



NEWSWAVE

NEWS FROM THE U.S. DEPARTMENT OF THE INTERIOR: OCEAN, COASTS AND GREAT LAKES

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Summer 2012



Secretary Salazar designates new trails as components of the Captain John Smith Chesapeake National Historic Trail system. Photo credit: Tami Heilemann

Historic River Trails Connect Five States to Chesapeake Bay

New river trails increase access, recreational opportunities, tourism, and cultural awareness

On May 16, at Sandy Point State Park, Secretary Salazar, Maryland Governor Martin O'Malley, National Park Service Director Jon Jarvis joined other tribal, state,

See Historic Trails page 17

Nation's Beaches and Coasts are Economic Assets for all Americans

By Ann B. Tihansky and Christian Crowley

Many of the best beaches across the Nation are on public lands managed by the Interior Department. In addition to beautiful scenery, coastal wildlife, and diverse recreational opportunities, these areas support diverse local economies. Secretary Salazar recognized their value to all Americans on World Oceans Day, June 8. "America's oceans and beaches are national treasures. From coast to coast, our national beaches generate billions in economic activity and support tens of thousands of jobs through outdoor recreation and tourism," said Salazar. Interior is committed to helping implement the vision of the National Ocean Policy to ensure that these vital

See Best Beaches page 18



Images from Interior's on-line beach photo gallery. Left to right, Padre Island National Seashore (Texas), Sleeping Bear Dunes National Lakeshore (Michigan), and Gateway National Recreation Area (northeastern US). Photo credits: Teresa Eimers (NPS), NPS file photo, Jacob Riis (NPS).



Secretary of Commerce, John Bryson (left) greets Jennifer Ewald, BOEM, (at right) and Chris Darnell, USFWS, during Capitol Hill Ocean Week, June 5-8, in Washington, DC. Interior's exhibit booth attracted visitors with a selection of materials describing Interior's diverse responsibilities for our Nation's ocean, coastal and Great Lakes resources. See story page 9.

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Visit: <http://www.doi.gov/pmb/ocean/news/Newswave/index.cfm>

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ArcSEES Grants Foster Arctic Research

Interior Bureaus are collaborating with the National Science Foundation Office of Polar Programs grant program to foster research related to the sustainability of human, built, and environmental systems in the Arctic. The initial round of The Arctic Science, Engineering, and Education for Sustainability (ArcSEES) grants will focus on four key thematic areas: the natural and living environment; the built environment; natural-resource development, and governance. BOEM, FWS and USGS are participants on these grants.

Learn more: http://www.nsf.gov/news/news_summ.jsp?cntn_id=124308&org=NSF&from=news

Learn more about the science behind coastal hazards. Watch USGS Coastal and Marine Geology's video podcast, "In Harm's Way: Measuring Storm Impacts to Forecast Future Vulnerability"

<http://coastal.er.usgs.gov/podcast/hazard.html>

Related stories pages 3 and 4

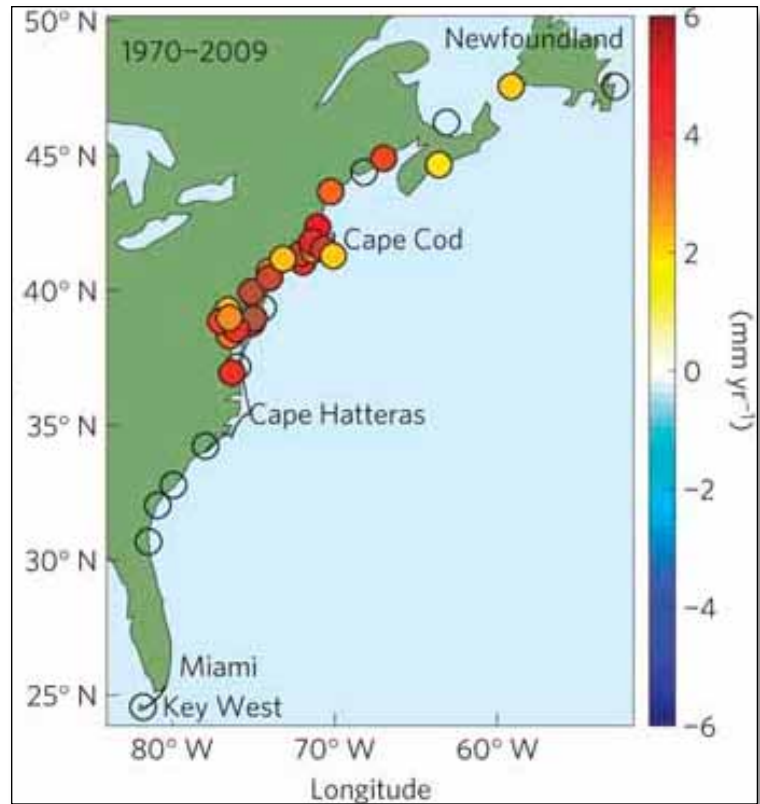


USGS Sea-Level Rise Research Points to 'Hot-Spots'

