



Sea Star

Greener Shores, Happier Homes

A new pilot project helps homeowners safeguard the shores on which they reside

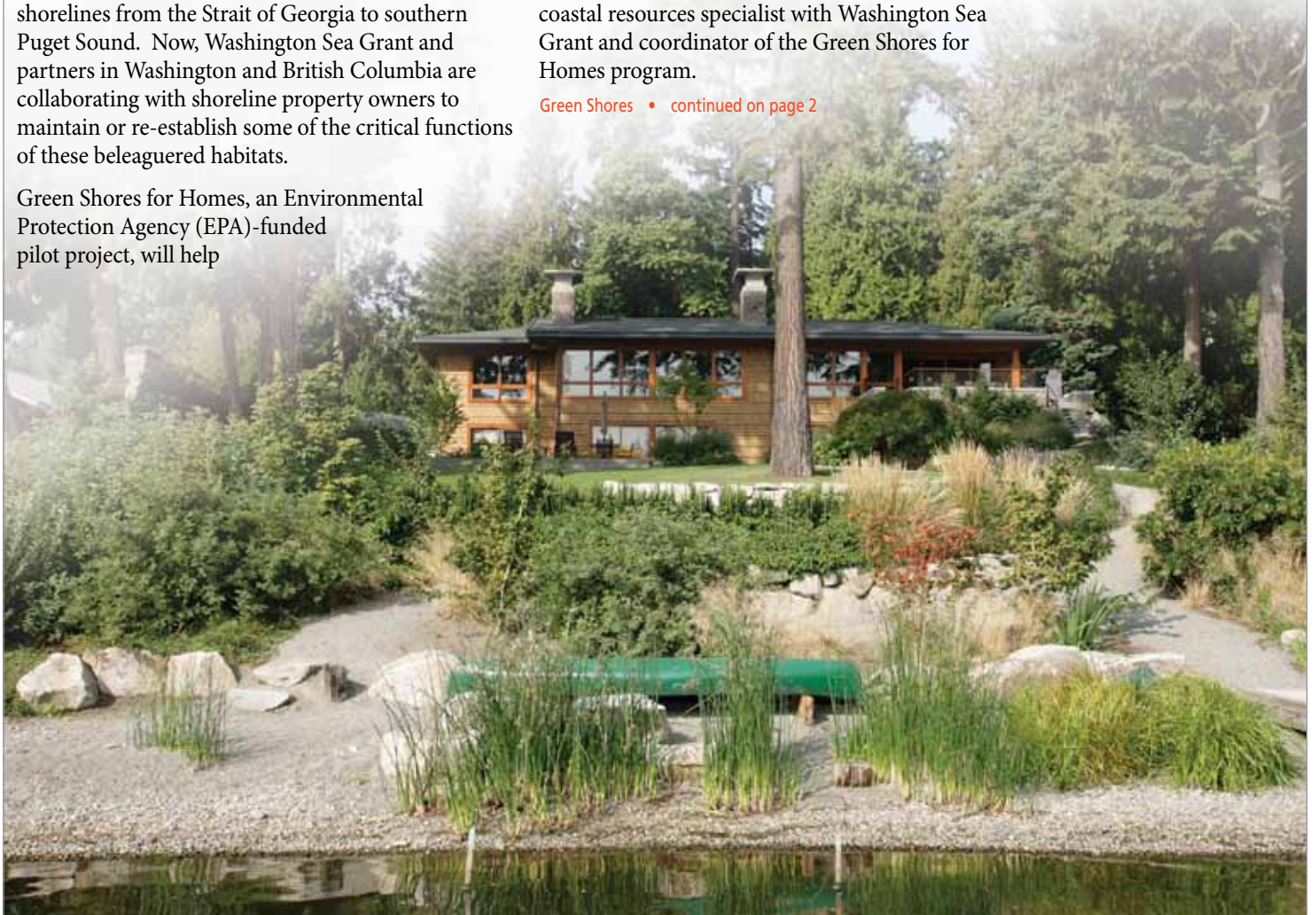
By Megan McPhaden, Spring 2011 WSG Science Writing Fellow

The densely forested coastlines of the Pacific Northwest have been significantly altered over the past centuries. Bulkheads and other man-made “armored” structures currently line over 25 percent — and in some regions as much as 60 percent — of shorelines from the Strait of Georgia to southern Puget Sound. Now, Washington Sea Grant and partners in Washington and British Columbia are collaborating with shoreline property owners to maintain or re-establish some of the critical functions of these beleaguered habitats.

