Washington Sea Grant Program
University of Washington

Spring 2005
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Sea Star

Innovative Approaches to Fisheries Management:

Sea Grant-Funded Scientists Offer Fresh Perspectives to Resolving Long-Standing Environmental and Economic Concerns

What exactly is a fishery?

"It's the interaction of three variables: an ecosystem, an economy, and a management scheme," says UW professor Robert Francis. That definition, first put forth by University of Wisconsin law professor Arthur McEvoy, has guided Francis and his cohorts, John Field and Jodie Little, to explore the oceanic ecosystem known as the Northern California Current from biophysical and socioeconomic perspectives.

A shallow, wide and slow-moving body of water, the California Current flows south, seaward of the Continental Shelf, from Vancouver Island in Canada to the Baja Peninsula of Mexico. Within this large region, many fish populations and the fishing communities that depend on them are in a state of crisis. Long-lived and slow-growing groundfish stocks have been severely depleted, their numbers so drastically reduced that the Pacific Fisheries Management Council deemed it necessary in 2003 to close the region to most commercial fishing activities as an emergency measure.

"The effects on fishermen and fishing-dependent communities on the Pacific coast were devastating," says Francis. "On the other hand, fisheries for high-turnover invertebrates such as shrimp and Dungeness crab, have been booming," he notes. "Clearly, decision makers need to take a more proactive approach to fisheries management — one that incorporates such things as climate variability, life-history characteristics and species interactions within the Northern California Current ecosystem."

Fisheries management •
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Robert Francis

Measuring Impacts with a Multi-Species Model

With funding from Washington Sea Grant Program, Francis worked with Field, then a doctoral student, to help shape Field's dissertation, Application of Ecosystem-Based Fishery Management Approaches in the Northern California Current. Submitted in 2004, this insightful document detailed an investigation of the large-scale structure and dynamics of the Northern California Current and used a multi-species model to evaluate the impacts of fishing and climate on the current's trophic structure and dynamics. With this model, Field identified some key elements of a regional Fisheries Ecosystem Plan for the Northern California Current, with which resource managers and decision makers might more effectively provide governance.

In modeling interactions among the ecosystem's components, Field identified two major influences: the movements of commercially exploitable Pacific hake (*Merluccius productus*), and variation in climate. "Pacific hake is the most abundant fish species within the Northern California Current ecosystem," explains Francis. "It provides the largest commercial harvest and, as a predator on other fish and invertebrates, has a major impact on the entire ecosystem. The other influence, climate variability, affects the oceanic food web from the bottom up, by determining the spatial distribution of planktonic communities, and from the top down, through its impact on the spatial distribution of predators," says Francis.

Field's dissertation offered three recommendations, all of which could be implemented immediately, to improve fisheries management efforts. First, resource managers should become better informed of the short- and long-term climate and ocean status trends and scenarios for the California Current and how these, in turn, affect the productivity of the resource. Second, management should consider fishing impacts on ecosystem structure and processes by incorporating what is known about food-web structure into assessment models. Third, new management approaches should be developed to protect critical life-history characteristics and ecosystem functions as well as maintain population abundances above threshold levels.

A Socioeconomic Element

Francis adds a fourth recommendation to the list. "We need to increase the focus on monitoring and modeling in the social–ecological realm. In fact it is the human inter-relationships and trade-offs that are of particular concern to decision makers."

This is what doctoral student Jodie Little is attempting to do in her WSGP-sponsored research project. Her study, titled Towards Sustainable Fisheries in the California Current, is linking two models: a biophysical model of the coastal marine food web and a socioeconomic model of port communities on the West Coast. The main linkage is through bioeconomic valuation — a methodology for expressing relationships between direct, commodity-based values and indirect values of beneficial ecosystem services.

"It's an important follow-up to Field's work and could have more immediate application to fisheries management," says Francis. "That's because the currency with which the information is presented needs to be more relevant to the managers' experiences. We're finding that, by itself, the biophysical context of the Northern California Current system is just not that compelling to non-scientists. We feel that management must begin to pay more attention to the many social and economic relationships that exist within a fishery and how, in turn, they both influence and are influenced by marine ecosystem processes and dynamics," offers Francis.

With funding from Washington Sea Grant Program, Francis, Field and Little are enhancing our understanding of the California Current ecosystem and helping to positively influence the future of fisheries throughout the world.