By Ann Tihansky

US Geological Survey (USGS) research identified a 1,000-km long 'hotspot' of accelerated sea-level rise extending from central North Carolina to above Boston, MA, in an article published June 24, 2012, in *Nature Climate Change*. USGS researchers found rates of sea level rise increasing, or accelerating, 3 to 4 times the global average. This increases the risks of flooding, erosion, and storm surge. "Cities in the hotspot, like Norfolk, New York, and Boston already experience damaging floods during relatively low intensity storms," said Dr. Asbury (Abby) Sallenger, USGS Oceanographer and project lead. "It potentially makes a storm more damaging," said Sallenger. USGS Director Marcia McNutt, who highlighted the need for this kind of coastal research and monitoring during a session at Capitol Hill Ocean Week (*related story page 9*) said, "many people mistakenly think that the rate of sea-level rise is the same everywhere as glaciers and ice caps melt, increasing the volume of ocean water, but other effects can be as large--as demonstrated in this study, regional oceanographic contributions must be taken into account in planning for what happens to coastal property." Sallenger adds, "We need to move away from talking about a bathtub filling with water and much more towards the idea of sea-level rise that varies regionally, which we will have to adjust to," he said. The article discusses the variables that cause sea-level trends to vary with unique spatial patterns along the Atlantic coast of North America. Sallenger says his study with field data, tests model results that project a hotspot in the northeast U.S.

Sallenger and co-authors analyzed data collected at tide gauges up and down the East Coast. Their results suggest the hot spot is a response to changes in ocean circulation caused by warming surface water in the subarctic, e.g. south of Greenland, and/or adding fresh water from the melting of the Greenland ice sheets, scenarios suggested by modeling studies. This kind of information is critical for coastal communities where planners, resource managers, and emergency responders have to account for these impacts. When extreme weather events and associated storm surge and wave run-up are superimposed on these sea-level trends, coastal



While global sea-level is on the rise, the rate of increase is faster than the global average in some areas. Spatial variations of sea-level rise (SLRD—deviation from global average) is shown here for locations along the eastern US coastline. Unfilled circles indicate areas with a value of zero—where the rate of sea-level rise is equal to the global average; positive numbers indicate areas where the rate is faster while negative numbers indicate it is slower than the average global rate. Red and orange colored circles show regional 'hotspots' calculated for the time period from 1970-2009.

cities become increasingly vulnerable to storm surge and flooding. Coastal beaches and wetlands can deteriorate by migrating and eroding.

Press release: http://www.usgs.gov/newsroom/article.asp?ID=3256&from=rss_home#.T-jN6lJuLq4

Link to the article: <http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate1597.html>

Dr. Sallenger appeared on the Diane Rehm show July 3. <http://thedianerehmshow.org/shows/2012-07-03/environmental-outlook-rising-sea-levels>

Subscribe to ocean.data.gov's Newsletter

Receive monthly updates about the National Ocean Council's data portal. Support ocean, coastal and Great Lakes information sharing and planning.

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Interior's Vision for Science-Based Integrated Arctic Management

By Randal Bowman

Secretary Ken Salazar and Deputy Secretary David Hayes delivered remarks at the Arctic Roundtable in Trondheim, Norway, June 26, highlighting the Department's role in ensuring safe and responsible oil and gas development in the Arctic. Interior has authority over exploration for and development of oil, gas, renewable energy resources and mineral deposits on the Outer Continental Shelf, and similar authorities on land, where BLM has jurisdiction over Federal oil, gas and subsurface minerals on approximately 220 million acres in Alaska. Salazar set the stage as opening speaker, "it's impossible to talk about energy development and resource management without talking about the need to preserve fragile environments, the need to develop infrastructure, or the need to protect Native communities and their way of life. For U.S. policy-makers, these issues coalesce in Alaska, which includes America's Arctic." (*related story page 7*). Interior manages the majority of land in the U.S. Arctic, and virtually all Federal land there. This includes vast areas of coastal ecosystems such as the Arctic National Wildlife Refuge, the Gates of the Arctic National Park and Preserve, the National Petroleum Reserve, and the Alaska and the Yukon Delta National Wildlife Refuge. Interior responsibility for energy development is receiving attention now. President Obama created the Interagency Working Group on Energy and Permitting in Alaska, chaired by Deputy Secretary Hayes, to



The Arctic boundary as defined by the Arctic Research and Policy Act.

<http://www.arctic.gov/maps.html>

facilitate a coordinated, science-based, domestic energy development and permitting approach in Alaska. Within the last year, the Working Group held three Science and Decision-making workshops with members of the Federal, tribal, state, and local government representatives and members of industry, academia, and non-governmental organizations. One of the key themes that emerged is the need to adopt an integrated, holistic approach to resource management in the Arctic, which closely follows efforts initiated last year by the Arctic Council to address sustainable resource management. The Secretary and Deputy Secretary accompanied Secretary of State Hillary Clinton to that Arctic Council meeting, and both strongly endorsed the outcome. The Department has been deeply involved in implementing actions since that time. A key element was the Arctic Council's decision to explore a framework for ecosystem-based management (or EBM) through establishment of an Arctic Council EBM Experts Group. That international group met initially at

Interior, and continues to cooperate in developing a body of best practices for EBM in a rapidly changing environment. In addition to these international efforts, the U.S. government has initiated a domestic effort to integrate Arctic management across jurisdictional boundaries. "The Federal government must take a comprehensive, science-based approach when addressing energy and other development issues in the Arctic, one that recognizes both the region's enormous resource potential and its irreplaceable natural and cultural resources," said Hayes, who serves as chair of the Alaska Interagency Working Group. "Getting it right in the Arctic requires a transparent, disciplined and integrated approach so that we can make sound, long-term planning decisions." These efforts are strengthening our scientific knowledge-base and opening up the lines of communication between the science community and decision-makers.

