USGS

Sound Waves Coastal and Marine Research News from Across the USGS

http://soundwaves.usgs.gov/

Fieldwork

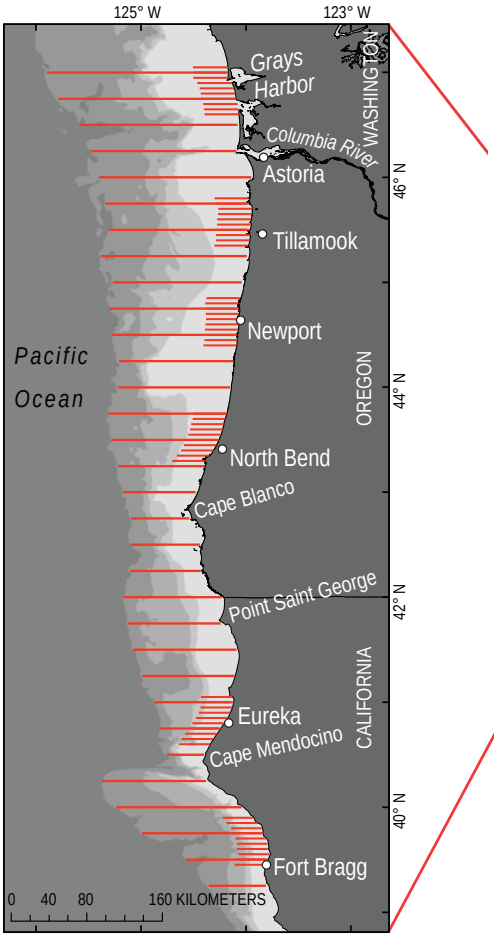
Seabird and Mammal Surveys Off California, Oregon, and Washington

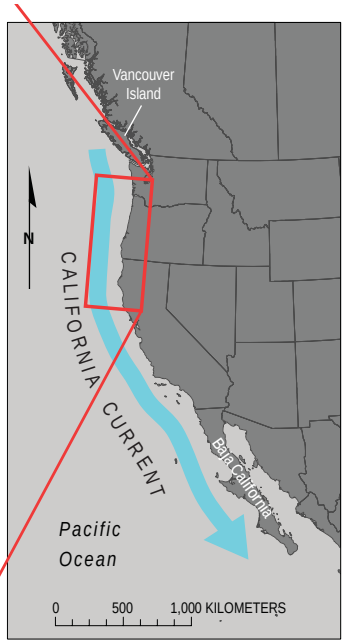
By Jonathan Felis, Josh Adams, and John Takekawa

Scientists from the U.S. Geological Survey (USGS) Western Ecological Research Center are conducting new seabird and marine mammal surveys for the Bureau of Ocean Energy Management (BOEM) in its Pacific Outer Continental Shelf Region. Their findings will inform future alternative-energy planning, development, and management in the northern California Current System—a biologically rich oceanic region offshore western North America dominated by the southward-meandering California Current.

The survey project, called the Pacific Continental Shelf Environmental Assessment (PaCSEA), is the first set of comprehensive, multiseasonal aerial surveys in the region since similar surveys were conducted two decades ago. The primary survey area extends from Grays Harbor, Washington (approximately 47° N. latitude), to Fort Bragg, California (approximately 39° N. latitude; see map).

Survey aircraft (Partenavia P-68) being loaded for departure. Inset shows observers in back seat counting seabirds in flight.





Map of seabird and marine-mammal survey transect lines (red) over continental shelf and slope waters in California, Oregon, and Washington. Index map shows location of study area and generalized path of the California Current, which moves south along the western coast of North America, from the vicinity of Vancouver Island, Canada, to southern Baja California, Mexico.

Surveys are being completed from a small fixed-wing, twin-engine plane at low altitude (200 ft above sea level). A navigator sits up front with the pilot to direct the aircraft to transect lines, operate oceanographic remote-sensing equipment, and sight marine mammals. The navigator helps the pilot avoid flying directly over marine mammals, in accordance with National Marine Fisheries Service regulations. Two additional, dedicated observers sit in the rear and count all seabirds and mammals sighted along a fixed-width strip as the plane flies over the ocean.

Collecting remotely sensed oceanographic data simultaneously with seabird and mammal counts will enable project scientists to examine the relations between ocean features—such as water masses of differing temperature—and the distribu-

(Seabird and Mammal Surveys continued on page 2)

Sound Waves

Editor
Helen Gibbons
Santa Cruz, California
Telephone: (831) 460-7418
E-mail: hgibbons@usgs.gov
Fax: (831) 427-4709

Print Layout Editors
Susan Mayfield, Sara Boore
Menlo Park, California
Telephone: (650) 329-5066
E-mail: smayfiel@usgs.gov; sboore@yahoo.com
Fax: (650) 329-5051

Web Layout Editor
Jolene Gittens
St. Petersburg, Florida
Telephone: (727) 803-8747 Ext. 3038
E-mail: jgittens@usgs.gov
Fax: (727) 803-2032

SOUND WAVES (WITH ADDITIONAL LINKS) IS AVAILABLE ONLINE AT URL
http://soundwaves.usgs.gov/

Contents

Submission Guidelines

Deadline: The deadline for news items and publication lists for the July issue of *Sound Waves* is Thursday, May 3.
Publications: When new publications or products are released, please notify the editor with a full reference and a bulleted summary or description.
Images: Please submit all images at publication size (column, 2-column, or page width). Resolution of 200 to 300 dpi (dots per inch) is best. Adobe Illustrator© files or EPS files work well with vector files (such as graphs or diagrams). TIFF and JPEG files work well with raster files (photographs or rasterized vector files).

Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

U.S. Geological Survey
Earth Science Information Sources:

Need to find natural-science data or information? Visit the USGS Frequently Asked Questions (FAQ's) at URL **http://www.usgs.gov/faq/**

Can't find the answer to your question on the Web? Call 1-888-ASK-USGS

Want to e-mail your question to the USGS? Send it to this address: ask@usgs.gov

Fieldwork, continued

(Seabird and Mammal Surveys continued from page 1)

tion of birds and mammals. The scientists are using an onboard pyrometer—a remote-sensing instrument that intercepts and measures thermal radiation—to measure sea-surface temperature, and a hyperspectral radiometer—a device that measures the power of electromagnetic radiation over a broad range of wavelengths—to measure sea-surface radiance and reflectance. Hyperspectral radiometry data can provide information about chlorophyll, phytoplankton, dissolved organic matter, and other constituents of the seawater. In the northern California Current System, seasonal upwelling and the Columbia River plume create oceanographic structure, including areas of enhanced phytoplankton growth and water-mass boundaries that can aggregate prey near the surface, thereby increasing availability for predators. The on-board remote-sensing equipment allows the researchers to map such oceanographic structures at fine scales and relate them to the observed patterns of seabird and mammal abundance.

(Seabird and Mammal Surveys continued on page 3)

*Mixed-species flocks of seabirds feed on subsurface aggregations of forage fish and krill along the Oregon coast in October 2011. The flocks pictured here contain mostly Western Gulls (*Larus occidentalis*) and Common Murres (*Uria aalge*).*

Fieldwork, continued

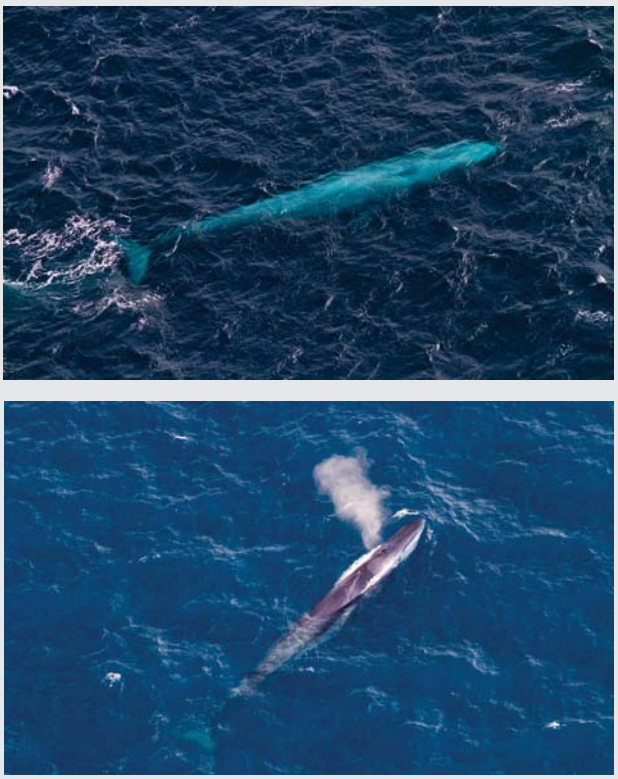
(Seabird and Mammal Surveys continued from page 2)

Surveys were conducted in January, June, and October of 2011 and February of 2012; additional surveys are scheduled for May, July, and September of 2012.

If you would like additional information about PaCSEA, please contact **Josh Adams** (**http://www.werc.usgs.gov/adams**).

A selection of photographic highlights from the project thus far is featured below (all photographs by **Jonathan Felis**, USGS).