Searching for Genetic Clues

To the north and west of Francis' and Little's area of study, another species exists in even greater abundance than Pacific hake. The international catch of walleye pollock (*Theragra chalcogramma*) tops four million metric tons annually. The U.S. harvest represents 40 percent of all landings of food fish in this country.

Despite this seeming abundance, annual catches have declined since the days of unregulated pollock fishing, more than 20 years ago. Overall abundance in the northeastern North Pacific appears relatively stable, although harvests have fallen in the Gulf of Alaska and stocks in Puget Sound, at the extreme southern part of their range, have seriously dwindled.

Because of the pollock fishery's importance, and because so many other creatures, including marine mammals and seabirds, depend on pollock stocks for food, scientists and resource managers are turning their attention towards this much sought-after fish.

When UW professor Paul Bentzen proposed to use DNA testing to distinguish pollock stocks in the

various areas of abundance — the Gulf of Alaska, Bering Sea, Sea of Okhotsk and Sea of Japan, for example — Washington Sea Grant Program stepped forth with funding.

Working with co-principal investigator Kevin Bailey of the National Oceanic and Atmospheric Administration's Alaska Fisheries Science Center (AFSC), and with the help of UW doctoral student Michael Canino and postdoctoral associate Patrick O'Reilly, Bentzen isolated microsatellite genetic markers in pollock. These highly repetitive DNA sequences of variable lengths play no actual part in determining genetic traits but may identify discrete populations of a plant or animal species based on frequency differences of size variants. By comparing microsatellite markers in pollock samples from various regions, the three scientists gained fresh insights about the nuances of fishery management.

"We found that samples from Japan were distinct from Bering Sea and North Pacific samples," says Canino. To a lesser extent, the samples from Puget Sound were distinct from the North Pacific and Bering Sea.

"We were unable to find significant differentiation between the Bering Sea and Gulf of Alaska samples, or within either management area," says Canino.

The study supports the current policy of developing separate management strategies for pollock fisheries in the Gulf of Alaska and other broad geographic areas. It suggested that there was no immediate need to alter the existing approaches within those areas in response to the study results. According to Canino, the comparatively slight variability in DNA samples could turn out to be significant, once additional markers are developed and more samples are analyzed. "This could provide argument for managing them as one stock," he adds.

Because the 'genetic stock' criterion is the most stringent definition of stock, it is often difficult to resolve at spatial scales relevant to management. A precautionary approach is to treat them separately. "There's no question that most marine fish have some degree of population structure," according to Canino. "It's usually a question of geographic scale."

As for Puget Sound pollock, once an easily caught sport fish, the study's results could figure in any future drive to protect this stock under the federal Endangered Species Act.

Are hefty pollock catches (like this one) a thing of the past? The answer could lie in WSGP-funded research.

Wolf Bauer Video Available

Copies of *Wolf Bauer: The Inland Sea* are now available. This video captures an hour-long presentation given by Bauer at the Shoreline and Coastal Planners Group, Spring 2004 Meeting.

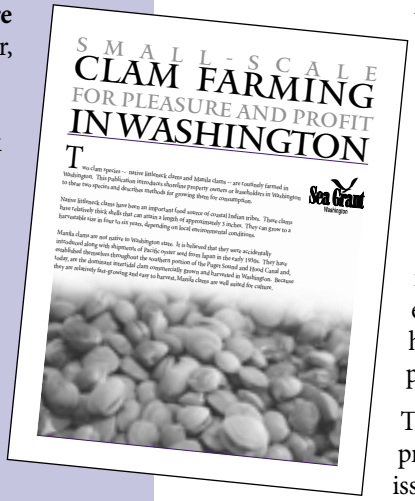
In the mid-1970's, when the Shoreline Management Act had just passed, Bauer was among the leading advocates of enlightened shoreline management in Washington. He gave presentations, analyzed shorelines, and worked with communities in developing new master programs.

Quite possibly the only videotape of its kind, *Wolf Bauer: The Inland Sea* is available to borrow, with a credit card as a deposit, from WSGP Publications, 3716 Brooklyn Avenue NE, Seattle, WA 98105-6716, *wsg.washington.edu/pubs/publications.html* or 206.543.0555.