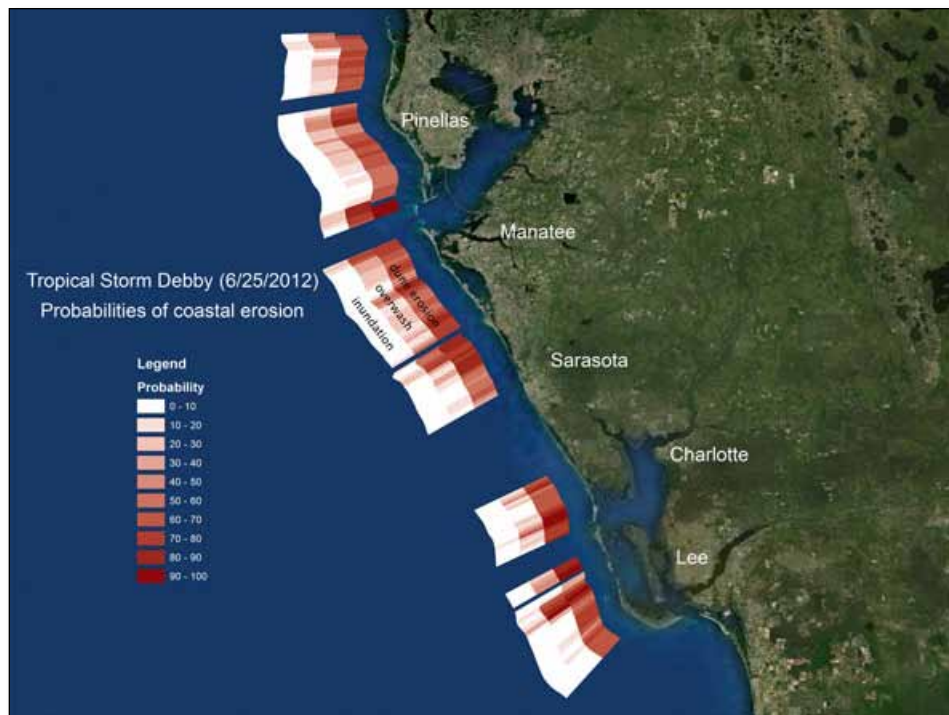
Next steps for Arctic:

<http://www.doi.gov/news/pressreleases/loader.cfm?csModule=security/getfile&pageid=311370>

Tropical Storm Debby Kicks Off USGS Coastal Impact Assessment Season

By Ann Tihansky and Hilary Stockdon

As Tropical Storm Debby formed in the Gulf of Mexico on June 23, 2012, USGS scientists predicted how the storm would impact Florida's Gulf coastal regions. While the storm's rain caused flooding throughout much of the western part of the state, its slow movement caused storm surge to build along Florida's panhandle and west-central coasts. Deep-water wave heights exceeded 3 m (10 ft) for almost three days. The combined effects of surge and storm-induced wave run-up increased water levels at the shoreline through multiple tidal cycles. This caused erosive conditions along the sandy dunes and beaches. Using a USGS-developed model that compares predicted water levels to observed beach elevations, scientists predicted how Debby might impact Florida's west coast beaches. Based on the National Hurricane Center's forecast advisory 9, USGS models predicted that beach and dune ero-



Probabilities of collision, overwash, and inundation predicted for Tropical Storm Debby along the west-central coast of Florida. Learn more about Tropical Storm Debby and USGS predictions here: <http://coastal.er.usgs.gov/hurricanes/debby/>

sion along west-central Florida was likely for 61 percent of the coast with 13 percent likely to experience overwash. Inundation of the beach system was not expected. These predictions currently are being verified using pre- and post-storm photography and topographic surveys. The data will also be used to further refine predictive models of coastal impacts from severe storms. The USGS works with

partners and other Federal agencies to refine model capabilities and share this information to enhance our Nation's coastal resiliency to storm impacts. Since beaches and dunes serve as the "first line of defense" for tropical storms and hurricanes, understanding the risks prior to storm landfall can inform emergency managers as they prepare coastal communities for these storms.

Coastal Impacts on Sandy Beaches

Collision-when surge and waves attack the base of dunes and erode the front face.

Overwash-when surge and waves overtop dunes causing them to erode and migrate landward as sand is deposited inland.

Inundation- when surge and wave setup exceed the elevation of the dune crest or beach berm, overland flow of water occurs. In extreme cases, islands are breached allowing waves and currents to cross the island, possibly creating breaches or new inlets.



Sea-level rise can contribute to increased levels of storm surge (related story page 3). Photo credit: Ann Tihansky

CSI Sea Otter

USGS Scientists Help Identify Culprit in Mysterious Deaths

By Seth Sykora-Bodie, Melissa Miller, and Ann Tihansky

When dead sea otters with unusual lesions began showing up at her lab, Dr. Melissa Miller was perplexed. Her autopsy table has seen its fair share of mysteries, but in 10 years of examining sea otters, she couldn't recall having seen stranded otters with this odd appearance. As a veterinarian with the California Department of Fish and Game, based in Santa Cruz, California, Dr. Miller realized that something new, or perhaps just newly recognized, was threatening California's sea otters.

