WASHINGTON SEA GRANT

SEA STAR

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How do our sea-meadows grow?

WSG-funded research informs the future of eelgrass restoration in Washington

By Erick Dowell, WSG student assistant

Beneath the coastal waters of Washington state, if you look in the right spots you'll find green, grassy meadows. They are not too different from meadows you may want to frolic through on land, but down here the blades of grass undulate with salt water eddies and waves of the sea instead of a gentle summer breeze. Eelgrass (*Zostera marina*) forms meadows in the muddy bottoms of Washington's marine bays and shorelines from the intertidal to the foreshore. Although eelgrass lives in the marine environment, it is not a kelp or another type of macroalgae. Eelgrass is a true plant that roots itself in the soft sediment bottoms off the coast. It flowers and produces seeds like any terrestrial plant. Like kelp, though, eelgrass forms dense communities that support a wide array of other organisms like young salmon, crabs, herring, mollusks, shrimp and others. And like the West Coast's well-known bull kelp (*Nereocystis luetkeana*), eelgrass is facing population declines, habitat loss and recovery challenges.

Above: (from left) Kerry Naish, Jennifer Ruesink and Bryan Briones Ortiz in the field. Opposite page: Briones Ortiz in an eelgrass meadow. Photos courtesy of Kerry Naish, Jennifer Ruesink and Bryan Briones Ortiz.

Habitat disturbance from development, agricultural practices and industrial use in coastal areas and upland watersheds disrupts the clean and clear waters in which eelgrass grows best. Direct disturbances from vessel anchors and propellers or overwater structures like private docks tend to destroy beds or block the sunlight that eelgrass needs to grow. These threats and resulting declines have prompted the Washington Department of Fish and Wildlife to list eelgrass as a species of special concern. Further, eelgrass's unique importance to the coastal ecosystem has led to the species' listing as critical habitat by Washington Department of Ecology's Shoreline Management Act. Conservation and restoration of this species has become an important part of the state's plans, so much so that Washington recently passed legislation creating a statewide kelp and eelgrass health and conservation plan. The plan aims to conserve and restore at least 10,000 acres of kelp and eelgrass in the state. But how do we protect and get these eelgrass meadows to grow? A research project funded by WSG is trying to find out.

The WSG study is headed by Kerry Naish and Jennifer Ruesink, respectively University of Washington professors in Aquatic and Fishery Sciences and Biology, as well as doctoral student Bryan Briones Ortiz. Their research first looked at the baseline genetic structure of the eelgrass population in Washington state. You can find eelgrass meadows from south Puget Sound up into the San Juan Islands and in the bays along the outer coast. The questions the researchers asked were: are these meadows all very closely related or nothing alike? Is each population very diverse or fairly homogenous? Will eelgrass from one bay adapt to grow in other locations?

"To make good decisions about which donor populations to use, and which investments to make in restoration, it helps to know the population genetic structure" says Ruesink. "[It] allows managers to make better decisions about conservation and restoration."

Surprisingly, it turns out that the eelgrass populations in the state are genetically distinct from each other. This means that, genetically, eelgrass found in Grays Harbor and Willapa Bay is different from eelgrass in Puget Sound. Even among the populations in the Sound, the meadows in south Sound are distinct from the ones in Hood Canal and in north Sound. The distinctiveness of eelgrass populations in Washington indicates that managers will have to be selective when choosing sources for meadow rebuilding projects.