*A megaherd of approximately 1,000 dolphins travels offshore of Fort Bragg, California, in February 2012. Photographs show only part of the group, which consisted primarily of Pacific White-sided Dolphins (*Lagenorhynchus obliquidens*), as well as a few Northern Right Whale Dolphins (*Lissodelphis borealis*).*



*Two of the biggest animals on Earth, the Blue Whale (*Balaenoptera musculus*; upper photograph) and Fin Whale (*Balaenoptera physalus*; lower photograph) have been sighted infrequently during surveys.*

*This photograph shows a mixed cetacean-seabird foraging aggregation off northern Oregon in June 2011. A feeding Humpback Whale (*Megaptera novaeangliae*) is surrounded by Pacific White-sided Dolphins and flocking Sooty Shearwaters (*Puffinus griseus*). The duplicate photograph at right was desaturated (color intensity reduced) to more clearly reveal the presence of the shearwaters and dolphins.*

Maps Based on Satellite Telemetry Help Russian Tanker Avoid Threatened Sea Ducks During First Maritime Fuel Delivery to Western Alaska Through Sea Ice

By Paul Laustsen and Matthew Sexson

On January 16–19, 2012, the 370-ft Russian tanker *Renda* offloaded 1.3 million gallons of gasoline and diesel fuel to Nome, Alaska, completing the first-ever delivery of petroleum products to a western Alaska community through ice-covered waters. The *Renda* had help from the 420-ft U.S. Coast Guard Cutter *Healy*, a polar icebreaker, for hundreds of miles of its journey through thick sea ice in the Bering Sea and Norton Sound.

The two ships also had help from the U.S. Geological Survey (USGS) to ensure that their mission would not disturb Spectacled Eiders (*Somateria fischeri*), a sea duck that winters in the Bering Sea. In 1993, Spectacled Eiders were listed as a threatened species under the Endangered Species Act. Resource managers from the U.S. Fish and Wildlife Service and navigators from the U.S. Coast Guard used USGS maps showing likely areas of Spectacled Eider concentrations to identify routes for the tanker and icebreaker that would minimize impacts to this species and its habitat. The maps were based on satellite-telemetry data.

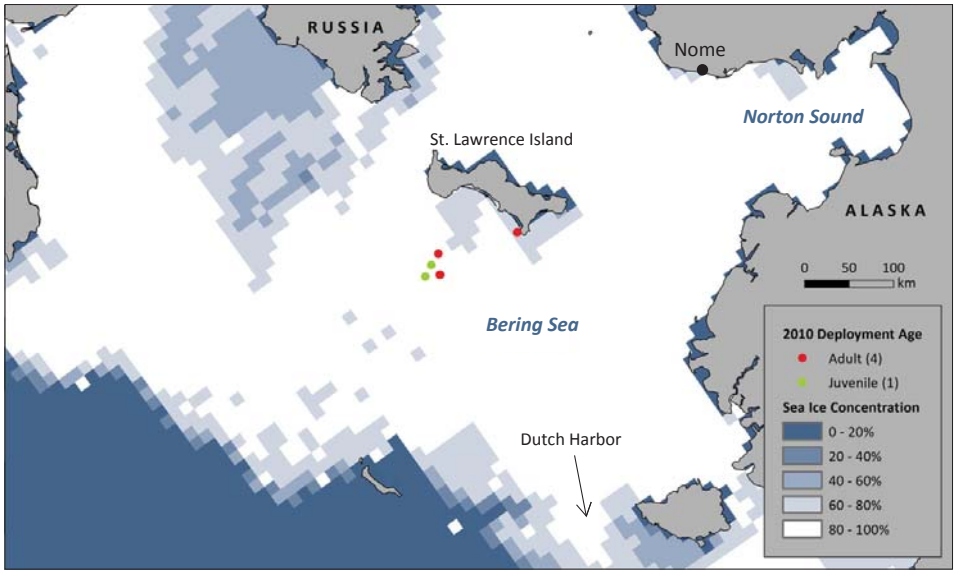
"Nearly 20 years ago, USGS biologists used the latest satellite-tracking technology available at the time to uncover the mysterious wintering behavior of the Spectacled Eider, now a threatened species," said USGS Director **Marcia McNutt**. "Little did these scientists know at the time that their information would be critical in allowing a Russian tanker decades later to thread the needle to Nome in order to deliver life-saving fuel oil without taking a toll on these elusive sea ducks."

The arctic-nesting sea ducks are wintering south of St. Lawrence Island in the northern Bering Sea, where sea ice abounds and the birds have access to abundant prey, in the form of clams and other invertebrates, that appears to be crucial for their winter survival.

Ordinarily, the ducks would not be affected by the delivery of Nome's winter fuel, which usually takes place in early fall before sea ice hardens over the Bering Sea and the Spectacled Eiders gather in their wintering grounds. But shipping delays and a major storm prevented last fall's shipment, and it was decided to use the *Renda*, a Russian tanker with an ice-hardened hull, to attempt a winter delivery. The *Renda* left Russia on December 17, 2011, picked up petroleum products in South Korea and Dutch Harbor, Alaska, and then made its way to Nome with an escort from the *Healy*, an icebreaker designed not only to conduct such Coast Guard missions as ship escort and search and rescue but also to support a wide range of scientific activities, such as the Arctic mapping described in last month's issue ("Arctic Expedition Reaches 88.5 Degrees North Latitude…," **http:soundwaves.usgs.gov/2012/02/**).

The USGS provided the U.S. Fish and Wildlife Service and the U.S. Coast Guard with maps of probable Spectacled Eider

(Satellite Tracking continued on page 5)



Spectacled Eider satellite telemetry locations and sea-ice concentration between January 2 and 8, 2012. Locations (six locations from five birds) are the single best received during each transmission period. Eiders were marked in 2009 and 2010 in northern Alaska. Image modified from map posted (and updated weekly) at ***http://alaska.usgs.gov/science/biology/seaducks/spei/****.*

Male Spectacled Eider after implantation of a satellite transmitter in Alaska's Colville River delta, June 2009. The species was listed as threatened in 1993 after breeding numbers of Spectacled Eiders declined by 96 percent at a primary breeding area in Alaska. Potential risks to eiders include being subjected to increased exposure during storms in winter, changes in foods because of declining ice, and warming temperatures in the Bering Sea.

(Satellite Tracking continued from page 4)

concentrations based on the past 4 years of satellite-telemetry data. "As stewards of the environment, we found the data invaluable to our mission planning and execution while protecting our nation's critical Spectacled Eider habitat," said U.S. Coast Guard Capt. **Craig Lloyd**, District 17 Chief of Response.

Satellite telemetry provides a way to track animals regardless of location, time of day, or weather. Transmitters send information to orbiting satellites, which relay the data to land-based receivers. Implantable satellite transmitters were first used by USGS Alaska Science Center biologists in 1993 to discover the distribution of Spectacled Eiders during molting (when birds shed old feathers and grow new ones) and wintering. At that time, no one knew where the species lived during the many nonbreeding months. USGS tracking data and subsequent aerial surveys revealed that Spectacled Eiders wintered in the northern Bering Sea, within the pack ice.

"Not only was this a surprise, but we've learned that about 380,000 Spectacled Eiders, or almost the entire population of this species, use this area every winter for 5 to 6 months; an amazing natural phenomenon in an incredibly harsh environment," said **Matthew Sexson**, USGS biologist.

In 2008, USGS biologists began marking Spectacled Eiders with improved transmitters with longer life cycles to learn more about the species and to help resource managers plan conservation actions and strategies. Each transmitter can last as much as 2 years, providing an opportunity to learn more about year-round migratory patterns and habitat use of this unique species, **Sexson** said. Between 2008 and 2011, 129 transmitters were deployed at nesting areas in coastal Alaska. The project is expected to produce continuous tracking data from 2008 through 2013.

"Our involvement in the fuel delivery is a great example of cutting-edge science informing policy makers and industry," said **Sexson**. "The Coast Guard and the *Renda* had an interest in avoiding the Spectacled Eiders, and we were fortunate enough to have the information to help them do so. In the end, we played a small role in a very large project. Sea-ice scientists and meteorologists also contributed through modern satellite imagery and unmanned aerial vehicles. Our involvement shows that science can inform sound decisions that minimize risk and maximize industry success."

Large flock of Spectacled Eiders aggregated on sea ice and in a lead (stretch of open water within the sea ice) in the northern Bering Sea, south of St. Lawrence Island, Alaska. Aerial photograph taken March 24, 2010, by ***Matthew Sexson****, USGS, from a helicopter deployed from the U.S. Coast Guard Cutter* Polar Sea.

Ellen Lance, Endangered Species Branch Chief for the U.S. Fish and Wildlife Service's Alaska Region, praised the cooperative effort. "Protecting America's fish and wildlife resources is a shared responsibility," she said. "It is satisfying to see agencies working together to protect threatened and endangered species, while meeting the needs of our communities."

For more information about USGS Spectacled Eider research, visit the USGS Alaska Science Center Web page at **http://alaska.usgs.gov/science/biology/seaducks/spei/**. One can also follow the research by subscribing to the research Twitter feed at **http://twitter.com/USGS_SpecEider**.