As the otters were brought in for examination, she noticed that their gums and the whites of their eyes were bright yellow, a finding that led her to suspect, and later confirm, that acute liver failure was the cause of death. She initially assumed that the cause of the liver failure was a bacterial infection that is relatively common in Cali-

fornia sea lions. However, after a series of negative tests, she was forced to go back to the drawing board. As with many murder mysteries, this one took a fortuitous turn when Dr. Miller received a tip from a friend that high concentrations of potentially toxic bacteria, called cyanobacteria, had been reported from a nearby lake.

One of the most important groups of toxin-producing cyanobacteria, also known as "blue-green algae", is the genus *Microcystis*, which produces a potent liver toxin called microcystin. Once produced in freshwater lakes and rivers, microcystin can travel downstream and cause problems in other areas. Microcystin can bioconcentrate in clams, oysters and mussels and other invertebrates that filter feed in contaminated water.

Could polluted fresh lake and river water really be poisoning the marine-dwelling sea otters that were turning up on Miller's autopsy table? This possibility seemed pretty far-fetched, at first. However, testing confirmed the presence of microcystin in the livers of



Veterinarian Melissa Miller (right) and lab assistant Debbie Brownstein conduct an autopsy on a dead sea otter at the Fish and Game Marine Wildlife Veterinary Care and Research Center in Santa Cruz, California (Photo credit: Melissa Miller, California Department of Fish and Game)



The threatened California sea otter, shown here, has a diet that includes a variety of shellfish. Here it is eating a clam, possibly the commercially harvested species known as the California butterclam, *Saxidomus nutalli*. Photo credit: Nicole LaRoche.

affected otters. When a colleague told Miller about an algal bloom in Pinto Lake, a small lake that is located upstream of where some of these otters were found, she began to work with local, Federal and state entities to piece together, and eventually, confirm the connections between freshwater *Microcystis* blooms and the sea otter deaths. Geographical and biological processes are always much more complicated and intricate than we imagine. The prevailing belief was that these toxic cyanobacterial blooms primarily affect cows, other livestock and pets on nearby farms, not marine mammals in downstream coastal areas. This is because the water bodies that most commonly support extensive cyanobacterial blooms are typi-

See Sea Otters page 19

Invasive Snakehead: 18-pounder caught in the Occoquan River



Juan Duran caught this 18-pound, 4-ounce northern snakehead in the Occoquan River in Virginia on May 8, 2012. Photo credit: Juan Duran.

By Seth Sykora-Bodie

After catching an 18-pound, 4-ounce Northern Snakehead in early May, Juan Duran is hoping the International Game Fish Association will grant him the world record based upon photos and the recorded weight. Others in the Potomac watershed including Interior's U.S. Fish and Wildlife Service (USFWS) are working to stamp out the spread of snakeheads in the U.S. Experts with USFWS's Branch of Aquatic Invasive Species, such as Laura Norcutt, began developing a National Snakehead Management Plan in 2011 to coordinate the control and management of the Chinese invader. The

See Snakehead page 14



BOEM's Ocean Science Volume 9, Issue 2, April-June 2012 is available on-line: <http://www.boem.gov/BOEM-Newsroom/Library/Ocean-Science/Ocean-Science.aspx>

of TK into the processes of environmental science and impact assessment activities, especially with regard to marine and coastal resources. BOEM actively collects TK information and integrates it within NEPA documents and decision making. BOEM and USGS were supporters of the First Stewards Conference, held in Washington, DC, at the Smithsonian National Museum of the American Indian July 17-20. This symposium was a first of its kind national event that brought together coastal tribal leaders to examine the impact of climate change on indigenous coastal cultures and discuss climate adaptation strategies.

You can watch many of the sessions on video.

<http://firststewards.org/videos/>

Interior at International Polar Year Conference

Deputy Secretary Hayes gave the keynote presentation at the International Polar Year Conference in Montreal IPY 2012, 'From Knowledge to Action' on June 22. Hayes' presentation and others are available via web cast, you will need a valid email to sign in.

<http://webcasts.welcome2theshow.com/ipy2012/tuesdaykeynote>

Supporting Traditional Knowledge

The Bureau of Ocean Energy Management (BOEM) has dedicated the April-June issue of Ocean Science to Traditional Knowledge (TK). TK is an important precursor and source of 'citizen science'. Over the past few decades, local and traditional ecological knowledge has been gradually and deliberately incorporated within government-funded science programs. In particular, the Arctic region of Alaska has become a focal point for progressive dialogue, experimentation, and incorporation

Interior and the Arctic

Norway Arctic Roundtable

Interior's press release and transcript: <http://www.doi.gov/news/pressreleases/Remarks-by-the-Secretary-and-Deputy-Secretary-at-Norway-Arctic-Roundtable.cfm>

Science Missions on the Extended Continental Shelf

<http://continentalshelf.gov/missions/10arctic/background/shelf.html>

Return to Poplar Island

Restoration is a Learning Process

By Ann Tihansky

See *NEWSWAVE* previous story--
http://www.doi.gov/pmb/ocean/news/newswave/upload/DOI_News-wave-Spring-2012-final.pdf