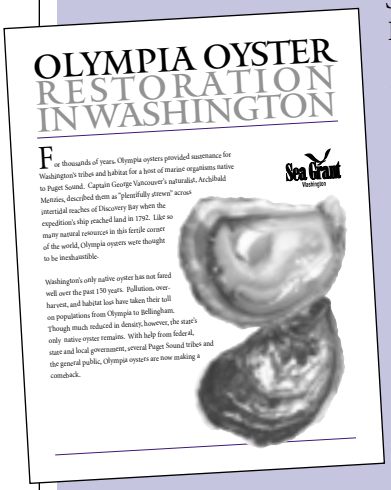
New Sea Grant Publications

We are pleased to announce two new publications in WSGP's popular aquaculture series:

Small-Scale Clam Farming for Pleasure and Profit in Washington contains clear, concise information on the biology, site considerations and culture techniques for growing Manila and native littleneck clams on area beaches. Written by shellfish biologist Derrick Toba, this handy booklet is ideal for both novice and experienced growers throughout the Northwest.



Olympia Oyster Restoration in Washington offers detailed instructions for rebuilding populations of native Olympia oysters (*Ostrea conchaphila*) to Washington's shores. This user-friendly publication is produced in conjunction with the nonprofit Puget Sound Restoration Fund.



Both documents are $5.00 each (Washington residents add 8.8 percent sales tax), plus shipping and handling, from WSGP Publications or online in pdf formats at *www.wsg.washington.edu,* click on "New."

Wainstein and Brennan, Welcome Aboard

Meet Michelle Wainstein and Jim Brennan, Washington Sea Grant Program's newest staff members.

Wainstein is WSGP's new Marine Fisheries Specialist, now working with Ed Melvin on seabird conservation issues in commercial fisheries. She received a PhD in ecology and evolutionary biology from the University of California at Santa Cruz. She has conducted research on and monitoring of elephant seals, harbor seals, southern sea lions, Hawaiian monk seals, dusky dolphins and seabirds and shorebirds in Washington, Oregon, California, Hawaii, Argentina and Chile.

During the past four years, Wainstein co-founded and co-directed the Juan Fernández Islands Conservancy, an organization based in Seattle but dedicated to conservation of Chilean islands. Also while in Seattle, she was a Research Associate and Lecturer at the UW's School of Aquatic & Fishery Sciences and Department of Biology. She is also fluent in Spanish.

"Michelle's background and skills, together with her passion for applied marine conservation, make her a great addition to our program and significantly add to our capacity to work regionally and internationally," says Melvin.

Jim Brennan began in March as WSGP's Marine Habitat Specialist. He has a Master of Sciences Degree from Moss Landing Marine Laboratories and 23 years of work experience. The majority of his work has focused on marine fisheries and habitats on the Pacific Ocean coast of the U.S. Brennan has worked in both private and public sectors, with responsibilities that included research, education, environmental assessment, watershed planning, habitat restoration and regulatory and policy programs.

The past 13 years of Brennan's career have been primarily devoted to marine resource management issues in Puget Sound, including the development and implementation of alternative management actions for the protection, enhancement and restoration of the nearshore ecosystem. Jim has served on numerous technical assessment and advisory committees. He has chaired the King County-sponsored Nearshore Technical Committee and is a member of the Nearshore Science Team for the Puget Sound Nearshore Restoration Partnership.

Brennan brings an extensive background as an educator, in both formal and informal settings. He has taught at Moss Landing Marine Labs and the University of California Santa Cruz, as well as field studies programs in Jamaica and Mexico. His informal education and outreach experience includes open house events, public speaking engagements and the development of informational pamphlets and videos.

"Having Jim on staff gives us a unique opportunity to develop badly needed education programs addressing protection of critical nearshore habitats," says WSGP Director Louie Echols. "Jim is uniquely qualified to take on this task, and we hope many other partners will join us in this important effort."

Focus on Fellowships: Introducing New NMFS/Sea Grant Fisheries Fellows

Three WSGP-nominated students — John Brandon, Willy Eldridge and Harrison Fell — have been selected for 2005's Graduate Fellowship Program in Population Dynamics and Marine Resource Economics.