The U.S. Coast Guard Cutter Healy *breaks ice for the tanker vessel* Renda *250 miles south of Nome, Alaska, on January 6, 2012. On January 19, the* Renda *completed delivery of more than 1.3 million gallons of fuel supplies to the residents of Nome. U.S. Coast Guard photograph by Petty Officer 1st Class* ***Sara Francis****.*

Severe Declines in Everglades Mammals Linked to Pythons

By Catherine Puckett

Precipitous declines in formerly common mammals in Everglades National Park, southern Florida, have been linked to the presence of invasive Burmese Pythons (*Python molurus bivittatus*), according to a U.S. Geological Survey (USGS) coauthored study published in the *Proceedings of the National Academy of Sciences* (**http://dx.doi.org/10.1073/pnas.1115226109**).

The study, the first to document the ecological impacts of this invasive species, strongly supports that animal communities in this 1.5-million-acre park have been markedly altered by the proliferation of pythons, particularly since 2000. Mid-sized mammals are the most drastically affected.

The most severe declines, including a nearly complete disappearance of raccoons, rabbits, and opossums, have occurred in the remote southernmost regions of the park, where pythons have been established the longest. In this area, populations of raccoons dropped 99.3 percent, opossums 98.9 percent, and bobcats 87.5 percent. Marsh and cottontail rabbits, as well as foxes, were not seen at all.

"Pythons are wreaking havoc on one of America's most beautiful, treasured, and naturally bountiful ecosystems," said USGS Director **Marcia McNutt**. "Right now, the only hope to halt further python invasion into new areas is swift, decisive, and deliberate human action."

The researchers collected their information through repeated systematic nighttime road surveys within the park, counting both live and road-killed animals. Over the period of the study, from 2003 to 2011, researchers traveled a total of nearly 39,000 miles. They compared their findings with similar surveys conducted in 1996 and 1997 along the same roadways before pythons were recognized as established in Everglades National Park.

The scientists who authored the paper noted that the timing and geographic patterns of the documented mammal declines are consistent with the timing and geographic spread of pythons.

The authors also conducted surveys in ecologically similar areas north of the park where pythons have not yet been discovered. In those areas, mammal abundances were similar to those in the park before pythons proliferated. At sites where pythons have only recently been documented, however, mammal populations were reduced, though not to the dramatic extent observed within the park where pythons are well established.

"The magnitude of these declines underscores the apparent incredible density of pythons in Everglades National Park and justifies the argument for more intensive investigation into their ecological effects, as well as the development of effective control methods," said **Michael Dorcas**, lead author of the study, a professor at Davidson College in North Carolina, and coauthor of the book *Invasive Pythons in the United States*. "Such severe declines in easily seen mammals bode poorly for the

(Invasive Pythons continued on page 7)

*An American Alligator (*Alligator mississippiensis*) and a Burmese Python (*Python molurus bivittatus*) locked in a struggle in Everglades National Park. This python appears to be losing, but snakes in similar situations have apparently escaped unharmed, and in other situations pythons have eaten alligators. Photograph by* ***Lori Oberhofer****, National Park Service.*

Fishing guide ***Camp Walker****, Catalyst Charters, of Islamorada, Florida, took this photograph of a Burmese Python swimming in Florida Bay from the end of Twisty Channel toward End Key on November 16, 2011.*

(Invasive Pythons continued from page 6)

many species of conservation concern that are more difficult to sample but that may also be vulnerable to python predation."

The mammals that have declined most significantly have been regularly found in the stomachs of Burmese Pythons removed from Everglades National Park and elsewhere in Florida. The authors noted that raccoons and opossums often forage for food near the water's edge, a habitat frequented by pythons in search of prey.

The authors suggested that one reason for such drastic declines in such a short time is that these prey species are "naïve"—that is, they not used to being preyed on by pythons because such large snakes have not existed in the eastern United States for millions of years. Burmese Pythons more than 16 feet long have been found in the Everglades. In addition, some of the declining species could be victims both of being eaten by pythons and of having to compete with pythons for food.

"It took 30 years for the Brown Treesnake (*Boiga irregularis*) to be implicated in the nearly complete disappearance of mammals and birds on Guam; it has apparently taken only 11 years since pythons were recognized as being established in the Everglades for researchers to implicate pythons in the same kind of severe mammal declines," said **Robert Reed**, a USGS scientist and coauthor of the paper. "It is possible that other mammal species, including at-risk ones, have declined as well because of python predation, but at this time, the status of those species is unknown."

The scientists noted that in their native range in Asia, pythons have been documented to consume leopards, showing that even large animals, including top predators, are susceptible to python predation. For example, pythons have been documented consuming full-grown deer and alligators. Likewise, the authors state that birds, including highly secretive birds such as rails, make up about a fourth of the diet of Everglades pythons, and declines in these species could be occurring without managers realizing it.

"Our research adds to the increasing evidence that predators, whether native or exotic, exert major influence on the structure of animal communities," said

*Screenshot from video footage of National Park Service biologists **Lori Oberhofer** (left) and **Skip Snow** hunting and capturing Burmese Pythons in Florida in 2009. The footage is posted at **http://gallery.usgs.gov/videos/169**.*

John Willson, a study coauthor, research scientist at Virginia Tech University, and coauthor of the book *Invasive Pythons in the United States*. "The effects of declining mammal populations on the overall Everglades ecosystem, which extends well beyond the national park boundaries, are likely profound, but are probably complex and difficult to predict. Studies examining such effects are sorely needed to more fully understand the impacts pythons are having on one of our most unique and valued national parks."

The authors found little support for alternative explanations for the mammal declines, such as disease or changes in habitat structure or water-management regimes.

"This severe decline in mammals is of significant concern to the overall health of the park's large and complex ecosystem," said Everglades National Park superintendent **Dan Kimball**. "We will continue to enhance our efforts to control and manage the nonnative python and to better understand the impacts on the park. No incidents involving visitor safety and pythons have occurred in the park. Encounters with pythons are very rare; that said, visitors should be vigilant and report all python sightings to park rangers," **Kimball** said.

The odds of eradicating an introduced population of reptiles once it has spread across a large area are very low, pointing to the importance of prevention, early detection, and rapid response. And with the Burmese Python now distributed across more than a thousand square miles of southern Florida, including all of Everglades National Park and areas to the north, such as Big Cypress National Preserve, the chances of eliminating the snake completely from the region are low. However, controlling their numbers and preventing their spread are crucial goals for south Florida land managers. For example, a number of Burmese Pythons have been found in the Florida Keys, but there is no confirmation yet that a breeding population exists in the Keys. Given a recent USGS study that showed the python's apparent ability to disperse across salt water (**http://dx.doi.org/10.1016/j.jembe.2011.11.021**), island

(Invasive Pythons continued on page 8)

*Female Burmese Python (*Python molurus*) on her nest with eggs. Photograph by **Jemeema Carrigan**, University of Florida. Courtesy of **Skip Snow**, National Park Service. Used with permission.*

(Invasive Pythons continued from page 7)

residents and resource managers need to stay vigilant so as to be able to detect and eliminate arriving pythons before they become established.

Exactly how pythons were introduced to Everglades National Park is controversial, but most agree that the founders of the current population were pets that had been released or had escaped. On January 23, 2012, the U.S. Fish and Wildlife Service (FWS) published a rule in the Federal Register that restricts the importation and interstate transportation of four nonnative constrictor snakes (Burmese Python, Northern and Southern African Pythons [*Python sebae* and *Python natalensis*], and the Yellow Anaconda [*Eunectes notaeus*]) that threaten the Everglades and other sensitive ecosystems. These snakes are now listed as injurious species under the Lacey Act. In addition, the FWS will continue to consider listing as injurious five other species of nonnative snakes: the Reticulated Python (*Broghammerus reticulatus* or *Python reticulatus*), Boa Constrictor (*Boa constrictor*), DeSchauensee's Anaconda (*Eunectes deschauenseei*), Green Anaconda (*Eunectes murinus*), and Beni Anaconda (*Eunectes beniensis*). For more information about the Lacey Act and the listing of the four constrictors as injurious, please visit the FWS News and Resources Web site at **http://www.fws.gov/invasives/news.html**.

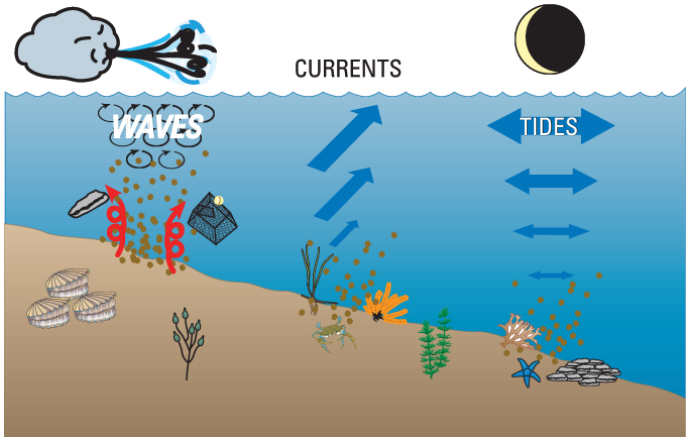
The online USGS Science Feature "The Big Squeeze: Pythons and Mammals in Everglades National Park" contains additional information about pythons in the Everglades and USGS studies of invasive species; to read it, visit **http://www.usgs.gov/blogs/features/usgs_top_story/the-big-squeeze-pythons-and-mammals-in-everglades-national-park/**.

The recently published report, "Severe mammal declines coincide with proliferation of invasive Burmese Pythons in Everglades National Park," is posted at **http://dx.doi.org/10.1073/pnas.1115226109**. Questions and answers about the study are posted at **http://www.fort.usgs.gov/FLConstrictors/FAQPrey.asp**. An interview with USGS scientist and study coauthor **Robert Reed** is posted at **http://gallery.usgs.gov/audios/439**.