In early July, USFWS and USGS biologists visited Poplar Island in Chesapeake Bay as a routine monitoring trip to see how nesting season was going. In late May, USFWS biologists Biologists Chris Guy, Peter McGowan, and Robbie Callahan identified what they thought would be prime nesting areas: open sandy and shelly uplands in several areas on Poplar Island. They experimented with several techniques using tern decoys and audio recordings to help entice common and least terns to move to these locations and avoid hazardous construction areas. As part of the monitoring process, the biologists count nests, eggs and chicks at marked sites where they can track progress over time to see if these restoration methods are successful. In the process, the terns are teaching the biologists a few new things. “Common terns are surprising us this year. First their numbers were way down compared to the previous two years, but then more and more birds kept arriving in late June and July,” said Mike Erwin, USGS Biologist at Patuxent Wildlife Research Center. Erwin has been involved with the wildlife



Continued monitoring of wildlife and habitat use helps scientists and managers collect information that informs restoration plans and activities. This wetland area was first planted in 2003 and within two years had filled in to become a healthy marsh. Photo credit: Ann Tihansky

monitoring and Poplar restoration since the early 1990’s when it was still just a conceptual idea. He has been the lead on waterbird monitoring since 2002 conducting tern research for about 40 years.

The terns are indeed using the specially-created sites but they have also set up nesting colonies in other areas that are much more heavily vegetated. According to Erwin, “birds move from year to year and we can only guess what habitat they will favor. During the restoration process, we carefully design a variety of habitats so that we can offer up suitable areas for successful nesting. But the birds don’t read any of the plans. Restoration is a learning process. Nesting season starts in late May. This year, the first birds began arriving on schedule, with the least terns beginning nesting a week or so earlier than the common

See Poplar Island page 15



Terns are well-camouflaged in open sandy areas. At left: USFWS Volunteer Emma Gosliner, points out a least tern nesting ‘scrape’ and egg while USGS Biologist Peter Osenton notes the presence of the egg. At right: A least tern chick is hunkered down low for protection while its parents are away. Least terns generally prefer to nest in open sandy areas like this. Photo credit: Ann Tihansky.

Oceans Month 2012

Interior Engages with Public at Various Forums

With June as Oceans Month, Interior leadership, scientists and staff interacted with experts, policy makers, journalists, media and the public at a variety of events celebrating ocean and coastal resources.



USGS Director, Marcia McNutt, shares science-based strategies for national coastal resilience, during Capitol Hill Ocean Week in Washington, DC. Photo credit: Ann Tihansky.

Capitol Hill Ocean Week

From June 5-8, Capitol Hill Ocean Week convened “One Nation, Shaped by the Sea”, focusing on the key roles the ocean plays in American history, culture and economy. Secretary of Commerce, John Bryson gave the opening keynote talk. Alan Thornhill, Chief Environmental Officer at BOEM, shared strategies about offshore energy development and the role of science in informing the process, especially in the Arctic (related story page 4). Washington Post’s National Environmental Reporter, Juliet Eilperin, moderated a panel exploring how oceans influence American culture. Steve Carr, of Ventura County, CA Office of



From left, Cliff McCreedy (NPS), Steve Carr (Ventura County, CA Office of Education) and Norman Mineta (Joint Ocean Commission Initiative Co-Chair) meet after the Joint Ocean Commission Initiative presented their U.S. Ocean Policy Report Card for 2012. Photo credit: Ann Tihansky.

Education, used the partnership with the NPS’s Channel Islands Live Dive program as an example of how a unique educational program can bring remote visitors closer to ocean issues. By using advanced audio/visual technology and SCUBA diving NPS rangers, Ventura County brings help forests and other ocean experiences to students and other visitors, many of whom would not be able to visit these resources. USGS Director, Marcia McNutt, teamed up with Margaret Davidson of NOAA discussing a range of scenarios and strategies facing coastal communities in the future. Many of these presentations and sessions are available online. <http://www.nms-focean.org/CHOW-2012-agenda>

World Oceans Day

On June 8, Coastal America hosted a variety of special activities that included ocean-related films, presentation and hands-on activities celebrating World Oceans Day. Interior staff served as experts on hand to answer questions with visitors at Smithsonian’s Sant Ocean Hall. <http://coastalamerica.wordpress.com/2012/06/14/ocean-champions-celebrate-world-oceans-day-at-special-events-in-washington-d-c/>

USA Science and Engineering Festival

BOEM represented ocean energy and ocean science technology at the second USA Science and Engineering Festival, April 27-29 in Washington, DC. BOEM shared examples of how scientists and engineers work together to help meet the nation’s energy and mineral resource needs in a responsible manner. The event drew more than 200,000 visitors from across the United States.

Read more: http://library.constantcontact.com/download/get/file/1108848433345-93/FINAL+article+for+the+B OEM+Bulletin_MW.pdf



Sam Cable (BOEM), helps a group of budding young scientists play the “Energize Your Mind with Ocean Science” board game. Photo credit: Marjorie Weisskohl.