Green Shores for Homes, an Environmental Protection Agency (EPA)-funded pilot project, will help

property owners with developing or retrofitting their shoreline parcels in a more sustainable manner. “By providing technical guidance and incentives, we hope to benefit both homeowners and the ecological functions of shorelines,” says Katrina “Kat” Hoffman, coastal resources specialist with Washington Sea Grant and coordinator of the Green Shores for Homes program.

[Green Shores](#) • [continued on page 2](#)





Katrina "Kat" Hoffman, WSG Coastal Resources Specialist

Beaches and their intertidal zones are ideal places for sand castles, long walks and bare toes. But by linking terrestrial and marine food webs, they are also essential to the survival of many plant and animal species. At low tide, clams, mussels and other bivalves are exposed for hungry gulls and oystercatchers. At high tide, surf smelt, sand lance and other forage fish deposit their eggs on mixed sand and gravel beaches, while juvenile salmon edge closer to shore to feed on insects falling from overhanging trees and brush.

In addition to providing nutrition for sea life, those remnant forests of Douglas fir, western red cedar, madrone, salal and fern stabilize banks, buffer the effects of storms on upland areas and provide habitat for birds and mammals. Felled trees, snags and other forms of large woody debris are also important contributors to coastal habitats, conferring significant ecological benefits to nearshore life. Early Salish peoples recognized the value of such interactions between land and sea: by floating bundled conifer branches in shallow waters, they could harvest large quantities of nutritious herring eggs.

These shoreline habitats rely on the natural erosion of coastal bluffs and upland areas to supply sediments and nutrients to keep them "alive." However, structures such as bulkheads or seawalls can inadvertently interrupt natural beach processes, causing more overall harm than good.

Is it possible to maintain or improve the vital functions of shorelines while supporting the growing population of people who choose to live near the water? "Hopefully," says Hoffman, who believes that both local jurisdictions and individual homeowners must work to address the issues. "Even with well-crafted federal, state and local shoreline development regulations, there can still be significant cumulative impacts from

single-family homes on shoreline parcels throughout the Puget Sound," she says. "Through technical guidance and incentive-based approaches, Green Shores for Homes will address this issue in a new way, allowing shoreline homeowners to invest in choices that feel right for them and the shorelines they appreciate."

The Green Shores for Homes program is completely voluntary and will help participating homeowners evaluate suitable options for improving their properties by providing information on sustainable shoreline design and guidance on how to reach specific target levels within the program. These guidelines and targets are similar to the LEED™ building standards used to evaluate the environmental performance of Green Buildings, but with a shoreline-centric approach. "The local jurisdictions that are piloting this program have committed to assisting willing homeowners who meet the high standards of the Green Shores for Homes program," says Hoffman.

Assistance could come in the form of expedited permit processing, educational outreach, planning guidance or extra hands to help with implementation. Projects that might be recognized in the Green Shores for Homes ratings system include planting native vegetation, diverting stormwater runoff, removing a bulkhead, creating a pocket beach, reducing artificial lighting of the shoreline or even changing the orientation of a dock to alter the effects of shading for juvenile salmon and submerged aquatic vegetation.

This stretch of reconfigured beach on Samish Island relies on beach nourishment to restore the sand, gravel and logs that had once marked this shoreline (below). The same Samish Island beach (inset, facing page) before efforts were made to soften the shore by removing the concrete seawall.





The inspiration for Green Shores for Homes came from two places. A previous iteration of the Green Shores™ program, initiated by the Stewardship Centre of British Columbia, focused on mixed-use and commercial shoreline development in British Columbia, while an effort called “Green Shorelines” led by the City of Seattle generated shoreline restoration design, cost and permitting information for homeowners interested in contributing to a healthier Lake Washington. When key players from both initiatives met at an Urban Waterfront Revitalization conference in 2008, they immediately recognized the programmatic synergies and were eager to collaborate. Although the Salish Sea knows no political borders, trans-boundary partnerships like these are rare but crucial for the ecological health of the region.

Hoffman convened a trans-boundary working group in 2009 to initiate brainstorming, which eventually led to the idea of Green Shores for Homes. A subsequent grant proposal solidified partnerships among the City of Seattle, San Juan County, a federation of Canadian Gulf Islands under the jurisdiction of Islands Trust and a technical team of scientists and engineers led by Victoria-based Archipelago Marine Research Ltd.