How Often Do Sediments on the Seafloor Move?

By P. Soupy Dalyander and Bradford Butman

U.S. Geological Survey (USGS) scientists **Soupy Dalyander** and **Brad Butman** have developed a method for characterizing bottom shear stress—the force created at the seabed by currents and waves—to address the question "How often do seafloor sediments move?" Working out of the USGS Woods Hole Coastal and Marine Science Center in Woods Hole, Massachusetts, **Dalyander** (Mendenhall postdoctoral research fellow) and **Butman** (oceanographer) have applied the method to an initial study area of the U.S. east coast's Middle Atlantic Bight. Their work is part of a USGS-wide effort to provide scientific data to inform coastal and marine spatial planning (**http://www.whitehouse.gov/administration/eop/oceans/cmsp/**).



Currents and waves cause stress on the seafloor that can affect sediments, structures, plants, and animals, as well as human use. Large waves, especially those with long periods, can affect the seafloor across the entire continental shelf; some of these waves may be caused by storms far offshore. Currents are caused primarily by tides and winds, especially in association with large storms.

Shear stress is the force created at the seabed by tidal currents, wind-driven currents, and the orbital motion of surface waves (see diagram). If strong enough, this shear stress resuspends sediment and other particles from the seafloor. Shear stress affects the geology and habitat of the seafloor through its influence on sediment texture. For example, sandy sediments are typically found in areas of high stress and muddy sediments in areas of low stress. Shear stress also influences habitat in other ways. For example, filter feeders—such as scallops and oysters—must have an energetic environment for food to be in suspension, but the stress environment must also have periods of sufficiently low stress to allow the planktonic phase of these animals (a free-drifting stage they go through before attaching to the seafloor or some other surface) to settle for successful colonization. The shear stress environment also affects humans' use of the seafloor. For example, excess shear stress can result in scour around the foundations of offshore structures, such as wind turbines; and shear stress may resuspend material disposed in the coastal ocean, including any associated contaminants.

In small enough areas, measurements of waves and currents can be used to calculate bottom shear stress. But **Dalyander** and **Butman** are looking at the entire continental shelf, across which long-term measurements of waves and currents are not available, and so they estimate bottom shear stress by using data from numerical models. In the Middle Atlantic Bight, the current data are provided by the Experimental System for Predicting Shelf and

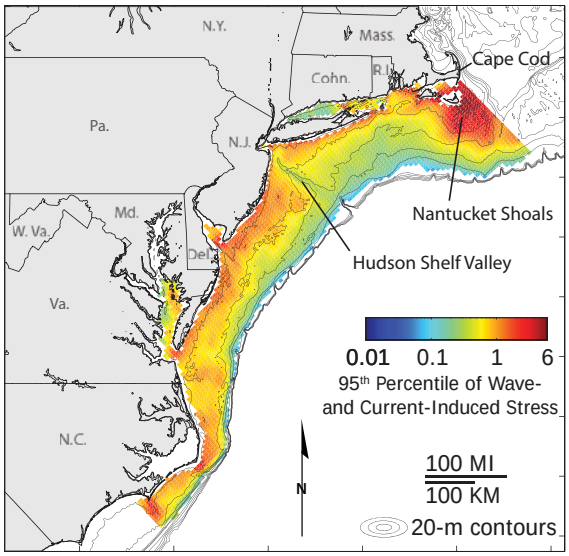
(Sediments Move continued on page 9)

(Sediments Move continued from page 8)

Slope Optics (ESPreSSO) Regional Ocean Modeling System (ROMS) nowcast/forecast circulation model developed by **John Wilkin** at Rutgers University and operated as part of the U.S. Integrated Ocean Observing System (IOOS; **http://www.ioos.gov/**). Wave data are provided by a Simulating WAves Nearshore (SWAN) model hindcast developed for this study.

Estimates of stress based on modeled waves and currents provide a "time series" (a sequence of data points at uniform time intervals, in this case every hour) of bottom shear stress at a spatial resolution of approximately one location per every 25-square-kilometer area over the continental shelf over a 1-year period. For this information to be easily used by planners and engineers in determining habitat types or implications for human use, it is displayed on maps of seasonal and spatial patterns that show areas of high and low stress (for example, see map at upper right). Comparison of these patterns with data in the USGS East-Coast Sediment Texture Database (**http://woodshole.er.usgs.gov/openfile/of2005-1001/htmldocs/database.htm**) reveals the influence of shear stress on sediment texture. Finer grained sediments (such as mud) are located in areas of weaker stress, and coarser sediments (sand to gravel) are located in areas of stronger stress, as a result of finer material being resuspended and swept away in areas of high stress.

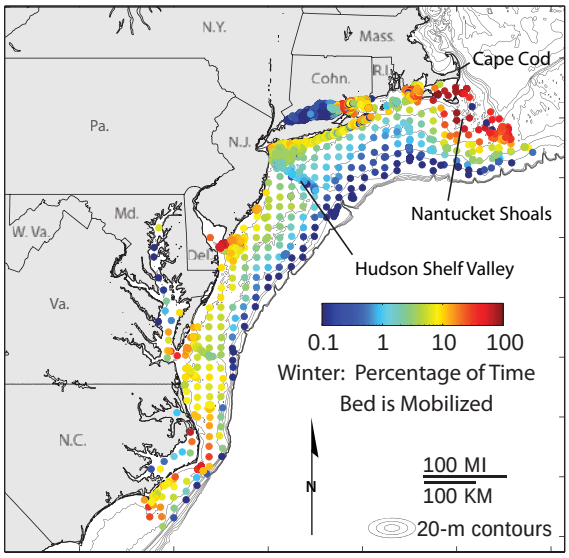
Determining the processes (waves versus different types of currents) that cause bottom shear stress provides insight into the frequency of stress events, to which organisms must adapt, and the ways in which an evolving climate might change the bottom shear stress distribution. Estimates of stress induced by tidal currents, storm-driven currents, and waves are compared to the total wave-plus-current stress to determine what processes dominate the generation of bottom shear stress on a regional basis. For example, over Nantucket Shoals, southeast of Cape Cod, Massachusetts, bottom shear stress is tidally dominated, resulting in a high-stress environment with frequent significant stress events. In contrast, waves created by storms—which are not as frequent as tides—dominate stress generation in a band along the coast throughout the Middle Atlantic Bight.



Combined wave-current bottom stress, in Pascals (Pa, a unit of pressure), that was exceeded 5 percent of the time during winter (December 2010–February 2011). The strongest stresses (red) are nearshore and over Nantucket Shoals. Weaker stresses occur over the outer shelf, in an area southwest of Cape Cod, and in the Hudson Shelf Valley.

In order for sediment on the seafloor to move, a grain-size-specific stress value, called the "critical stress," must be exceeded. Critical stress values are established at points where sediment texture observations are available from the USGS East Coast Sediment Texture Database. These critical stress values are then compared to modeled stress at the closest model point to determine when sediment will be mobilized (see map below). Sediment moves every tidal cycle over Nantucket Shoals, whereas mobility in the rest of the Middle Atlantic Bight occurs as a result of storm forcing and at frequencies governed by storm frequency and water depth, with sediment moving more frequently at shallower depths where the influence of surface waves is stronger.

Dalyander and **Butman's** work to date has produced a way to quantify the spatial and seasonal distribution of seafloor shear stress and sediment mobility and to determine the physical processes that generate stress and cause sediment movement. Areas of frequent sediment mobility have been identified. The next step in this study is to expand the analysis to cover the rest of the U.S. east coast and the Gulf of Mexico by using output from other IOOS regional models. The resulting regional stress characterizations will be incorporated into a USGS Seafloor Stress and Mobility Database for access by other researchers and the coastal and marine spatial-planning community.



Percentage of time the critical stress for each sediment observation (dots) is exceeded for winter (December 2010–February 2011). Sediments move more than 20 percent of the time in a band along the coast and over Nantucket Shoals. Sediments are less mobile over the outer shelf, in an area of fine-grained sediments southwest of Cape Cod, and in the topographic low of the Hudson Shelf Valley.

USGS Expands Presence at SACNAS National Conference

By Ben Gutierrez and Claudia Flores

For the fifth year running, the U.S. Geological Survey (USGS) hosted a booth at the National Conference of the Society for the Advancement of Chicanos and Native Americans in Science (SACNAS). The 2011 conference, held in San Jose, California, from October 26–30, was the largest SACNAS meeting yet, with an attendance of 4,000 people. Last fall's meeting also had the largest USGS attendance at SACNAS, with 24 USGS employees attending the meeting over a 3-day period, including Director **Marcia McNutt** and Federal Employee of the Year **Paul Hsieh** (see **http://soundwaves.usgs.gov/2011/11/awards.html**), along with several executives and managers. Members of the USGS team not only served as exhibitors, but also gave invited presentations, participated as judges in student oral- and poster-presentation sessions, and took part in networking sessions.