The Program was established by NOAA's National Marine Fisheries Service (NMFS) and National Sea Grant Office in 1999. Through it, fellows develop close ties with NMFS, whose facilities in Washington state include the Alaska Fisheries Science Center, Northwest Fisheries Science Center and the National Marine Mammal Laboratory.

As a Population Dynamics Fellow, Eldridge will evaluate the effects of fisheries management actions that lead to inadvertent selection on hatchery-reared chinook salmon. Such selection can lead to loss of genetic diversity, which can diminish the viability of chinook populations. Many chinook populations are protected under the federal Endangered Species Act and most of these are supported by augmentation from hatcheries.

Brandon's time as a Population Dynamics Fellow will be devoted to developing a formal, flexible and well-documented mathematical framework to synthesize information related to environmental variables and population processes that pertain to marine mammals in the Arctic and subpolar oceans. User-friendly software will be developed and made available to NMFS scientists, enabling them to accurately assess the relationship between conditions such as global warming on populations of marine mammals and other long-lived species such as sea turtles and sharks.

As a Marine Economics Fellow, Harrison Fell will conduct a market analysis of Alaskan groundfish fisheries. "Specifically, I will be conducting demand function estimation at the ex-vessel/processor stage of the Bering Sea and Gulf of Alaska pollock fisheries market chain," he writes. The results of this estimation "will be used to predict welfare implications brought about by current and future policy changes."

The three fellows will work closely with mentors from NOAA Fisheries, who provide data for each fellow's thesis, serves on the fellow's committee and hosts an annual summer internship at the NMFS center or laboratory where the fellow is placed. Population Dynamics Fellows may spend as many as 20 of these summer days at sea, conducting scientific surveys or experiments and learning about sampling techniques, fishery biology, commercial fishing and regional issues in fisheries management.

The program is designed to introduce talented students to careers in the areas of population dynamics and marine economics. As "known commodities," there's a strong likelihood that, eventually, these fellows will be offered jobs at NMFS. The program also fosters close ties between NMFS and academic scientists at non-government research institutions.

"The internship aspect of the fellowship is an excellent way to meet NMFS scientists and see what it is like working for a government agency," says Ian Stewart, who received a Population Dynamics fellowship in 2001. In February 2004, Stewart took a job as research biologist with the NMFS Northwest Fisheries Science Center.

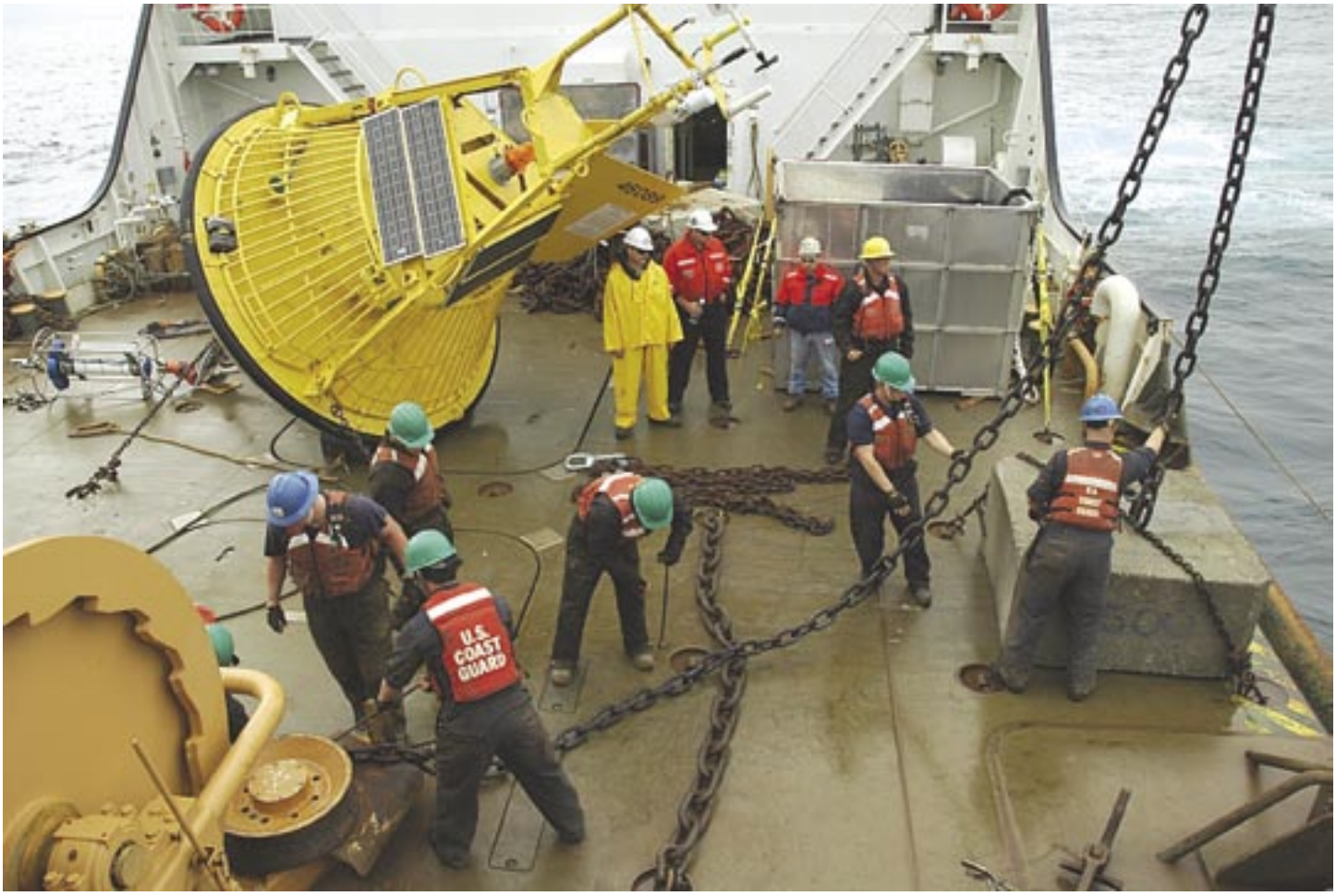
"I hadn't planned to work for NMFS, but that was because I didn't know that much about the agency," Stewart says. "I was pleasantly surprised by the breadth of research and quality of the science — which is why I now work here!"

