Educators will be able to integrate these experiences into both informal, museum-like settings and classrooms. Once downloaded, no internet will be required to use the app and educators can share their screens in virtual space and walk learners through the experiences. These experiences will integrate live-action footage, CGI, and visual effects with increased interactivity through a gaming engine delivery system, which is learner-center and allows youth to investigate the various educational components included. These experiences will incorporate teen hologram avatars that will orient users to what residents and visitors need to know in various coastal communities, share resources available to increase preparedness, and include specific information on how to get involved.

History has demonstrated time and again that effective engagement and education efforts are critical to reduce loss of life and support post-disaster recovery. As natural hazards become more frequent and intense throughout our nation, a collective need exists to share successes and explore new ways of fostering resilience in our communities. By collaborating with partners and implementing innovative strategies that target a variety of stakeholders, Oregon Sea Grant is meeting that need through education and outreach efforts that promote best practices and personal preparedness. We invite you all to join us in these efforts to create a more resilient nation, one community at a time.


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The authors have no competing interests to declare.

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