The USGS was in the conference spotlight when **Marcia McNutt** introduced the Saturday luncheon keynote speaker, **Margaret Hiza-Redsteer** (Crow) of the USGS Flagstaff Science Campus in Flagstaff, Arizona (**http://arizona.usgs.gov/Flagstaff/**). **Hiza-Redsteer**, who has been active as a student mentor with SACNAS for several years, gave an inspiring account of how she became motivated to pursue a career in science to improve the living conditions on tribal lands by better understanding the environmental damage and climate-change impacts that have affected her family and her people. As a USGS scientist, **Hiza-Redsteer** leads the Navajo Land Use Planning Project, which is composed of a team of researchers studying relations among climate, geology, and historical land use to understand landscape-change impacts on Navajo communities (see **http://geomaps.wr.usgs.gov/navajo/**). This work has led to international collaborations in which **Hiza-Redsteer** has been able to work with tribal elders to understand landscape changes in locations around the world. Also on the science front, USGS geophysicist **Eric Geist** gave an invited presentation on USGS tsunami research in a scientific session organized by **Aaron Velasco** (University of Texas at El Paso, past SACNAS president) to discuss the Tohoku earthquake and tsunami that struck Japan in 2011.

***Margaret Hiza-Redsteer** (USGS Flagstaff Science Campus) delivering a luncheon keynote address at the 2011 SACNAS National Conference. Photograph by **Maria Montour**, USGS.*

*USGS exhibit team and guests. Left to right: **Andrea Llenos**, **Jeff Keay**, **Maria Montour**, **Alicia Torregrosa**, Director **Marcia McNutt**, **Monique Fordham**, **Deb Lowe** (back), **Alexandra Haldey** (front), **Orlando Romero**, **Claudia Flores**, **Paul Hsieh**, **Ben Gutierrez**, **Judit Camacho** (SACNAS Director), and **Chris Andronicos** (SACNAS Board Member, Cornell University). Not pictured: **Walter Barnhardt**, **Tom Brocher**, **Jim Calzia**, **Brian Collins**, **Li Erikson**, **Eric Geist**, **Fawn Golden**, **Keith Knudsen**, **Jennifer Palguta**, **Kate Scharer**, and **Heather Wright**. Photograph by **Melanie Gárate**, University of Massachusetts Boston.*

The USGS team was able to network with many students and professionals at the meeting. Networking sessions provided students the opportunity to speak with USGS scientists one-on-one to learn more about USGS research and discuss the educational and career paths of USGS scientists. In particular, several current and former USGS Mendenhall Research Fellows (**Brian Collins**, **Li Erikson**, **Andrea Llenos**, **Jennifer Palguta**, **Heather Wright**) participated in a networking session on postdoctoral opportunities to provide information to and encourage SACNAS Ph.D. students to apply to the USGS Mendenhall Research Fellowship Program (**http://geology.usgs.gov/postdoc/**). The Mendenhall representatives also attended additional sessions to discuss education and early career pathways in Earth science and to judge student posters.

Students with USGS connections also attended the meeting. Of the 1,000 student posters, two were presented by students who took part in the Partnership Education Program (PEP; **http://www.woodshole diversity.org/pep/**), which is partially supported by the USGS Woods Hole Coastal and Marine Science Center in Woods Hole, Massachusetts. **Alicia Perez** (Humboldt State University) presented her work on updating greenhouse-gas estimates for California, which was undertaken with **Eric Sundquist** and **Kate Ackerman** (USGS, Woods Hole). **Jacob Cravens** (Boston College) presented his research examining physiological responses of sea urchins to food abundance and predation, conducted under the direction of **Shawn Arellano** (Woods Hole Oceanographic Institution).

The 2012 SACNAS National Conference will be held October 11–14 in Seattle, Washington. For more information about SACNAS, visit **http://sacnas.org/** or contact **Ben Gutierrez** (**bgutierrez@usgs.gov**) or **Claudia Flores** (**cflores@usgs.gov**).

Inaugural Monterey Bay Marine GIS Users Meeting

By Nadine Golden

The inaugural meeting of the Monterey Bay Marine GIS User Group was held January 27, 2012, at the U.S. Geological Survey (USGS) Pacific Coastal and Marine Science Center in Santa Cruz, California. A GIS (geographic information system) is a computer-based system for storing, manipulating, analyzing, and managing all types of geographically referenced information. The goal of the new GIS user group is to support GIS training, expand capabilities on an individual and community level, and increase awareness of marine spatial datasets among the GIS science community in the Monterey Bay region.

Approximately 100 coastal-GIS data users, marine researchers, and policy makers gathered for five interesting and informative presentations. In this inaugural meeting, we hoped to foster collaboration among academic, private, state, and federal agencies and non-governmental organizations (NGOs) in the Monterey Bay marine-GIS science community. To facilitate collaboration, the meeting presentations were organized to highlight the interconnections among GIS tools, data, and public policy—including coastal and marine spatial planning, a comprehensive, science-based planning process for analyzing current and anticipated uses of ocean, coastal, and Great Lakes areas (**http://www.whitehouse.gov/administration/eop/oceans/cmsp**).

The day began with an update from the keynote speaker, Esri Chief Scientist **Dawn Wright**, who described the new GIS ocean initiatives and science vision that are emerging from Esri (**http://www.esri.com/**). She also provided details and examples of exciting marine-GIS projects and tools currently being developed by and with Esri, such as the company's bathymetric information system and new ocean basemap layer, and SeaSketch, a decision-support tool under development at the Marine Science Institute of the University of California, Santa Barbara, that is based on a combination of open-source and Esri technologies. Notes from **Wright's** presentation are posted online in a 7.1-MB PDF file at **http://dusk.geo.orst.edu/Pickup/Esri/Monterey_MGIS_djw_Esri.pdf**, and further information on the latest advances with respect to GIS ocean initiatives is posted at **http://www.esri.com/oceans**.

*Monterey Bay Marine GIS User Group meeting participants enjoy the winter sunshine in Santa Cruz, California, during a lunch break. Photograph by **Theresa Fregoso**, USGS.*

The next presentation by **Sam Johnson**, USGS Research Geologist and chief scientist in the California Seafloor Mapping Program, focused on the federal- and state-funded seafloor-mapping effort and data. **Johnson** discussed the California seafloor-mapping vision and gave an update on relevant datasets, derived products, and progress. More information about California Seafloor Mapping Program data collection and publication progress is posted online at **http://walrus.wr.usgs.gov/mapping/csmp/**.

After a lunch of networking and socializing in the Santa Cruz winter sunshine, the group heard a presentation by **Rikk Kvitek**, professor and director of the Seafloor Mapping Lab at California State University, Monterey Bay. **Kvitek** described the lab's California Seafloor Mapping Program efforts, as well as data availability and location. He also captivated the group with images of the lab's research vessel

(Marine GIS continued on page 12)

***Larry Crowder**, Science Director at the Center for Ocean Solutions in Monterey, California, pulls all the threads together in the Monterey Bay Marine GIS User Group meeting's final presentation, which focused on bridging the gaps among GIS, policy, and coastal and marine spatial planning. Photograph by **Theresa Fregoso**, USGS.*

(Marine GIS continued from page 11)

KelpFly, a craft designed to conduct sonar and laser mapping in shallow waters. Information and an online video about the R/V *KelpFly* is posted at **http://news.csumb.edu/news/2011/sep/23/research-vessel-works-uncharted-waters?news-index=14279**.

Matt Merrifield, GIS Manager at the Nature Conservancy of California, described how coastal GIS datasets are used in modern Web and mobile applications that provide easier data access to non-GIS users, community groups, and policy makers. **Merrifield** presented two specific examples: (1) an implementation of data sharing through early GIS Web-based software called MarineMap, which is a decision-support tool for marine spatial planning, and (2) a centralized data-collection tool called eCatch, which is an automated posting system being used by fishermen to submit spatial information on fish.

Merrifield's presentation provided an excellent transition to the final talk, which focused on bridging the gaps among GIS, policy, and marine-spatial-planning applications. **Larry Crowder**, Science Director at the Center for Ocean Solutions in Monterey, California, gave the group a comprehensive presentation on coastal and marine spatial planning—its legislative history, the complex issues associated with it, and lessons learned from several case-study examples. He pointed out that GIS is a natural fit for coastal and marine spatial planning because its layered-information approach can help users visualize and sort through the multiple demands commonly placed on a single area, such as a shipping channel. **Crowder** also highlighted an upcoming project evaluating the mapping of cumulative human impacts in Monterey Bay and encouraged the group of GIS scientists to consider addressing the need for creating spatial datasets for coastal planning and use. More about **Crowder's** work and the work at the Center for Ocean Solutions can be found at **http://www.centerforoceansolutions.org/initiatives**.

*Monterey Bay Marine GIS User Group meeting organizers **Nadine Golden** (USGS; left) and **Lisa Wedding** (University of California, Santa Cruz; right) enjoy a sense of accomplishment as they pose with keynote speaker and Esri Chief Scientist **Dawn Wright** at the end of the meeting. Photograph by **Theresa Fregoso**, USGS.*

The Monterey Bay Marine GIS User Group will meet again in summer 2012; details to be announced soon. For any questions about the Monterey Bay Marine GIS User Group or meeting, please contact **Lisa Wedding** at **lwedding@ucsc.edu** or **Nadine Golden** at **ngolden@usgs.gov**. ☸

Ph.D. Student Researching Marine Mineral Deposits—A Collaboration Among the USGS Pacific Coastal and Marine Science Center, the University of California Santa Cruz, and the Monterey Bay Aquarium Research Institute

Tracey Conrad is a first-year Ph.D. student at the University of California, Santa Cruz (UCSC), working with **James R. Hein**, U.S. Geological Survey (USGS) senior scientist and adjunct professor in UCSC's Ocean Sciences Department, and **Adina Paytan**, UCSC research scientist in the departments of Earth and Planetary Sciences and Ocean Sciences. **Tracey** is studying samples collected with the Monterey Bay Aquarium Research Institute's (MBARI) remotely operated vehicles (ROV) *Tiburon* and *Doc Ricketts* during cruises conducted in 2000, 2003, 2004, and 2010 under the direction of **David Clague** (MBARI Senior Scientist, formerly with the USGS). This project is possible thanks to the close collaboration among the three institutions.