Eelgrass is a special plant species that can have either an annual life cycle or a perennial life cycle depending on the environment where the plant is growing. Another surprising insight from the research project is data showing that annual and perennial eelgrass plants are genetically distinct. "If you take a walk in Willapa Bay and walk out onto the tidal flat, you'll see this transition between an annual bed and a perennial bed and then another annual bed. The annuals tend to grow in more extreme environments, so have more desiccation, more exposure to the sun. Whereas perennials tend to be in more stable environments," Naish explains. "People have thought for

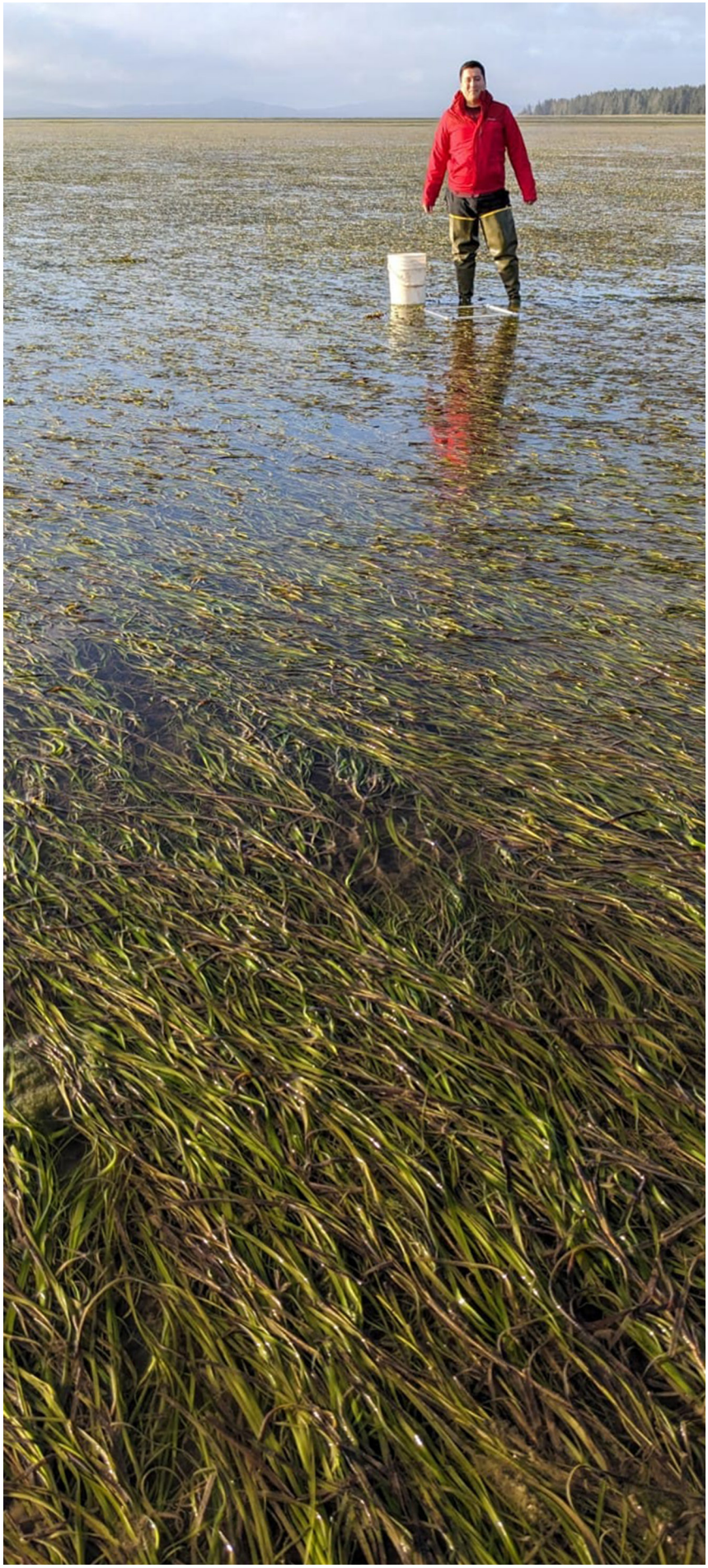
ages that those two life history strategies are interchangeable, but based on the work we've done, it turns out that they are not, at least in this area."