In March 2010, the EPA awarded more than \$500,000 to the City of Seattle and San Juan County, along with partners Washington Sea Grant and Archipelago Marine Research Ltd., to develop the Green Shores for Homes ratings and credit system. The grant will fund the development of incentives to encourage shoreline homeowners to participate, in addition to trainings for homeowners, builders and developers in Seattle and San Juan County. Each jurisdiction will tailor incentives to meet specific local needs and capabilities. It will be up to each homeowner or developer to determine what credits are attainable on their property, and project staff will work to help them understand their various options.

One of the first tasks for this project is to map and classify shoreline areas amenable to the Green Shores for Homes approach. These maps will serve as decision-making aids for project staff, property owners and professionals in the building industry. “We do not want a project to fail, so we will not encourage people to take actions that would lead to detrimental erosion. Not all shorelines are the same,” says Maggie Glowacki, a shoreline planner with the City of Seattle. “Many property owners are wary of

erosion risks due to armoring removal and are very interested in learning how to improve their property without this loss.” While some property owners could remove a bulkhead, the best bet for others may be to cultivate a diversity of native trees, shrubs and grasses.

Although the Washington State Shoreline Management Act of 1971 created new regulations for shoreline development, many shoreline properties were developed prior to the passage of this legislation and, as such, do not necessarily conform to current standards. Furthermore, “when one person installs a bulkhead, there often is a domino effect in which properties adjacent to bulkheads can become vulnerable to increased erosion, requiring action by other homeowners, as well. So you often see multiple seawalls in a given local area,” offers Hoffman.

Instead of succumbing to the cascading effect of building bulkheads, communities can protect and restore shorelines through other means. In 1998, a dozen property owners on Samish Island were faced with chronic beach erosion and serious storm damage despite the long-term presence of a concrete seawall. They considered rebuilding a larger seawall, but after research and community discussion, they chose a softer alternative, employing beach nourishment to restore the sand, gravel and logs that had once marked this shoreline. Not only did this successfully restore fragile intertidal habitat and the natural movement of sediment on their beach, but it has also proven remarkably effective at addressing the original erosion problem.

“I’m looking forward to working with Sea Grant, and Kat has been a great motivator to get us going,” notes Brian Emmett of Archipelago Marine Research Ltd. and coordinator of the technical team.

Hoffman herself is quite inspired by this project. “It is so encouraging to see a trans-boundary partnership dedicated to benefiting the Salish Sea ecosystem and our communities,” she says. “Political leaders in British Columbia and Washington have signed commitments to collaborate on coastal and ocean issues, but these efforts aren’t always obvious to folks working ‘on-the-ground.’ With Green Shores for Homes, local jurisdictions are facilitating collaboration in a way that should benefit homeowners and the Salish Sea ecosystem on both sides of the border.”

For more information about the Green Shores for Homes project, contact Katrina Hoffman at 360.416.7048 and kathoff@uw.edu.

WSG Science Writer David G. Gordon and Vicki Loe, communications coordinator of NOAA's Office of Response and Restoration, shared an Awards for Public Excellence (APEX) award for their work on the new OR&R program brochure. OR&R is one of several outside clients, including the UW's Program on the Environment and Joint Institute for the Study of the Atmosphere and Ocean, that have benefitted from WSG Communications in the past year.

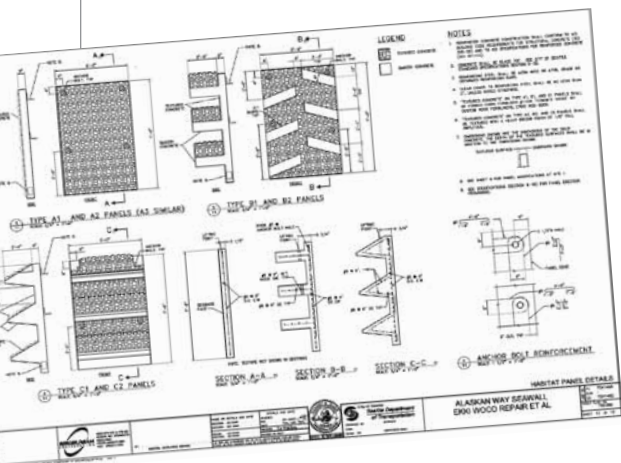
Working under contract with the Whatcom County Marine Resources Committee, **WSG Water Resource Educator Sue Blake** helped coordinate expansion of the Shore Stewards program to over 100 new members. Information about the program was provided through presentations to nine local groups, articles in newsletters and the use of existing email lists "We also mailed postcard flyers to 2,017 waterfront property owners," says Blake. "Through that effort and our online enrollment campaign, we now have more