Tracey's Ph.D. research concerns a specific type of marine mineral deposit:

(Ph.D. Student continued on page 13)

*Ph.D. student **Tracey Conrad** at University of California, Santa Cruz, March 2012. **Tracey** is studying a specific type of marine mineral deposit—ferromanganese (Fe-Mn) crusts—from along the California continental margin. Fe-Mn crusts form globally on subsea ridges and seamounts.*

(Ph.D. Student continued from page 12)

ferromanganese (Fe-Mn) crusts that form on submarine ridges and seamounts throughout the ocean. She will focus on Fe-Mn crusts along California's central and southern continental margin, comparing them to open-ocean samples. The composition of the continental-margin deposits is significantly different from that of open-ocean deposits—a difference that may be related to the history of upwelling, productivity, and sediment input along the continental margin. The results of this research will enhance our understanding of marine geochemistry and the history of the California margin. The accurate location and water-depth information for samples collected by the MBARI ROVs will allow **Tracey** to study the effects of water depth and localized input on the composition of Fe-Mn crusts.

*Ferromanganese crust on basalt substrate, collected during Monterey Bay Aquarium Research Institute (MBARI) cruise to the Taney Seamounts—a chain of four undersea volcanoes that lie about 300 kilometers due west of Monterey Bay, California—from August 5–13, 2010 (see **http://www.mbari.org/expeditions/Taney10/**).*

*Ferromanganese crust without a substrate, collected during MBARI cruise to the Taney Seamounts, August 5–13, 2010 (see **http://www.mbari.org/expeditions/Taney10/**).*

Dutch Student Visiting USGS Pacific Coastal and Marine Science Center

By Guy Gelfenbaum

Dutch student **Jeroen Stark** is visiting the U.S. Geological Survey (USGS) Pacific Coastal and Marine Science Center in Santa Cruz, California, for 2½ months, from February 26 to May 10, 2012. He is working with **Guy Gelfenbaum** and **Andrew Stevens** on long-term morphological modeling of the mouth of the Columbia River, Oregon/Washington, with a particular focus on factors that cause accretion or erosion of sediment at the river mouth and along the coast to the north and south. **Jeroen** is currently working on his M.S. thesis in the field of coastal engineering at the Delft University of Technology, the Netherlands. The project he is working on is part of a cooperative agreement between the USGS and Deltares, a Dutch research institute in the field of water management and building in deltaic regions.

Jeroen's thesis focuses mainly on how dredging at the Columbia River mouth affects the long-term morphological development of the littoral system—the nearshore area where sediment is moved by waves. Because much of the sand dredged from the Columbia River mouth is placed at deep-water disposal sites, entrance-channel dredging has removed a significant amount of material from the littoral system. Strategic placement of dredged material at the mouth of the Columbia River, however, could help solve coastal-erosion problems. The long-term effects of historical sediment-disposal practices, as well as future disposal strategies, are therefore part of this study.

A process-based numerical model (Delft3D) originally developed by **Edwin Elias** (coastal engineer with Deltares and the USGS) and **Guy Gelfenbaum** is used for long-term morphological simulations of the Columbia River mouth and adjacent coastal areas. Model simulations are performed to study the influence of historical dredge and disposal activities on the littoral drift (net alongshore sediment transport) and on the morphological development of the area. Ultimately, the Delft3D model could be used for investigating or optimizing strategic placement of dredged material.

Historically, the Columbia River has supplied sediment to the littoral system, in which a general accretion trend was present during Holocene time (the past approximately 12,000 years). Sediment from the Columbia River and estuary was deposited at the ebb-tidal delta, and waves dispersed the material to the littoral cell. Jetty construction significantly disturbed this natural behavior of the morphological system. Initially, it caused accretion rates to increase rapidly. As these accretion rates are now slowing down or even reversing to erosion, it is important to study the influence of the different natural and anthropogenic processes on the littoral system.

*Visiting M.S. student **Jeroen Stark** at a beach near Santa Cruz, California, March 2011. **Jeroen** is studying how dredging at the Columbia River mouth affects the long-term morphological development of the littoral system—the nearshore area where sediment is moved by waves.*

New Video Shows a Virtual Fly-Through Along the Lower Elwha River, Washington, Using Recently Acquired Ground-Based Lidar Data

By Joshua Logan

The U.S. Geological Survey (USGS) recently released a short video that takes the viewer on a virtual flight down the lower Elwha River on Washington's Olympic Peninsula. The video—posted on the USGS YouTube channel at **http://youtu.be/0tEvz-rEz3Q**—was created from ground-based lidar (light detection and ranging) data collected in September 2011 as part of USGS work investigating how the removal of two large dams on the Elwha will affect the river system downstream. (See "Elwha Dam Removal Begins—Long-Planned Project Will Restore Ecosystem, Salmon Runs," *Sound Waves*, November/December 2011, **http://soundwaves.usgs.gov/2011/11/**.) The video begins about 0.8 river kilometers upstream (south) of the bridge on Elwha River Road. The virtual flight path then proceeds downstream approximately 5.5 kilometers, in a northerly direction, to the mouth of the river on the Strait of Juan de Fuca.

The data shown in the fly-through are a composite of multiple scans collected with a ground-based lidar scanner, which uses high-speed laser measurements to produce highly accurate three-dimensional maps of the surrounding environment. By combining these measurements with digital images from a camera mounted on the scanner, the instrument produces three-dimensional "point clouds" that can be displayed in true color. Because the water surface is not measured by the lidar scanner, it appears black in the video. Each of the millions of data points represents a discrete measurement of precise elevation and geographic position. Cobble bars, gravel beds, bluffs, riverside vegetation, and manmade features are all visible in the data. Using the appropriate software, each feature can be queried for size, geographic position, and precise elevation.

The river system shown in the video is downstream from the Elwha and Glines Canyon Dams, both of which are being removed in the largest dam-removal project in U.S. history. For nearly a century, these

(Virtual Flight continued on page 15)

Screenshot from recently released USGS video that takes the viewer on a virtual flight through lidar (light detection and ranging) data collected along the lower Elwha River, Washington. Location is approximately 500 meters upstream from the bridge on Elwha River Road. Black "holes" in data (see prominent one in lower third of image) are sites where the lidar scanner stood; because of limitations in the scanner's vertical field of view, no data are collected immediately below the scanner. Likewise, the water surface appears black because it is not measured by the scanner.

***Josh Logan** (left) and **Amy Draut** of the USGS collecting lidar data on the lower Elwha River, Washington, on September 14, 2011, less than a week before removal of two large dams commenced on September 17. Photograph by **Justin T. Minear**, USGS.*

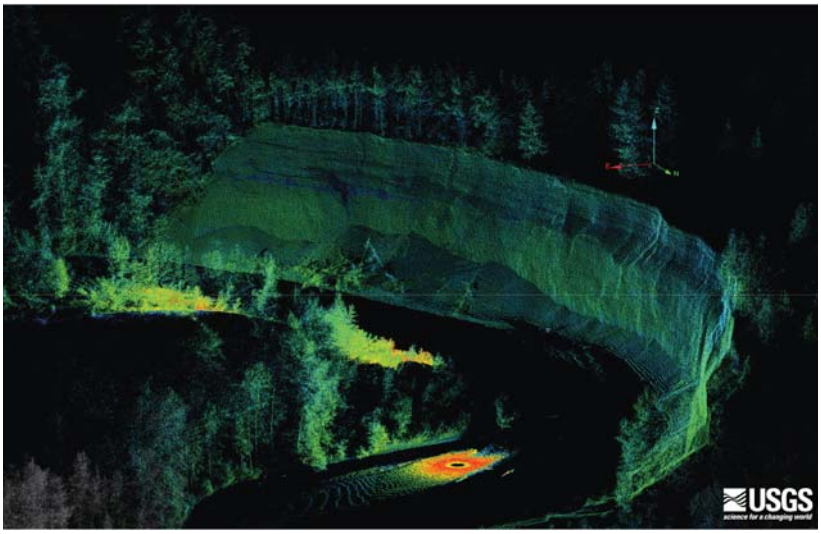
(Virtual Flight continued from page 14)

dams have been preventing salmon and steelhead from accessing historic spawning habitat above the dams. The dams have also been blocking the natural supply of sediment to the lower river and the nearby coastal beaches. Beginning in 2006, scientists from the USGS have been monitoring seasonal changes in the river channel below the dams to serve as a baseline with which to compare post-dam-removal changes in the future. Just before dam removal began in September 2011, scientists from the USGS conducted a ground-based lidar survey to map the lower river in great detail. This data set will provide scientists with an accurate snapshot of the lower river before dam removal. The elevation models produced from these data will be compared with measurements from future surveys to monitor and quantify changes that occur in the river system as it responds to dam removal.