To take the study further, Ruesink took seedlings from annual and perennial plants and swapped their locations, so annual seedlings were growing in an area where perennial plants were found. The surprising result was that they both kept their distinct life history strategies — the annuals stayed annual, and the perennials stayed perennial. This result was repeated when the experiment was done again with annual seeds planted in a perennial bed. Briones Ortiz then studied the genetics of eelgrass displaying the two life histories. The results showed that annual and perennial life history types were genetically determined, yet the annual and perennial plants within a region were more closely related to each other than to plants elsewhere in the state. The fact that they have been found in many regions, combined with each region being genetically distinct, suggests that annual life histories have evolved more than once. Briones Ortiz also found that some perennial beds can have up to 97 percent clonality, meaning a single eelgrass plant has asexually spread out to create almost an entire meadow.

"This could have implications for conservation. Maybe this is a resistant genotype that's doing well," says Briones Ortiz. Many of the other results from this study also show implications for conservation measures, and the conclusions from these studies will help inform the next steps in restoring eelgrass in the state.

"The eelgrass researchers are asking, 'if we want to recover our population, which plants should we be using?'" says Naish. If the geography of the eelgrass population matters, and whether the eelgrass is perennial or annual matters, what else needs to be considered as the state works to conserve and restore eelgrass populations? In Washington, even eelgrass that is geographically and genetically close can look fairly different. This group's current experiments are also exploring whether these physical differences are important when considering conservation and restoration plans.

This work represents the first step toward gathering knowledge needed for Washington state's eelgrass conservation and restoration goals to be met. Eelgrass is a key player in the foundation for healthy coastal ecosystems in the state. The novel knowledge being collected by this research team will help conserve and grow eelgrass meadows in the future.



In the hunt for invasive green crab, Molt Search seeks their shedded shells

WSG Crab Team's new program makes it easy to get involved in invasive species response

By Alison Lorenz, WSG Science Writer

When Lisa Watkins started at WSG as a community science specialist, WSG Crab Team was almost ten years old. The Crab Team monitoring network — a network of several hundred volunteers and partner staff spread all across the state — has spent that decade on the front lines of the European green crab (*Carcinus maenas*) invasion into Washington's coastline and inland waterways. Watkins came to the team with a strong background not only in science, but also in managing volunteers to conduct high-quality community-based research. Until the spring of 2023, she and the team were focused on what Crab Team has always done: conducting annual trainings and managing thousands of volunteer hours spread across more than 60 monitoring sites, all in search of invasive green crabs.

> "I have a vision that on every shoreline access... there will be a sign that helps people engage with Molt Search."

Volunteers learn Molt Search protocols at a training in Padilla Bay.

But there was, as Watkins notes, "an obvious gap" to be addressed — volunteers had more enthusiasm than time. The existing Crab Team program asks for a substantial commitment from participants, who must attend nearly ten hours of intensive training and commit to visit their assigned trapping sites two consecutive days a month. At the same time, there are many community members who are interested in getting involved at a smaller scale. And as green crab continues to establish and expand into new areas, there are more shorelines that need monitoring.

This combination inspired the creation of Molt Search, a new program launched in partnership with Washington State University (WSU) Extension in May 2023. The program is meant to have a low barrier to entry: volunteers hunt for crab molts, the shells crabs shed as they grow, during timed beach surveys, then submit what they find via a smartphone app called MyCoast. They're trained with a short and simple, yet comprehensive research protocol. This means that volunteers can rest easy knowing that while tracking molts is simple, their time and effort still produce high-quality data — the type researchers and decision makers can actually use.

The decision to focus on crab molts, rather than live crabs, is similarly motivated. "Through our existing network, volunteers sometimes notice molts before actually trapping a crab," says Watkins. "By just looking for signs of crab — for molts — it allows the local person to get involved looking for crab without that huge amount of work [to trap them]."

So how is it going so far? As of this writing, Molt Search had already recorded about 400 beach surveys input by more than 120 individual volunteers in different parts of Washington — sufficient, Watkins notes, to give WSG Crab Team and its partners "a really good dataset to work with." As Crab Team focuses heavily on the early detection of green crab, this new, robust data is all the more important. Molts can serve as a window into all sorts of information about crab activity in an area. They indicate, first of all, that crabs are growing and therefore surviving well. They're also helping researchers learn more in real time about the connection between where molts are found and where crabs are actually living. Molt Search is even helping to build data about Dungeness crab,

whose juvenile phase, Watkins notes, is "remarkably understudied." Molt data could help managers understand the impacts of green crab on Dungeness during this crucial time, when the two are in direct competition for food and resources.