than 300 Shore Stewards in our county." New members receive educational materials about shoreline-friendly practices, a lawn sign and a quarterly Shore Steward newsletter. Members were surveyed about the influence of the Shore Stewards program on their lives, and all the respondents indicated high degrees of positive behavioral change. For information about Shore Stewards, contact Blake at 360.676.6736 and sgblake@wsu.edu or visit the Shore Stewards website at www.shorestewards.wsu.edu/whatcom/index.html.

With the arrival of autumn, it's time to say farewell to **Heather Wiedenhoft, WSG's Summer 2011 Science Writing Fellow**. During her 10-week fellowship, Wiedenhoft worked on an article for *Sea Star* (page 6 of this issue) and crafted news features for the soon-to-be-revamped WSG website. As this issue goes to press, applications are being received for Heather's successor, the recipient of the fall 2011 fellowship. For more information or to apply for the winter 2012 fellowship, contact David G. Gordon, 206.685.8191 and davidg@uw.edu.

Engineering Ecosystems on Seattle's Sea

By Liz Ewings, WSG Communications Intern



In the early 1900s, the Denny Regrade project flattened the slope of one of Seattle's steepest hills. Dirt from the regrade and similar projects throughout Seattle was used as fill to fortify the city's newly constructed seawall along the waterfront of Elliott Bay. Improved shipping as a result of the seawall and the deepwater moorage it offered would, over time, transform Seattle into a hub of international trade.

Unfortunately, the seawall that transformed Seattle's Central Waterfront also transformed the shoreline ecosystem. The mudflats and gently sloping beaches of the old, unimproved waterfront — formerly the home for a bounty of birds, fish, marine invertebrates and plants — were lost. Especially hard-hit were Elliott Bay's once-abundant populations of juvenile salmon. Historically, these fish, including now-endangered runs of Chinook salmon, relied on the food and shelter found along Elliott Bay's undeveloped shores. With nearly three kilometers of hard, vertical seawall replacing the natural shoreline, the city's Central Waterfront was no longer a fish-friendly place.

Concerns were raised in 2001, when parts of the seawall settled as a result of sediment liquefaction during the Nisqually earthquake of that year. Close inspection revealed that the seawall would need to be replaced. Instead of replacing the old structure with an equally salmon-challenging one, Jeff Cordell, a

member of the University of Washington's Wetland Ecosystems Team, along with habitat managers from the City of Seattle, hatched a plan.

"In general, seawalls have fewer species of marine flora and fauna than do natural beaches, probably because flat, vertical structures don't provide a variety of habitats," says Cordell. "There are fewer crevices and overhangs for algae and sessile invertebrates like barnacles and anemones to attach, fewer amphipods and insects to feed fish, and fewer places for juvenile fish to find shade and hiding places from predators."

Studies of seawalls in Sydney, Australia, have established that even the simplest improvements, such as adding submerged flowerpots to seawalls, have tripled the number of species living on these artificial structures. Cordell reasoned, why not enhance the new seawall's vertical surfaces, giving structural and textural complexity through the addition of shelves, fins and cobbled stone surfaces?

With funding from Washington Sea Grant, King Conservation District and the City of Seattle, Cordell and his team created three kinds of prototype panels — flat, featureless walls, ones with steps that mimic overhangs and ones with sloping diagonal fins — that, when installed, would potentially enhance the ecosystem function of any new seawall structures. The three kinds of panels were also replicated in two forms: with smooth and with cobbled surfaces.

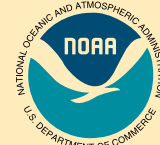
The five-foot wide by seven-and-a-half-foot-tall test structures were installed with their bases at the zero-foot tide mark at three sites along the waterfront: at Clay Street, Vine Street and the Seattle Aquarium. Unaltered "reference" walls were also sampled at each

WSG Marine Field Agent Steve Harbell recently gave two presentations at the Fifth National Aquaculture Extension Conference in Memphis. The conference was designed to provide a forum for extension and Sea Grant aquaculture professionals to enhance programming for the benefit of the aquaculture industry. Harbell's presentations covered new developments in aquaculture extension in the Western region and recent research and outreach efforts related to shellfish culture impacts to estuarine systems in the West.