Interior Contributes to Inaugural AGU Science Policy Conference

By Ann Tihansky and Kristan Uhlenbrock

Interior recognizes the value and important function science plays in informing policy decisions. From April 30 to May 2, Interior leaders and scientists participated in American Geophysical Union's (AGU) inaugural Science Policy Conference in Washington, D.C. This meeting is AGU's first time bringing together the scientific and policy communities on topics of natural hazards, natural resources, oceans, and Arctic science policy. Interior experts examined ocean and coastal-related issues where combined science and policy can benefit human society. Sessions were often moderated by members of the media who generated discussions that demonstrated the important role scientific information plays in informing local and national communities and influencing our economy, public safety, and national security. The mixture of formats including plenary speakers, panel discussions, poster sessions, and a Capitol Hill briefing allowed more than 300 participants to network with colleagues across scientific and policy professions. Interior staff was invited to participate in a number of plenary discussions with other distinguished invited panelists. USGS Director Marcia McNutt highlighted how good science saves lives with examples of ways scientific research and monitoring programs have successfully prepared many communities with critical information about hazards such as tsunamis, hurricanes, earthquakes, and wildfires. BOEM Chief Environmental Officer Alan Thornhill, discussed



BOEM Chief Environmental Officer Alan Thornhill (right) joins Fran Ulmer, chair of the U.S. Arctic Research Commission, in a discussion about changing conditions in the Arctic. Photo credits: Ann Tihansky.

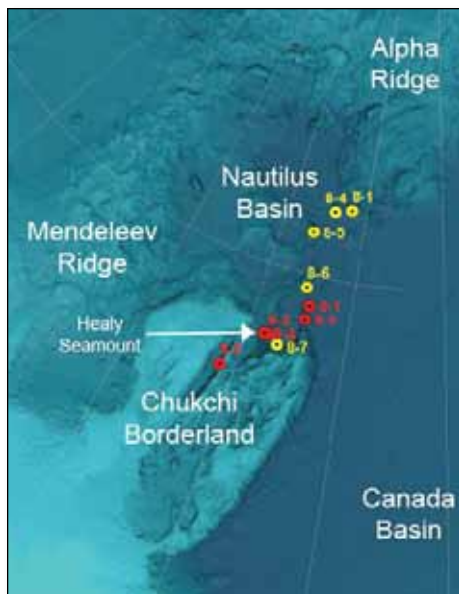
challenges and progress facing the governance, security, economy, and ecosystem health in the Arctic during the opening plenary with Fran Ulmer, chair of the U.S. Arctic Research Commission (*related story page 4*). Deputy Assistant Secretary for Land and Minerals Management Ned Farquhar discussed our nation's energy future, including renewable energy and Interior's 'Smart from the Start' program. USGS Program Coordinator for the Energy Resources Program, who described ongoing research to determine potential Arctic energy development. John

Haines, USGS Program Coordinator for the Coastal and Marine Geology Program, was part of the session, "Coastal Management for a Changing Future", where panelists explored how sea-level rise, erosion, and infrastructure changes will transform our coasts physically and impact coastal communities. A number of USGS scientists shared posters ranging from climate change in the Arctic to hazard assessments of hurricanes and tsunamis and ocean acidification. Watch session videos and look at the submitted posters.

www.agu.org/spconference



John Haines, Program Coordinator for USGS Coastal and Marine Geology, discusses scientific programs that support coastal community resilience and preparedness.



Locations of sites for deep sea dredge samples collected during the Extended Continental Shelf Program.

Volunteer for Ocean Literacy

Volunteers provide vital support of the Regional and National Ocean Science Bowls (related story page 13). Local contacts provide critical resources and content for competitions and professional development of coaches and teachers. You can do your part in challenging the nation's brightest high school students in their knowledge of the ocean while raising awareness of Interior's Ocean role.

There are many ways to get involved and contribute. Individuals can write competition questions, review competition questions for scientific integrity, participate in career events, mentor local teams, present scientific research during professional development webinars, and serve as competition room officials during the events. Network with your peers! Contact Melissa Brodeur, NOSB Program Specialist, mbrodeur@oceanleadership.org.

Visit: www.nosb.org

USGS Assesses Deep Sea Mineral Deposits

Possible Source for Rare Metals Used by High-Technology Industries

By Ann Tihansky and Jim Hein

Rare metals are increasingly used in solar cells, wind turbines, hydrogen fuel cells, and computer chips. Increased global demands for these 'high-tech' metals are driving price increases. The plans of the U.S. to become energy self sufficient through use of fuel-cells and hybrid automobiles will be more challenging as costs for platinum, an essential component of fuel cells, copper, nickel, and other metals increase. While nearly all raw-metal resources are currently produced at land-based sites, unique deep sea environments may be valuable sources for mining high-tech metals in the future. The comprehensive resource potential of the vast mineral deposits that occur within the U.S. Exclusive Economic Zone (EEZ) is unknown, although specific field studies have taken place during the past 25 years. Quantitative information about U.S. EEZ resources is essential in order for the Federal and State governments to make informed decisions about competitive land/sea-use issues, outer continental-margin boundary negotiations, contaminant issues, and energy, mineral, and biologic resources potential, including homeland security concerns of self sufficiency in energy and strategic and critical minerals.

As part of the U.S. Extended Continental Shelf (ECS) program north of Alaska, the USGS collected deep sea rock samples along the western margin of the Canada Basin for mineral analysis. (related story page 4). Sample sites included steep escarpments on the Chukchi Borderland, a newly discovered seamount informally named Healy seamount, the southern part of Alpha-Mendeleev Ridge, and several basement outcrops in Nautilus Basin. While deep sea mining presents many technological challenges, the first step is assessing what minerals are present and if they are at economical concentrations.