The goal of Molt Search and Crab Team's work, after all, is to generate data that can direct efforts to keep green crab at bay as long as possible. Watkins notes Washington's Department of Fish and Wildlife responds rapidly to any credible reports of green crab detection. And finding no evidence of green crab in an area is valuable too: it tells state managers that there's no need to put resources there, at least for now.

Despite prevention measures, green crab populations are slowly spreading. There are simply too many methods of dispersal, from human transportation of ballast water and live seafood to the natural dispersal of crab larvae in ocean currents. The importance of early detection means Molt Searchers will be out on Washington's shorelines, ready to spot their shedded shells. WSU Extension has taken the lead on getting out into the public and leading training in communities. This train-the-trainer model means that local partners will hopefully have the means to take ownership of their own Molt Search programs, adapting and running them to suit their needs. For example, thanks to Friends of the San Juans hosting local trainings, Molt Search surveys have already been conducted on remote islands not served by ferries. Overall, Watkins is hopeful that the program can play a role in sharing resource managers' and biologists' technical expertise with the local communities they're already serving by, as she puts it, "bringing green crab management work out from behind the curtain."

"I have a vision that on every shoreline access, every shoreline where folks are welcomed to come, there will be a sign that helps people engage with Molt Search...[so that on] every shoreline, every shorewalker will be combing for signs of green crab," Watkins says.

As beachwalkers around the state get involved, Watkins hopes, too, that Molt Search can help to get them interested in what happens in our state's diverse, vibrant waters. "One of my highlights was going on a beach walk with my East Coast mom and finding a way to linger on a sunny day. I said, let's do this molt search, and ten minutes later, my Atlanta landlocked mom and I were looking at all these crab shells, chit-chatting collecting these shells, and were able to engage with this local fauna in a way that we wouldn't otherwise," Watkins shares. "I'm hoping that others are able to do this as well — engage with your local beach or environment."

From top: part of Molt Search training is learning to properly measure molts across the widest part of the shell; Molt Search asks volunteers to collect any crustacean molts they find and trains them to distinguish European green crab molts from the molts of native crabs.

THE OTHER TSUNAMIS

By Alison Lorenz, WSG Science Writer

The Big One. It's the threat looming over all who live in western Washington and the greater Pacific Northwest: a magnitude 9 earthquake from the Cascadia Subduction Zone. A quake from the fault line stretching from Vancouver Island to northern California could create the kind of devastating tsunami documented in Coast Salish Peoples' stories 300 years ago. Now, decades after Cascadia's potential for a huge earthquake–tsunami event was brought to light, the threat is familiar to many. But did you know there are other, smaller fault lines all over western Washington? And that some of them have also produced tsunamis—and will eventually do so again?

These other tsunamis are a research focus of Carrie Garrison-Laney, WSG's coastal hazards specialist and paleoseismologist. Garrison-Laney was an undergraduate in the San Francisco Bay area during the famous 1989 earthquake that paused the Major League Baseball World Series. "That experience really sealed the deal as far as working in earthquake related science," she says. But the "how" wasn't clear until graduate school, when she accompanied a professor to take cores of sediment at a suspected tsunami inundation zone.

The site was a freshwater pond near the beach behind a sandy berm. Once there, they pushed a handheld metal corer meters down into the sediments at the bottom of the pond. When they pulled it out, Garrison-Laney remembers seeing layers of sand in the sediment core. These were tsunami deposits, evidence of times tsunamis washed over the beach and dunes and spread a layer of marine sediment distinct from the peaty pond deposits. In the core, this sediment stood out like frosting between layers of cake.

Below: Carrie Garrison-Laney in the field after taking sediment cores.