Washington Sea Grant Program has an impressive record for placing student applicants into fellowship programs. It has nominated more successful applicants for these fellowships, managed by the National Sea Grant Program, than any other Sea Grant program in the country.

"Only six fisheries fellows are selected in any one year, and our nominees for 2005 represent half of that total," says WSGP Director Louie Echols. "Over the six years that this fellowship has been in existence, 30 percent of the national total has come through our program."

Top to bottom: John Brandon, Willy Eldridge and Harrison Fell

The annual national symposium for NMFS/Sea Grant fellows will be held from April 11 to 13 on the University of Washington's Seattle campus. For information about this event, contact Sue Raub, 206.543.6600 or ***susan@u.washington.edu.***



Buoy #46089 rests on the deck of a US Coast Guard vessel, ready to be lowered overboard.

Keeping an Eye on Severe Coastal Storms

Extreme weather conditions in the North Pacific can threaten the safety and efficiency of commercial fishing and marine transportation industries along the Washington and Oregon coasts. Commercial crab fishermen are particularly at risk during this time because of dangerous ocean conditions, and the loss of life and vessels has been a severe problem in the past. Unfortunately, lack of direct weather and sea condition data currently results in poor quality weather forecasts for the nearshore area, creating a safety problem for commercial fishing vessels, tug and barge operations and other marine traffic. In addition, substantial economic losses and increased expenses occur when marine conditions are overstated in the forecast, causing unnecessary delays in commercial fishing or marine transportation operations.

To reduce the danger, Washington Sea Grant Program implemented the Coastal Storms Initiative Program, in partnership with the National Oceanographic and Atmospheric Administration and Oregon Sea Grant Program, to improve weather forecasting off the coast. As part of the project, a new weather buoy, #46089, was launched last winter, 75 miles west of Seaside, Oregon, in an area ideal for monitoring squalls before they hit the coast. The new buoy provides much-needed data on wind and waves. Such information is helping the National Weather Service to improve its marine forecasts — and save people's lives.

The Coastal Storms Initiative Program has also supported improvements in shoreside weather observations, including a wind profiler in Astoria, Oregon, and updated coastal weather stations. Future plans may include additional weather buoys, Doppler radar or voluntary weather observations from ships and other commercial vessels to further improve marine weather forecasts off the coast.