Learn more: <http://pubs.usgs.gov/circ/2005/1286/>
http://walrus.wr.usgs.gov/reports/reprints/Hein_0_23.pdf
<http://www.reuters.com/article/2012/07/10/us-china-rareearths-idUSBRE8691E920120710>

Selected Rare Metals and High Technology Applications



Cobalt: Hybrid and electric car batteries, storage of solar energy, magnetic recording media, high-T super-alloys, super magnets, cell phones (shown at left).

Bismuth: Liquid Pb-Bi coolant for nuclear reactors; Bi-metal polymer bullets, high-T superconductors, computer chips

Tungsten: Negative thermal expansion devices, high-T super alloys, X-ray photo imaging

Niobium: High-T super alloys, next generation capacitors, superconducting resonators

Platinum: Hydrogen fuel cells, chemical sensors, cancer drugs, flat-panel displays, electronics.

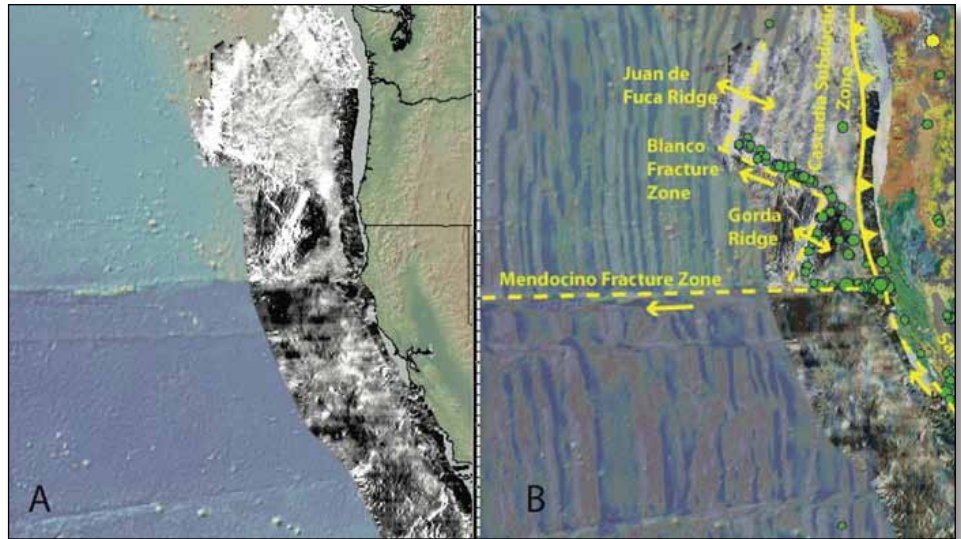
Tools for Integrating Earth-Science Data:

GeoMapApp and Virtual Ocean Allow Users to Put Data Together in New Ways

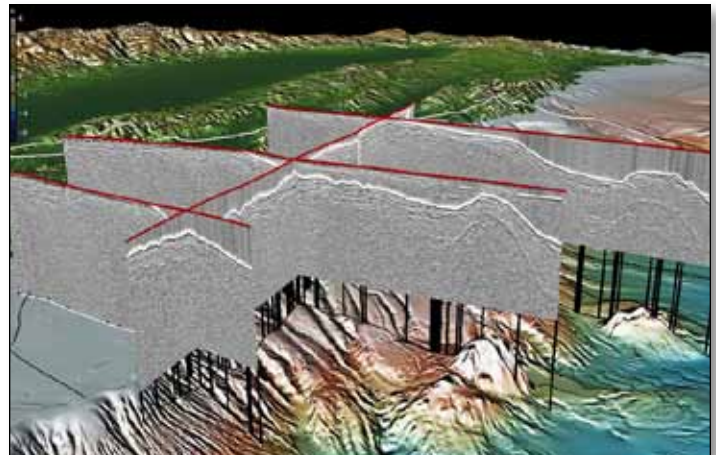
By Shawn Dadisman and Greg Miller

The U.S. Geological Survey (USGS) Coastal and Marine Geology Program (CMGP) has begun a large-scale effort to incorporate the program's publicly available, digital geophysical data into two widely used Earth-science tools, GeoMapApp and Virtual Ocean. This task of the CMGP Integrated Data Management System project will help support information exchange with partners, regional planning groups, and the public, as well as facilitate integrated spatial-data analysis.

Sharing USGS-CMGP geophysical data via GeoMapApp and Virtual Ocean will aid data discovery and enable the data to support new purposes beyond those for which the data were originally intended. Although few open-source tools currently exist for visualizing or analyzing marine geophysical data, GeoMapApp and Virtual Ocean are freely available and well known among the Earth-science community. These applications, which work on multiple platforms (Mac OS X, Windows, and Unix), were specifically developed for exploring Earth-science data collected in the marine environment. The applications are widely used by Federal, state, academic, and international Earth-science organizations to view, integrate and explore data in a wide variety of ways, in both two-dimensional (GeoMapApp) and three-dimensional (Virtual Ocean) space. Tables, spreadsheets, and various other data import formats are supported, depending on which tool is used. By including USGS data in these popular applications, the geophysical data become more accessible and can be integrated with many other types of information from both national and international sources. Incorporating USGS data into GeoMapApp and Virtual Ocean has led to the development of the USGS Coastal and Marine Geoscience Data System (CMGDS). USGS is working to provide these valuable holdings to a broad range of users, including other government agencies and academic institutions involved in planning offshore activities, managing



GeoMapApp images demonstrating the ease and value of integrating various data types. A) GeoMapApp presentation of USGS GLORIA sidescan-sonar data collected off the U.S. west coast. The GLORIA data are superimposed on the Marine Geoscience Data System's GMRT. B) GLORIA imagery integrated with NOAA magnetic anomalies (blue, green, and purple stripes at 50-percent opacity), USGS earthquake data (green and yellow dots), and onshore geologic-map information. Interpretations of major tectonic-plate boundaries along the U.S. west coast are shown in yellow.