Carrie Garrison-Laney's research paints a fuller picture of Washington's tsunami risk

"It was amazing to me," Garrison-Laney recalls. "I was so excited." She's been looking at tsunami deposits ever since.

Why look at evidence of tsunamis that happened hundreds of years ago? It turns out the answer has a lot to do with preparing for tsunami hazards now. The problem Garrison-Laney's research tries to address is that tsunami threats in Washington are not well understood. "I've been trying to understand the sources of tsunamis in the Salish Sea," she explains. "We think we know all the faults that can make tsunamis. We know Cascadia makes them, and that we get them from elsewhere in the Pacific Ocean. But we don't really know enough about which faults around Puget Sound have produced tsunamis." For example, the geological record shows evidence of seven big earthquakes in western Washington over the past 3500 years. But in Discovery Bay — a bay on the Olympic Peninsula, near Port Townsend — sediment cores hold deposits from ten tsunamis over that same period. "There are extra deposits, and we don't know where they came from," Garrison-Laney says. "It's important to understand that to define the hazard."

Recently, she's been focused on improving the precision of estimates of tsunami recurrence, or how often tsunamis have occurred as a result of the movements of certain faults. The heart of this analysis is radiocarbon dating. Garrison-Laney's research has necessitated that she delve deep not only into paleoseismology, but also paleoecology, as the plant and animal life caught up in sediment deposits can help to determine the nature of the sediment, where it came from, and its age. Radiocarbon dating measures the decay of a radioactive isotope of carbon, an element present in all plant and animal life, to pinpoint the age that the organism died — in this case, the plants that were covered in tsunami sand or grew on the sand after the tsunami event. By collecting bracketing ages, researchers statistically determine the span of calendar years when the tsunami occurred.

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> "I think what we should always do is give people enough information that they can incrementally get to a safer place."

Makah Tribe • continued on page 6

Flood planning goes local

WSG supports the rollout of the Coastal Storm Modeling System (CoSMoS) in Washington state

Flooding caused by a king tide in Gig Harbor in 2022. Photo submitted by David Barker to the King Tides program via MyCoast.

By Alison Lorenz, WSG Science Writer

The first time Ian Miller, Washington Sea Grant (WSG) coastal hazards specialist, heard about CoSMoS, he was in graduate school at the University of California, Santa Cruz. This was around 2009, when the first iteration of CoSMoS was being used to model coastal storms in southern California. While Miller was interested at the time, he couldn't have known how soon CoSMoS — a computer modeling system created by the United States Geological Survey (USGS) — would reappear in his career.

In 2011, Miller joined WSG. The next year, he began his first sea level rise planning project with the Jamestown S'Klallam Tribe. In his role as coastal hazards specialist, he was responsible for providing technical assistance to the Tribe, helping them to understand where and how sea level rise would most impact them. The first step was to develop a map showing the risk of sea level rise or coastal flooding to specific areas. Since that time, Miller again and again found himself in a similar position: collaborating with local communities and jurisdictions on shoreline planning, only to have that first step — creating sea level rise or coastal flooding maps — become a hurdle.

After advisory discussions with Miller, local jurisdictions would often realize they lacked the type of expertise to create the maps themselves. The maps required technical capacity, like GIS expertise and localized data gathering, that many jurisdictions simply didn't have. That meant they needed to hire consulting firms to do the work for them. Hiring consultants meant finding funding to do so, which meant syncing with budget cycles and justifying the project to decision makers, until all of a sudden years went by — and the jurisdiction's shoreline planning project was still stuck on step one.

"If we're going to be doing a lot of this, it would be really useful to have a tool rather than building it ourselves every time," Miller remembers thinking.

CoSMoS is just that tool. CoSMoS stands for Coastal Storm Modeling System. It's a numerical modeling system uniquely capable of interpreting the physics of compound flooding — the combined impacts of coastal storms, sea level rise, and river flooding — down to the local scale. As a result, planners, managers and residents can use the new system to help them understand the impacts of coastal flooding to property, homes and businesses.