For more information on this and other coastal projects, contact Steve Harbell, WSGP's Marine Field Agent, at 360.875.9331 or *sharbell@u.washington.edu*.

APRIL

SIMPLE TECHNIQUES CLINICS

April 1-June 25
Check WSGP Web site (*wsg.washington.edu/educationconferences.htm*) for clinic schedule. FFI: Teri King or Janis McNeal, Washington Sea Grant Program, 360.432.3054, *guatemal@u.washington.edu.*

PACIFIC FISHERY MANAGEMENT COUNCIL MEETING

April 3-8
Sheraton Tacoma Hotel, 1320 Broadway Plaza, Tacoma, Washington. FFI: Pacific Fishery Management Council, 77 NE Ambassador Place, Suite 200, Portland, OR 97220-1384, 503.820.2280, 866.806.7204 (toll-free), *pcouncil.org.*

SUSTAINABILITY AND RESTORATION: A PRACTICAL PARTNERSHIP FOR THE 21ST CENTURY

April 4-8
Washington State Convention and Trade Center, Seattle, Washington. FFI: Society for Ecological Restoration, Engineering Professional Programs, University of Washington, 10303 Meridian Avenue North #301, Box 358725, Seattle, WA 98133-9483, 206.543.5539, *uw-epp@engr.washington.edu, engr.washington.edu/epp/ser/contact.html.*

NATIONAL SHELLFISHERIES ASSOCIATION 97TH ANNUAL CONFERENCE

April 10-14
Doubletree Hotel, 237 South Broad Street, Philadelphia, Pennsylvania. FFI: Dr. Danielle Kreeger, Academy of Natural Sciences, 1900 Ben Franklin Parkway, Philadelphia, PA 19103, 215.299.1184, *kreeger@acnatsci, shellfish.org/meetings/ philadelphia.htm.*

SHORELINE WORKSHOPS

April 13-May 11
A series of WSGP-sponsored workshops, covering topics from habitat to stormwater management on the shoreline of Puget Sound. FFI: Jonathan White, 253.857.1514, *jonathanw@penlight.org, penlight.org/pages/communitysrvs/comm_wrshps.html.*

BEACH WATCHER AQUACULTURE

April 20
Island County, Washington. FFI: WSU Beach Watchers, P.O. Box 5000, Coupeville, WA 98239-5000, 360.679.7327, *beachwatchers@wsu.edu, beachwatchers.wsu.edu/.*

MANAGING FISHERIES—EMPOWERING COMMUNITIES

April 21-23
Marriott Downtown Hotel, Anchorage, Alaska. FFI: Sherri Pristash, Symposium Coordinator, Alaska Sea Grant College Program, PO Box 755040, Fairbanks, AK 99775-5040, 907.474.6701, fyconf@uaf.edu, *www.uaf.edu/seagrant/Conferences/fish-com/announce.html.*

CENTER FOR WOODEN BOATS

Monthly Meetings: Third Friday of the month, 8 p.m., at the CWB Boat. *Exhibit:* The Legendary Vessels of a Maritime Genius, L.E. "Ted" Geary, Naval Architect, April 22-May 1. *Learn to Sail Now,* all year, Saturdays and Sundays. FFI: The Center for Wooden Boats, 1010 Valley Street, Seattle, WA 98109, 206.382-BOAT (2628), *cwb@cwb.org, www.cwb.org.*

SEATTLE AQUARIUM

April-May
Outdoor Adventures: Dive into Spring Break, April 9-17; Sucia Island Adventure, May 7; Migratory Bird Day, May 14. For more information on these and other activities: The Seattle Aquarium, Pier 59, Waterfront Park, 1483 Alaskan Way, Seattle, WA 98101, 206.386.4353, *aquarium.programs@seattle.gov, seattleaquarium.org.*

MAY

SOLUTIONS TO COASTAL DISASTERS CONFERENCE 2005

May 8- 11, 2005
Doubletree Guest Suites, Charleston, South Carolina. FFI: American Society of Civil Engineers, World Headquarters, 1801 Alexander Bell Drive, Reston, VA 20191-4400, 800.548.2723 (toll-free), *asce.org/conferences/cd05/cd05_contacts.cfm.*