"The conference provides one of the only opportunities for extension aquaculture professionals nationwide to plan, organize, implement and evaluate programs and techniques to better serve industry clientele," says Harbell. "With warm temperatures and Memphis barbecue, I felt like summer had finally arrived." Contact Harbell at 360.875.9331 or sharbell@u.washington.edu.

This past summer, **Jeff Adams, WSG Marine Water Quality Specialist** in Kitsap County, met with teachers and students at five local schools to discuss the possibility of building rain gardens and integrating this activity into school curricula. If all goes as planned, his WSU and Kitsap County colleagues, teachers and students will be working with Washington Conservation Corps to install the gardens at the schools. Rain gardens are efficient and aesthetically pleasing means to manage stormwater runoff, replenish groundwater

supplies and provide habitat for native Northwest animals and plants. For more info: Jeff Adams, 360.337.4619 or jaws@u.washington.edu.



Editor, David G. Gordon; Designer, Robyn Ricks; Web Editor, Marcus Duke; Communications Manager, Dan Williams. Photos: Cover, Ben VanHouten; pages 2-3, Hugh Shipman; 4-5 Jeff Cordell; 6 (top) NOAA Science Camp, (center) Samantha Brombacker. All other photos © Washington Sea Grant, except as noted. ©2011, University of Washington, Board of Regents. WSG-MR 11-06

seawall

site to compare the existing community of marine organisms with the community that is populating the test walls. Portions of the seawall itself were also pressure-washed to remove algae and invertebrates and thus function as control panels.

Every two weeks during the peak salmon migration seasons of 2008 and 2009, Cordell's team observed fish from above, using polarized glasses to note both the numbers and behaviors of the fish. They donned dive suits and gear to count fish and larger invertebrates underwater and even sent out miniaturized remotely operated vehicles (ROVs) to videotape marine life at various times of the day and night.

To capture small organisms that live on the thin layer of algae and diatoms, the team relied on an epibenthic pump — a sophisticated form of dust buster that sucks everything from its plastic holding chamber into a collection sieve. After marking off sections of the panels into standardized zones known as quadrats, they also compared the percentages of the surface covered by algae and sedentary invertebrates.

Results from the first two years showed a succession of species colonizing the structures, led by ephemeral algae and sessile invertebrates such as barnacles. These set the stage for more complex organisms, including bay mussels (*Mytilus trossulus*).

"Mussels are called 'ecosystem engineers' because their presence has such a large effect on the diversity of organisms in the habitats where they live," says Cordell.

Analysis of additional data collected in 2010 and 2011 is now underway. The ecological communities

of both the smooth finned and stepped panels are most rapidly approaching the types of communities found on segments of the unaltered reference seawall — evidence, as Cordell says, "that marine organisms return quickly when provided with good places to live."

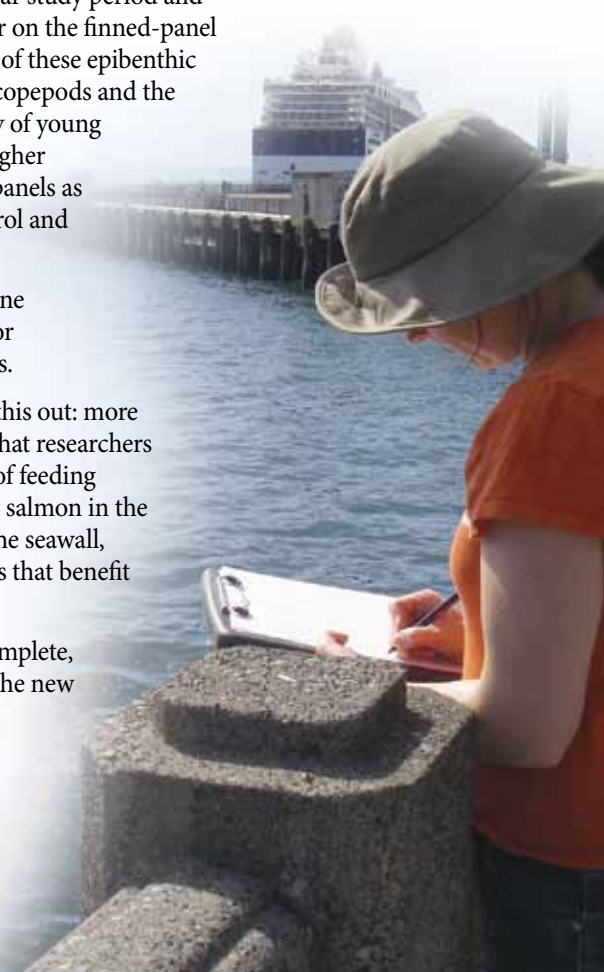
The diversity of epibenthic animals — those associated with the micro-flora of the panels — increased quickly over the two year study period and was as much as 50 percent greater on the finned-panel than on flat-panel designs. Many of these epibenthic organisms, such as harpacticoid copepods and the larvae of midges, are favored prey of young salmon. Both had significantly higher densities on stepped and finned panels as compared to flat panels and control and reference seawall areas.