Fortunately, interest in CoSMoS was big enough in California that it eventually drew attention in Washington. Both states now mandate that local jurisdictions assess and plan for vulnerabilities on their coasts. And after a positive experience with Sea Grant in California, it made sense for USGS to partner with WSG to connect jurisdictions and communities with CoSMoS. WSG was well-positioned to provide outreach, education and technical assistance as the tool expanded farther north. In Washington, WSG is a known connector already working with local partners to conduct sea level rise and coastal planning; in CoSMoS, USGS created a free, accessible tool that could make this planning easier than ever. With these mutual benefits, the partnership was born.

"It was a no-brainer for WSG to be involved in an education effort for CoSMoS," says Chandler Countryman, WSG resilience and adaptation specialist. "We're already a group that people turn to for the best science available, and for resources around these questions. We are already involved in so many communities and showing up to local meetings — so it's very easy for us to provide the outreach and public education about CoSMoS to all those places that we're already showing up to."

Washington's coastline is home to diverse communities, important infrastructure and industry, and habitat critical for commercial fisheries, Tribal Treaty Rights and public well-being. But the same things that make the coastline appealing put it at risk of flooding. Between sea level rise, storms, tides and overflowing rivers, many factors drive flood events. Yet whether it lies within a river floodplain or holds important municipal infrastructure, each piece of shoreline has unique and valuable traits that flooding can impact in different ways.

CoSMoS has several key features that make it especially useful for examining these potential impacts. First, the system incorporates wind, atmospheric pressure, and sea surface temperature data from global climate models. It then combines these data with models of local water levels that include factors like tides and storm surge. Finally, CoSMoS incorporates a wide range of sea level rise scenarios, allowing planners to view potential flooding impacts in both the near and long term.

As coastal flooding in Washington is often caused by a combination of factors — a winter storm combining with a king tide, for example — CoSMoS is well suited to the needs of planners here. "The model couples together a lot of different coastal impacts. It's not just sea level rise data, just wave data, just storm data — it's all of those things together, and all of those things can be factors in the flooding that people experience," says Sydney Fishman, coastal management specialist at WSG. "The fact that CoSMoS can model all of these factors, that makes it especially important for our geography."

Predicting local flooding impacts with this level of precision has many uses, especially to local planners. A growing number of counties are beginning to actively plan for future higher water levels, more intense storms, and the flooding they bring. Data such as those from CoSMoS and its associated web tools help planners determine which assets — from roads to ports and parks — are most at risk, and which are most in need of action. CoSMoS has even been combined with other information to show, for example, disparities in local socioeconomic vulnerability in flood exposed areas. With information in hand, planners can begin to determine which mitigation and adaptation strategies will work best to protect their particular communities.

In their effort to spearhead outreach efforts, WSG staff will be rolling out the modeling system, connecting it to communities and helping them implement it. Miller is hopeful that with CoSMoS, more jurisdictions and tribes will soon be able to access the information they need to start planning for sea level rise.

King tide flooding at the Guemes Island ferry lot, 2022. Photo submitted by Sally Peyou to the King Tides program via MyCoast.

FIELD NOTES

Left to right: Bridget Trosin, Melissa Poe, Kevin Decker and Jeff Adams

WSG staff were nominated for several awards this academic year. WSG's 2023 team leads — **Jeff Adams, Kevin Decker, Melissa Poe**, and **Bridget Trosin** — were nominated for the University of Washington's Distinguished Staff Award in the Collaboration category. Individuals and teams are nominated in the Collaboration category for making an outstanding achievement or providing ongoing excellence through effective collaboration. Through the College of the Environment, **Katy Curtis** was nominated for the Distinguished Staff Award and **Kayj Morrill-McClure** was nominated for Outstanding Commitment to Diversity, Equity, Inclusion, Justice and Accessibility (DEIJA). Congratulations to these staff on their excellent work!