To view the video—produced by scientists **Joshua Logan** and **Amy Draut** of the USGS Pacific Coastal and Marine Science Center, Santa Cruz, California, and **Justin T. Minear** of the California Water Science Center, Sacramento—visit the USGS YouTube channel at **http://youtu.be/0tEvzrEz3Q**.

To learn more about the USGS science supporting Elwha River restoration, visit **http://walrus.wr.usgs.gov/elwha/**. For additional information about the Elwha River Restoration project, visit the National Park Service's Elwha River Restoration Web site at **http://www.nps.gov/olym/naturescience/elwha-ecosystem-restoration.htm**.

Amy Draut *of the USGS collecting lidar data near a large bluff on the lower Elwha River, Washington, on September 14, 2011. The same bluff appears in the lidar image below. Photograph by* ***Justin T. Minear****, USGS.*



Lidar image of bluff in photograph above. Colors in this image indicate the intensity of light returned to the lidar scanner (reds and yellows for higher intensities, greens and blues for lower intensities), which is a function of distance from the scanner as well as of the texture of the reflecting surface. Black "hole" surrounded by yellow and orange near bottom of image is one of the sites where the scanner stood; because of limitations in the scanner's vertical field of view, no data are collected immediately below the scanner.

Recently Published Articles

Ackerman, J.T., Overton, C.T., Casazza, M.L., Takekawa, J.Y., Eagles-Smith, C.A., Keister, R.A., and Herzog, M.P., 2012, Does mercury contamination reduce body condition of endangered California clapper rails?: Environmental Pollution, v. 162, p. 439–448, doi:10.1016/j.envpol.2011.12.004 [**http://dx.doi.org/10.1016/j.envpol.2011.12.004**].

Brand, L.A., Smith, L.M., Takekawa, J.Y., Athearn, N.D., Tayler, K., Shellenbarger, G.G., Schoellhamer, D.H., and Spenst, R., 2011, Trajectory of early tidal marsh restoration; elevation, sedimentation and colonization of breached salt ponds in the northern San Francisco Bay: Ecological Engineering, v. 42, p. 19–29, doi:10.1016/j.ecoleng.2012.01.012 [**http://dx.doi.org/10.1016/j.ecoleng.2012.01.012**].

Byrd, K., 2011, Land-use planning for nearshore ecosystem services—the Puget Sound Ecosystem Portfolio Model: U.S. Geological Survey Fact Sheet 2011–3067, 2 p. [**http://pubs.usgs.gov/fs/2011/3067/**].

Byrd, K.B, Kreitler, J.R, and Labiosa, W.B, 2011, Tools and methods for evaluating and refining alternative futures for coastal ecosystem management—the Puget Sound Ecosystem Portfolio Model: U.S. Geological Survey Open-File Report 2011–1279, 47 p. [**http://pubs.usgs.gov/of/2011/1279/**].

Dimova, N.T., Swarzenski, P.W., and Dulaiova, H., 2012, Utilizing multichannel electrical resistivity methods to examine the dynamics of the

(Recently Published continued on page 16)

(Recently Published continued from page 15)

fresh water-seawater interface in two Hawaiian groundwater systems: Journal of Geophysical Research, v. 117, C02012, 12 p., doi:10.1029/2011JC007509 [**http://dx.doi.org/10.1029/2011JC007509**].

Dorcas, M.E., Willson, J.D., Reed, R.N., Snow, R.W., Rochford, M.R., Miller, M.A., Meshaka, W.E., Jr., Andreadis, P.T., Mazzotti, F.J., Romagosa, C.M., and Hart, K.M., 2012, Severe mammal declines coincide with proliferation of invasive Burmese pythons in Everglades National Park: Proceedings of the National Academy of Sciences, v. 109, no. 7, p. 2418–2422, doi:10.1073/pnas.1115226109 [**http://dx.doi.org/10.1073/pnas.1115226109**].

Fellers, G.M., Cole, R., Reinitz, D., and Kleeman, P., 2011, Amphibian chytrid fungus (*Batrachochytrium dendrobatidis*) in coastal and montane California, USA Anurans: Herpetological Conservation and Biology, v. 6, no. 3, p. 383–394 [**http://www.herpconbio.org/contents_vol6_issue3.html**].

Hart, K.M., Schofield, P.J., and Gregoire, D.R., 2012, Experimentally derived salinity tolerance of hatchling Burmese pythons (*Python molurus bivittatus*) from the Everglades, Florida (USA): Journal of Experimental Marine Biology and Ecology, v. 413, p. 56–59, doi:10.1016/j.jembe.2011.11.021 [**http://dx.doi.org/10.1016/j.jembe.2011.11.021**].

Kéfi, S., Berlow, E.L., Wieters, E.A., Navarrete, S.A., Petchey, O.L., Wood, S.A., Boit, A., Joppa, L.N., Lafferty, K.D., Williams, R.J., Martinez, N.D., Menge, B.A., Blanchette, C.A., Iles, A.C., and Brose, U., 2012, More than a meal... integrating non-feeding interactions into food webs: Ecology Letters, v. 15, no. 4, p. 291–300, doi:10.1111/j.1461-0248.2011.01732.x [**http://dx.doi.org/10.1111/j.1461-0248.2011.01732.x**].

Kellogg, C.A., Piceno, Y.M., Tom, L.M., DeSantis, T.Z., Zawada, D.G., and Andersen, G.L., 2012, PhyloChip™ microarray comparison of sampling methods used for coral microbial ecology: Journal of Microbiological Methods, v. 88, no. 1, p. 103–109, doi:10.1016/j.mimet.2011.10.019 [**http://dx.doi.org/10.1016/j.mimet.2011.10.019**].

Klimstra, J.D., Yee, J.L., Heinz, G.H., Hoffman, D.J., and Stebbins, K.R., 2012, Interactions between methylmercury and selenomethionine injected into mallard eggs: Environmental Toxicology and Chemistry: v. 31, no. 3, p. 579–584, doi:10.1002/etc.1708 [**http://dx.doi.org/10.1002/etc.1708**].

Lorenson, T.D., and Collett, T.S., 2011, Gas hydrate prospecting using well cuttings and mud-gas geochemistry from 35 wells, North Slope, Alaska: U.S. Geological Survey Scientific Investigations Report 2011–5195, 27 p. and workbook files [**http://pubs.usgs.gov/sir/2011/5195/**].

Lorenson, T.D., Leifer, I., Wong, F.L., Rosenbauer, R.J., Campbell, P.L., Lam, A., Hostettler, F.D., Greinert, J., Finlayson, D.P., Bradley, E., and Luyendyk, B.P., 2011, Biomarker chemistry and flux quantification methods for natural petroleum seeps and produced oils, offshore southern California: U.S. Geological Survey Scientific Investigations Report 2011–5210, 45 p., 4 data files, and OCS Study BOEM 2011–016 [**http://pubs.usgs.gov/sir/2011/5210/**].

McMullen, K.Y., Poppe, L.J., Danforth, W.W., Blackwood, D.S., Schaer, J.D., Glomb, K.A., and Doran, E.F., 2012, Sea-floor geology of Long Island Sound north of Duck Pond Point, New York: U.S. Geological Survey Open-File Report 2011–1149, DVD-ROM [**http://pubs.usgs.gov/of/2011/1149/**].

Middleton, B.A., and McKee, K.L., 2011, Can elevated CO^2 modify regeneration from seed banks of floating freshwater marshes subjected to rising sea-level?: Hydrobiologia, v. 683, no. 1, p. 123–133, doi:10.1007/s10750-011-0946-3 [**http://dx.doi.org/10.1007/s10750-011-0946-3**].

Middleton, B.A., and McKee, K.L., 2011, Soil warming alters seed-bank responses across the geographic range of freshwater *Taxodium distichum* (Cupressaceae) swamps: American Journal of Botany, v. 98, no. 12, p. 1943–1955, doi:10.3732/ajb.1100246 [**http://dx.doi.org/10.3732/ajb.1100246**].

Morton, R.A., Gelfenbaum, G., Buckley, M.L., and Richmond, B.M., 2011, Geological impacts and implications of the 2010 tsunami along the central coast of Chile: Sedimentary Geology, v. 242, no. 1–4, p. 34–51, doi:10.1016/j.sedgeo.2011.09.004 [**http://dx.doi.org/10.1016/j.sedgeo.2011.09.004**].

Poppe, L.J., McMullen, K.Y., Ackerman, S.D., Schaer, J.D., and Wright, D.B., 2012, Sea-floor geology and sedimentary processes in the vicinity of Cross Rip Channel, Nantucket Sound, offshore southeastern Massachusetts: U.S. Geological Survey Open-File Report 2011–1222, DVD-ROM [**http://pubs.usgs.gov/of/2011/1222/**].

Presto, M.K., Storlazzi, C.D., Logan, J.B., Reiss, T.E., and Rosenberger, K.J., 2012, Coastal circulation and potential coral-larval dispersal in Maunalua Bay, Oʻahu, Hawaii—Measurements of waves, currents, temperature, and salinity, June–September 2010: U.S. Geological Survey Open-File Report 2012–1040, 67 p. [**http://pubs.usgs.gov/of/2012/1040/**].