2005 ENVIRONMENTAL EXPLORATIONS

May 18
Belfair, Washington. FFI: Hood Canal Watershed Project Center, P.O. Box 1445, Belfair, WA 98528, 360.275.0721, *hcwp@hctc.com, hood.hctc.com/~hcwater/events.html.*

JUNE

PACIFIC FISHERY MANAGEMENT COUNCIL MEETING

June 12-17
Crowne Plaza Mid Peninsula, 1221 Chess Drive, Foster City, California. FFI: PFMC, 77 NE Ambassador Place, Suite 200, Portland, OR 97220-1384, 503.820.2280, 866.806.7204 (toll-free), *pcouncil.org.*

FIRST INTERNATIONAL SYMPOSIUM ON THE MANAGEMENT AND BIOLOGY OF DOGFISH SHARKS

June 13-15
University of Washington, School of Aquatic & Fishery Sciences, Seattle, Washington. FFI: Washington Department of Fish & Wildlife, 600 Capitol Way N., Olympia, WA 98501-1091, Attn: Dogfish 2005, *dogfish@dfw.wa.gov.*

OREGON'S SEAFEST - SEAS OF CHANGE

June 25
Hatfield Marine Science Center, Newport, Oregon. FFI: HMSC, 2030 SE Marine Science Drive, Newport, OR 97365, 541.867.0100, *seafest@oregonstate.edu, hmsc.oregonstate.edu/seafest/.*

On the Horizon

NOAA SCIENCE CAMP

July 11-15
Seattle, Washington

NATIONAL MARINE EDUCATORS ASSOCIATION CONGFERENCE 2005

July 11-16
Kahului, Maui, Hawaii

April

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SEA GRANT PUBLICATIONS

Many marine-related publications are available from Washington Sea Grant Program.

To order publications or to request a current catalog, please contact: Washington Sea Grant Program Publications, University of Washington, 3716 Brooklyn Ave. N.E., Seattle, WA 98105. Phone 206.543.0555. Fax 206.685.0380. *sgpubs@u.washington.edu wsg.washington.edu.*

JULY/AUGUST/SEPTEMBER 2005 SEA STAR SUBMISSION DEADLINE MAY 15, 2005.

Items with the gull logo next to them are wholly or partially Sea Grant-sponsored.

Sea Grant Washington

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

Environmental Education for Whatcom County Realtors

Real estate agents and brokers are usually concerned with what's on top of the ground but not what's underneath it. Ken Carrasco, WSGP's Fresh/Marine Water Resource Educator may be changing that, through a series of one-day classes for realtors in Whatcom County.

The initial class, called Environmental Regulations in Whatcom County, was developed collaboratively with the Whatcom County Association of Realtors, a group of over 740 agents and brokers in the county. It begins with an overview of the geological history of Washington.

"People usually don't think about it," Carrasco said. "The hills, the mountains, streams and lakes and other features of the landscape don't end up where they do solely by accident. There's a story behind it."

Tape measure in hand, Ken Carrasco explains the benefits of 100-foot wetland buffers to students of his Environmental Regulations class.

Carrasco then discusses wetlands and other environmentally critical areas such as streams and floodplains, as well as geophysical hazards such as erosion, earthquakes and volcanoes. Following this discussion, the realtors take a field trip to a small wetland. This outdoor learning opportunity helps turn the abstract into reality and shows them how to apply the new insights in their daily practices. At the end of the day, staff of the Whatcom County Department of Planning and Development Services and other regulators are available to answer questions.

"Real estate professionals serve vital roles in our society, and it helps their clients, the environment and themselves if they can understand and explain the reasoning behind land-use regulations," Carrasco points out.

The extremely popular class will be repeated several times during the year. Real estate professionals and appraisers can also get 7.5 continuing education credit hours for taking the course.

"Informed citizens, especially those involved with land-use issues, can contribute a lot to the conversation," says Carrasco. "The question is always 'How can we protect the environment while providing for housing and other needs in a growing area?'"

A pair of follow-up classes — on septic systems and drinking water issues and on low-impact development — will also be offered.

For information about class content, contact Carrasco at 360.676-6736 or *ken_c@wsu.edu*. To register for or inquire about classes, contact the Whatcom County Association of Realtors® at 360.671.5477 or *info@wcar.net*.

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