Katy Curtis

Kayj Morrill-McClure

WSG is excited to welcome several new staff this season. **Azalea Hermann** is the new fellowships and workforce development specialist. In her role, Azalea will manage recruitment, engagement, professional development and more for WSG's growing cohort of fellows. **Allison Spooner** is the new HR and equity specialist, focusing on employee relations and general human relations responsibilities that incorporate inclusion and equity throughout. **Jessika Tantisook** is WSG's first Economic Recovery Corps (ERC) Fellow. Jess is part of the inaugural cohort of the new ERC Fellowship from the US Economic Development Administration and will work with **Kevin Decker**, WSG coastal economist, on several projects focused on economic development on the Washington coast.

Azalea Hermann

Allison Spooner

Jessika Tantisook

WSG environmental outreach specialist **Aaron Barnett** was recently in the news for facilitating the creation of some of the first solar powered, zero-emissions mobile pumpout boats used in Washington. Barnett leads the Pumpout Washington program to improve marine water quality through advancing proper marine sewage disposal among recreational boaters. Introducing concepts successfully implemented on the East Coast, Barnett helped to kickstart two projects with the Northwest School of Wooden Boatbuilding using Clean Vessel Act funding. Students at the School constructed one zero-emissions pumpout boat and a first-of-its-kind removable solar powered pumpout skid unit. The story was reported in *Marina Dock Age* and *Soundings*.

WSG is a partner on a new project titled Blue Carbon, Green Fields: Mobilizing Marine Algae to Benefit Sea and Soil in the Pacific Northwest through carbon specialist **Meg Chadsey**. As seaweed grows, it absorbs carbon dioxide that contributes to ocean acidification. The Blue Carbon, Green Fields project will pilot the practice of harvesting nuisance seaweed from shellfish farms in Puget Sound and applying it to agricultural soils, using carbon captured in the seaweed to improve soil quality. The project is a partnership between WSG, researchers from the University of Washington and Washington State University Extension, Viva Farms, Puget Sound Restoration Fund and Baywater Shellfish, and is funded through the US Department of Agriculture's Partnerships for Climate-Smart Commodities grant program.

River & Ocean Film Festival

Ian Miller

WSG's River & Ocean Film Festival, led by coastal hazards specialist **Ian Miller**, returns this year after a several-year hiatus. The festival highlights the natural and social dimensions of the coast and coastal watersheds of the Olympic Peninsula. This year for the first time the festival will have two showings, one in Forks and one in Port Townsend. This year's festival will be brought to you by the North Pacific Coast Marine Resources Committee, Olympic Coast National Marine Sanctuary, the Clallam County Marine Resources Committee, and Surfrider Foundation, in addition to WSG.

WSG received additional funding from NOAA Sea Grant in 2023 to support work to advance resilience in coastal and fishing communities throughout Washington state. The WSG project seeks to enhance Washington coastal resilience in several ways, including but not limited to: broadening outreach to coastal communities on coast-specific climate hazards; connecting marine and coastal resource managers with funding opportunities to address coastal hazards; communicating hazard risk reduction and resilience best practices to coastal stakeholders; and increasing capacity for shoreline erosion monitoring and analysis. The WSG project also aims to promote resilience in Washington state fisheries by increasing WSG staff capacity, providing new and expanding existing trainings, supporting direct seafood marketing and sales, and supporting the Makah Tribe's Food Sovereignty Program through increasing seafood access and distribution.

WSG and the Washington departments of Ecology, Transportation, and Fish and Wildlife received $850,000 as part of a new grant to support coastal resilience work. The grant comes from the National Coastal Resilience Fund, a partnership between the National Oceanic and Atmospheric Administration (NOAA) and the National Fish and Wildlife Foundation. In particular, the funded project will allow the Washington Department of Transportation to update its 2011 climate impacts vulnerability assessment. WSG will provide technical expertise in incorporating new data and tools, including up-to-date local sea level rise projections, into this assessment. WSG will also join the project team in working with local partners to identify three to six nature-based hazards resilience projects to implement at the community level. WSG will help to develop and implement community and stakeholder workshops toward this goal, as well as serve as a liaison between this project and other sea level rise and climate adaptation projects in Washington state.