"Simply put, more bugs and marine invertebrates means more food for juvenile salmon," Cordell explains.

Data from the panel study bears this out: more than half of the juvenile salmon that researchers monitored exhibited some form of feeding behavior. Almost all of the young salmon in the area were seen within 10 feet of the seawall, close to the habitat enhancements that benefit their prey.

Once the seawall evaluation is complete, results will be incorporated into the new Elliott Bay seawall.

For more information, contact Jeff Cordell at 206.543.7532 and jcordell@uw.edu.





NOAA Science Camp

Seventh and eighth graders participated in a range of indoor and outdoor activities during two sold-out sessions of NOAA Science Camp. The camp is co-sponsored by Washington Sea Grant, Joint Institute for the Study of the Atmosphere and Ocean and several NOAA offices. For information on next year's sessions, contact Maile Sullivan, WSG Education Coordinator, at 206.543.2822 and mailesul@u.washington.edu.



Ocean Acidification Comes to the Classroom

By Heather Wiedenhoft, Summer 2011 WSG Science Writing Fellow



Garfield High School students carefully add carbon dioxide to seawater containing oyster spat before observing and recording the results.

For more information about the school project, contact Brent Vadopalas at 206.685.4689 and brentv@uw.edu.

This past spring, students at Seattle's Garfield High School were busy watching bubbling bottles of sugar, yeast and water — small manufacturing plants for carbon dioxide, a greenhouse gas. As they watched, UW graduate student Siri Nelson described the carbon cycle and the phenomenon of ocean acidification —how

the ocean takes in atmospheric carbon dioxide and converts it to carbonic acid, reducing the seawater's pH and making it difficult for clams, oysters and other marine invertebrates to build calcium carbonate shells.

The bubbling bottles were part of an ingenious outreach effort tied to a Washington Sea Grant-funded research project. Led by Carolyn Friedman and Brent Vadopalas of the UW's School of Aquatic and Fishery Sciences, with additional funds from NOAA's Northwest Fisheries Science Center, this effort was designed to help high-school students understand the emerging threat of ocean acidification on Puget Sound shellfish.

The outreach curriculum was assembled and organized by SAFS undergraduate capstone student Sammi Brombacker and Nelson, a UW Ocean and Coastal Interdisciplinary Science graduate student fellow. Guided by Brombacker and Nelson, groups of

Garfield students set up their experiments, using gear that included beakers with live oyster larvae (known as spat) donated by Taylor Shellfish Farms. Students placed the spat into acidified and non-acidified seawater. Over the course of two weeks, they measured the water's pH, as well as the relative buoyancy and color-change of the spat. These latter measures are indicators that the increased acidity of the seawater was eating away at the spat's naturally thin shells. Some of the spat didn't survive this change, a potential predictor of survival rates in natural conditions if ocean acidity continues to increase.

Overall, the project was a huge success, attracting students from a total of eight Garfield biology, environmental science and chemistry classes. As with any lab work, some students' experiments ran more smoothly than others. "Many of them encountered problems similar to those that advanced research scientists must overcome," says Nelson. "But in the end, the students were able to grasp the science behind the project, and that's what we really were hoping for."

Vadopalas says there has been sufficient interest in continuing the program next year, and he hopes the program will expand to include high-school chemistry and math classes. The hook, according to Vadopalas, is using live specimens to help keep high-school students engaged in the project. "For them, it was like having tiny classroom pets," he says. "They could visualize the outcome of ocean acidification and that started them thinking about ways to stop, or at least slow, this disturbing trend in our oceans."