Olabarrieta, M., Warner, J.C., Armstrong, B., Zambon, J.B., and He, R., 2012, Ocean-atmosphere dynamics during Hurricane Ida and Nor'Ida; an application of the coupled ocean-atmosphere-wave-sediment transport (COAWST) modeling system: Ocean Modelling, v. 43–44, p. 112–137, doi:10.1016/j.ocemod.2011.12.008 [**http://dx.doi.org/10.1016/j.ocemod.2011.12.008**].

Ramsey, E.W., III, Rangoonwala, A., Thomsen, M.S., and Schwarzschild, A., 2012, Flat-plate techniques for measuring reflectance of macro-algae (*Ulva curvata*): International Journal of Remote Sensing, v. 33, no. 10, p. 3147–3155, doi:10.1080/01431161.2011.633124 [**http://dx.doi.org/10.1080/01431161.2011.633124**].

Ramsey, E.W., III, Rangoonwala, A., Thomsen, M.S., and Schwarzschild, A., 2012, Spectral definition of the macro-algae *Ulva curvata* in the back-barrier bays of the Eastern Shore of Virginia, USA: International Journal of Remote Sensing, v. 33, no. 2, p. 586–603, doi:10.1080/01431161.2010.543436 [**http://dx.doi.org/10.1080/01431161.2010.543436**].

Ramsey, E.W., III, Werle, D., Suzuoki, Y., Rangoonwala, A., and Lu, Z., 2012,

(Recently Published continued on page 17)

(Recently Published continued from page 16)

Limitations and potential of satellite imagery to monitor environmental response to coastal flooding: Journal of Coastal Research, v. 28, no. 2, p. 457–476, doi:10.2112/JCOASTRES-D-11-00052.1 [**http://dx.doi.org/10.2112/JCOASTRES-D-11-00052.1**].

ten Brink, U., and Flores, C., 2012, Geometry and subsidence history of the Dead Sea basin; a case for fluid-induced mid-crustal shear zone?: Journal of Geophysical Research, v. 117, no. B01406, 21 p., doi:10.1029/2011JB008711 [**http://dx.doi.org/10.1029/2011JB008711**].

van Riper, C., III, Powell, R., van Wagtendonk, J.W., Machlis, G., Galipeau, R., van Riper, C.J., and von Ruschkowski, E., Integrated science and interdisciplinary research for parks and protected areas, *in* Weber, S., ed., Rethinking protected areas in a changing world; proceedings of the 2011 George Wright Society Biennial Conference on Parks, Protected Areas, and Cultural Sites: Hancock, Michigan, George Wright Society, p. 350–355 [**http://www.georgewright.org/proceedings2011**].

Walters, L.J., Turner, T., Kuffner, I.B., and Paul, V.J., 2012, Sea urchin foraging; impacts in coral recruits [abs.]: Society for Integrative and Comparative Biology Annual Meeting, Charleston, S.C., January 3–7, 2012, abstract P3.56 [**http://sicb.org/meetings/2012/schedule/abstractdetails.php?id=1331**].

Publications Submitted for Bureau Approval

Cochran, S.A., Aerial photography application, *in* Goodman, J.A., Purkis, S.J., and Phinn, S.R., eds., Coral reef remote sensing—a guide for multi-level sensing, mapping and assessment: Springer [**http://www.springer.com/earth+sciences+and+geography/remote+sensing/book/978-90-481-9291-5**].

Cross, V.A., Bratton, J.F., Crusius, J., Kroeger, K.D., and Worley, C.W., Continuous resistivity profiling data from Manhasset Bay and Northport Harbor, Long Island, New York: U.S. Geological Survey Open-File Report 2011–1041.

Draut, A.E., Redsteer, M.H., and Amoroso, L., Recent seasonal variations in arid landscape cover and aeolian sand mobility, Navajo Nation, southwestern U.S.: American Geophysical Union Chapman Conference on Climates, Past Landscapes, and Civilizations, Santa Fe, New Mexico, USA, March 21–25, 2011, proceedings.

Fletcher, C.H., Barbee, M., Genz, A.S., Romine, B.M., Dyer, M., Frazer, L.N., Anderson, T.R., Lim, S.C., Vitousek, S., and Bochicchio, C., National Assessment of Shoreline Change; a GIS compilation of vector shorelines and associated change data for the sandy shorelines of Kauai, Oahu, and Maui; Hawaii: U.S. Geological Survey Open-File Report 2011–1009.

Fletcher, C.H., Romine, B.M., Genz, A.S., Barbee, M.M., Dyer, M., Anderson, T.R., Lim, S.C., Vitousek, S., Bochicchio, C., and Richmond, B.M., National Assessment of Shoreline Change; historical shoreline changes in the Hawaiian Islands: U.S. Geological Survey Open-File Report 2011–1051.

Foxgrover, A.C., and Barnard, P.L., A seamless, high-resolution, digital elevation model (DEM) of the north-central California coast: U.S. Geological Survey Data Series.

Geist, E.L., Near-field tsunami edge waves and complex earthquake rupture: Pure and Applied Geophysics.

He, R., Wooller, M.J., Pohlman, J.W., Catranis, C., Quensen, J., Tiedje, J.M., and Leigh, M.B., Identification of functionally active aerobic methanotrophs in sediments from an arctic lake using stable isotope probing: Environmental Microbiology.

He, R., Wooller, M.J., Pohlman, J.W., Quensen, J., Tiedje, J.M., and Leigh, M.B., Diversity of active aerobic methanotrophs along depth profiles of arctic and subarctic lake water column and sediments: International Society for Microbial Ecology (ISME) Journal.

Hein, J.R., and Conrad, T.A., Resource considerations for ferromanganese crusts in Oceania [abs.]: International Geological Congress, 34th, Brisbane, Australia, August 5–10, 2012.

Hein, J.R., Conrad, T.A., Klofas, J., and Runtzel, K., Metal-rich mineral deposits found in the western Arctic Ocean [abs.]: American Geophysical Union Science Policy Conference, Washington, D.C., April 30–May 3, 2012.

Hutchinson, D.R., Along track ice conditions, chap. 5 *of* Mosher, D.C., 2011 Canadian High Arctic Seismic Expedition—CCGS *Louis S. St-Laurent* expedition report: Geological Survey of Canada Open-File Report 7053, p. 100-114.

Hutchinson, D.R., Gravity data acquisition, chap. 4 *of* Mosher, D.C., 2011 Canadian High Arctic Seismic Expedition—CCGS *Louis S. St-Laurent* expedition report: Geological Survey of Canada Open-File Report 7053, p. 85-99.

Kuffner, I.B., Paul, V.J., Ritson-Williams, R., Hickey, T.D., and Walters, L.J., Baseline surveys to detect RNA-induced trophic changes in shallow hard-bottom communities: National Park Service Report.

Lacy, J.R., and MacVean, L.J., Wave-height evolution in the shallows of San Francisco Bay [abs.]: Physics of Estuaries and Coastal Seas Symposium, New York, New York, August 12–16, 2012.

Lavoie, D.L., Flocks, J., Twichell, D., and Rose, K.V., Benthic substrate classification map; Gulf Islands National Seashore: U.S. Geological Survey Open-File Report.

MacVean, L.J., and Lacy, J.R., Sediment dynamics in the shallowest regions of an estuary [abs.]: Physics of Estuaries and Coastal Seas Symposium, New York, New York, August 12–16, 2012.

Pendleton, E.A., Twichell, D.C., Foster, D.S., Worley, C.R., Irwin, B., and Danforth, W.W., High-resolution geophysical data from the inner continental shelf; Elizabeth Islands, Massachusetts: U.S. Geological Survey Open-File Report 2011–1184.

Subino, J.A., Forde, A.S., Dadisman, S.V., Wiese, D.S., and Calderon, K., Archive

(Publications Submitted continued on page 18)

(Publications Submitted continued from page 17)

of digital boomer seismic reflection data collected offshore east-central Florida during USGS cruises 96FGS01 and 97FGS01 in November of 1996 and May of 1997: U.S. Geological Survey Data Series 652, 2 DVDs.

Subino, J.A., Forde, A.S., Dadisman, S.V., Wiese, D.S., Calderon, K., and Phelps, D.C., Archive of digital boomer seismic reflection data collected offshore northeast Florida during USGS cruise 02FGS01, October 2002: U.S. Geological Survey Data Series 653, 1 DVD.

Swarzenski, P.W., Smith, C.A., Ganguli, P.M., Izbicki, J.A., and Sheibley, R.W., An assessment of submarine groundwater discharge and its nearshore ecological impacts; examples from the U.S. west coast and Hawai‘i [abs.]: Goldschmidt Conference, 22nd, Montréal, Canada, June 24–29, 2012.

Twichell, D., Kelso, K., and Pendleton, E., Evidence for mid-Holocene intensified storm activity in Mobile Bay, Alabama: U.S. Geological Survey Open-File Report.

Warrick, J.A., Rosenberger, K., Lam, A., Ferreira, J., Miller, I.M., Rippy, M., Svejkovsky, J., and Mustain, N., Observations of coastal sediment dynamics of the Tijuana Fine Sediment Fate and Transport Demonstration Project, Imperial Beach, California: U.S. Geological Survey Open-File Report.

Yates, K.K., DuFore, C.M., and Robbins, L.L., Chemical and biological consequences of using carbon dioxide versus acid additions in ocean acidification experiments: U.S. Geological Survey Scientific Investigations Report.