King tide flooding at Cooks Cove, Guemes Island, 2022. Photo submitted by Sally Peyou to the King Tides program via MyCoast.

WSG's two newest student assistants are Manya Chadha and Zach Bengtsson. Manya assists the communications team in web and social data analytics, content updates and more. Zach joins WSG Crab Team, where he will help to engage community science volunteers in the early detection and monitoring of invasive European green crab.


Zach Bengtsson


Manya Chadha

Jess Davis and Brian McGreal are the new WSG Science Communications Fellows. As part of the communications team, Jess will contribute to the WSG News Blog, monthly newsletter and social media. As well as writing for the communications team, Brian will focus on event planning initiatives for the River & Ocean Film Festival.


Jess Davis


Brian McGreal

WSG director update

WSG is pleased to provide an update on its search for a new director. The Dean's Office of the University of Washington's College of the Environment and WSG are jointly exploring a new model for WSG leadership that would add a faculty director to our leadership team. We believe this new model will serve to maintain existing WSG programs and partnerships while providing additional valuable connections to research, expertise and resources for the benefit of Washington's coastal communities.

Dr. Terrie Klinger, professor in the College of the Environment's School of Marine and Environmental Affairs and longtime Sea Grant partner, will step in as director on an interim basis to help WSG build our new leadership model starting in July. The College of the Environment intends to recruit a member of the UW faculty to serve as permanent director of WSG by September 2025. Kate Litle will continue as deputy director, leading programs and other strategic partnerships and activities at WSG.

Terrie, Kate, and the rest of WSG's outstanding leadership team and staff will continue to deliver research, technical expertise, community engagement and education to support the needs of Washington's residents and the marine systems they depend on. We look forward to this opportunity to build on the impressive strengths that WSG has developed over decades of collaboration and engagement with partners in Washington's coastal communities.

Thank you,

WSG Leadership Team

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The other tsunamis • continued from page 7

Garrison-Laney drills into the earth to take a sediment core.

Even as recently as the eighties and nineties, radiocarbon dating was far from precise. Garrison-Laney explains that in some cases, it would have been impossible to tell whether two tsunamis happened 100 or 300 years apart. Thanks to knowledge gained since then, improved analytical methods, and cheaper high-precision dating, scientists have been able to revisit previously studied sites and sieve them for more information. The Discovery Bay project is a significant success for Garrison-Laney, as she was able to narrow the date ranges of three tsunamis to within 100 years. "When the ranges are smaller, you can feel a lot more confident with making correlations," Garrison-Laney explains. "We're seeing a lot of evidence around Washington and Vancouver Island for an earthquake and a tsunami that happened about 600 years ago that we don't see in southwest Washington." That is important information: something about the subduction zone that we didn't know before.

All that being said, Garrison-Laney is cleareyed about the nature of the work. She describes research contributions as small bits that cumulatively, over time, turn into something larger and more significant. That's why the other piece of her role is sharing tsunami science that is as up to date as possible. She does this through a variety of venues, from serving on the Tsunami Science and Technology Advisory Panel, a standing working group of the National Oceanic and Atmospheric Administration's Science Advisory Board, to consulting with specific communities about the tsunami risk they face and what they can do to prepare. Some communities are more risk tolerant than others, and decisions can range from where to locate emergency supplies to what actions people should take if the earth begins to rumble beneath their feet. "I think what we should always do is give people enough information that they can incrementally get to a safer place," she says. Garrison-Laney is a strong believer in vertical evacuation options, and in not giving up if the earth starts to shake — because the earthquake-tsunami event that does happen in our lifetimes may not be the Big One, but a smaller one from a fault you've never heard of.

"I work on earthquakes and tsunamis, which are horrible deadly events," Garrison-Laney says. "That part of it doesn't excite me, but I do want to understand them. When you can make sense out of it, or help someone else make sense out of it, that helps take some of the fear out of it."