Visit us at one or all of these fine fall events:



October 1-2
30th Annual West Coast Oyster Shucking Championship and Washington State Seafood Festival (a.k.a. OysterFest) at the Port of Shelton Fairground; www.oysterfest.org or contact Teri King at 360.432.3054 or guatemala@uw.edu



October 25-27
2011 Salish Sea Ecosystem Conference, at the Sheraton Wall Centre in Vancouver, British Columbia. WSG staff will be giving presentations, chairing workshops and emceeding the Salish Sea Ecosystem Film Festival; www.salishseaconference.org/ or contact Raechel Waters at 206.685.8209 and rlwaters@uw.edu

November 5
Sound Living — Exploring the Connections Between Water, Land and People, from 9 a.m. to 4 p.m. at Everett Community College. WSG Director Penny Dalton is the keynote speaker for this one-day “Communiversities”; www.beachwatchers.wsu.edu/snohomish/events/documents/SoundLiving2011.pdf or 425.357.6028

November 12
Elliott’s Oyster New Year Bash, a seafood extravaganza and fundraiser for shellfish restoration projects, hosted by Elliott’s Oyster House on the Seattle waterfront; 206.623.4340.

November 18-20
Pacific Marine Expo, the West Coast’s largest marketplace for the working waterfront, at the Qwest Field Event Center in Seattle; pacificmarineexpo.com/09/public/enter.aspx, or contact Pete Ganger at 206.685.9261 or pgranger@uw.edu

New Hershman Fellows Announced

Four graduate students will be putting their marine science and policy skills to good use through Marc Hershman Marine Policy Fellowships. The program matches outstanding students with state agency “hosts” for a one-year paid fellowship in Olympia or Tacoma.

Bridget Emmett received her bachelor’s degree from St. Mary’s University in Winona, Minn., and recently completed her master’s degree at the University of Washington’s School of Marine and Environmental Affairs (SMEA). She will be working with the Department of Ecology to advance marine spatial planning and policy development in Washington.

Heather Gibbs earned her bachelor’s degree at the University of Washington’s School of Aquatic and Fishery Sciences and her master’s degree from SMEA. She will be working with the Department of Natural Resources to track and analyze policies and regulations protecting eelgrass, an important component of Puget Sound’s nearshore habitats.

Clara Hard received a bachelor’s degree in biology from Williams College, Williamstown, Mass., and a master’s degree from SMEA. Her host state agency will be the Department of Health, where her duties will include studying and monitoring harmful algal blooms and developing an information network among state, tribal and local agencies on the prevalence of emerging marine toxins.

Allison Smith is a graduate of Columbia University and is a candidate for a master’s degree in environmental studies at the Evergreen State College, Olympia. Her fellowship will be with the Puget Sound Partnership, where she will help develop the policy and science framework for implementing a network of marine protected areas in Puget Sound.

For information on the Hershman Fellowship, please contact Nancy Reichley, 206.685.8302 and reichn@uw.edu.



Announcements, event info and program updates are only a click away — at Washington Sea Grant’s new Facebook page, www.facebook.com/WaSeaGrant.



Washington Sea Grant
University of Washington
Box 355060
3716 Brooklyn Avenue NE
Seattle, WA 98105-6716

AUTUMN 2011

GREEN SHORES FOR HOMES
SEATTLE SEAWALL PANELS
OCEAN ACIDIFICATION LAB

Seminar on Ocean Acidification

Town Hall Seattle
8th Avenue and Seneca Street
Seattle

Tuesday, November 8

Reception: 5:30-6:30 p.m.

Presentation: 6:30-8 p.m.

Breakout Sessions:
8-9 p.m.

On the evening of November 8, WSG is collaborating with Sustainable Path Foundation on a seminar titled *Dissolving Before Our Eyes: Ocean Acidification*. This special event will feature Dr. Richard Feely, senior scientist with NOAA's Pacific Marine Environmental Laboratory, and Dr. Brian Baird, former Washington (3rd District) Congressman and former chair of the House Science and Technology's subcommittee on Energy and Environment.

The two distinguished speakers will describe the science, environmental and economic consequences and political opportunities and challenges of ocean acidification. A symposium is scheduled at the University of Washington for the following day.

For information about the seminar, contact info@sustainablepath.org or 206.443.8464 and for the symposium, contact Meg Chadsey, event coordinator, at megchadsey@gmail.com and 206.669.1387.