Above-Virtual Ocean shows a 3D fence diagram created with four USGS multichannel seismic-reflection profiles collected across the continental margin off the Golden Gate (the entrance to San Francisco Bay, California). Three-dimensional (3D) viewing is one of Virtual Ocean's unique display capabilities, which are highly interactive and allows the user to rotate the image in all directions and turn profiles on or off.

natural resources, identifying gaps in data and planning future data collection activities.

The GeoMapApp and Virtual Ocean software can be downloaded from <http://www.geomapapp.org/> and <http://www.virtualocean.org/>, respectively.

USGS data are available for download via the Coastal and Marine Geoscience Data System: <http://cmgds.marine.usgs.gov/>

See full article: <http://soundwaves.usgs.gov/2012/06/research4.html>

Fostering Ocean Literacy Through the National Ocean Science Bowl

By Kathleen Meehan-Coop

The National Ocean Science Bowl (NOSB) program, funded through the National Oceanographic Partnership Program (NOPP), was started in 1998, the Year of the Ocean, as a vehicle to encourage students to become excited about science and pursue STEM (science, technology, engineering and math) careers. The nationally recognized academic competition for high school students is organized around the theme of ocean science. Through test questions, the competition covers a wide range of topics pertaining to ocean and coastal resources, technical science, history, biology, chemistry, geology and physical oceanography. By using the ocean, the NOSB has engaged students in a fun yet academic competition, that has been quite successful in exposing students to ocean topics. Not only is the study of the ocean diverse, appealing to a wide range of students, but because most high schools lack a marine science curriculum, it makes the subject more applied and unique. The lack of formal ocean science in standard high school curriculum creates its own challenges. Many teams prepare for the NOSB competitions after school, as with high school sports. Similarly, NOSB students invest personal time and energy preparing for the competitions. Regional competitions take place at 25 locations across the nation. Regional winners advance to the National Finals competition which moves location every April. The program



A team works together during the National Ocean Science Bowl Competition held in Baltimore, MD April 26-30, 2012. Photo credits: Ann Tihansky

involves approximately 2,000 students and over 1,200 volunteers at 25 regional sites annually. Since 1998, over 24,000 students have participated. National winners are awarded an experiential trip to a marine science facility over the summer, where the team of five students and their coach experience local ocean science and cultural communities. Teams have traveled to Hawaii, Southern California, Puerto Rico, Panama, South Florida, and the Great Lakes. The NOSB increases ocean literacy beyond the academic competition. Each year the NOSB provides professional development opportunities for teachers and coaches. Students are exposed to

professionals working in ocean science fields and participate in career-related activities that show breadth and depth of career opportunities. Scholarships are provided to participants who enter their first year in college in a STEM major. A video competition awards prizes to best entries conveying Ocean Literacy Principals. An online game, “The Ocean Sciences Quiz” encourages students and adults to increase their knowledge of the ocean sciences. Impact of the NOSB has been evaluated since the beginning, and a longitudinal study has been tracking program alumni for five years. Annual reports are posted online: <http://www.nosb.org/alumni-2/alumni-study-archives/>



Mary Boatman, BOEM (left), and Jason Goldberg, USFWS, were among Interior staff who volunteered for the 2012 National Ocean Science Bowl competition in Baltimore, MD.

Snakehead continued from page 7

National Snakehead Management Plan provides actions and best available information to prevent the introduction and spread of the torpedo-shaped predator that eats native fish, such as bass, as well as frogs and rarely small birds and mammals. The plan is in review and is planned to be released in November. The 2002 discovery of Northern Snakeheads in a Maryland pond set off a flurry of activity, including removal of the fish from the pond. Around the same time the USFWS listed the entire Snakehead family as an injurious species under the Lacey Act in the hopes that such moves would stop the interstate movement and importation of these fish from overseas. Permits are allowed under limited circumstances. However, while the injurious wildlife listing has successfully prevented 25 other species of snakehead from establishing, one of the species that had already entered the U.S. still managed to spread into the Potomac watershed. The USFWS began the process of developing a plan to manage the species and control its further spread. By 2004, Northern Snakeheads found in the Potomac River were determined to have originated from a different source than those found in the pond. While understanding of invasive species, their impacts, and the tools needed to identify and address their risks have improved over the years, continued improvement is needed to ensure the nation's biosecurity in both terrestrial and aquatic ecosystems. USFWS is currently evaluating potential actions, both voluntary and regulatory, that can effectively prevent the introduction of new invasive threats. These actions seek to im-

prove injurious wildlife provisions, promote collaboration with the public, and build a greater shared sense of responsibility for invasive species threats. The greatest threat is believed to be that Northern Snakeheads will decimate native fish stocks, many of which have just reached healthy levels for the first time in many years. While the species is aggressive and detrimental to other fish populations, many anglers think that the fish's introduction has a number of economic benefits. Many find an 18-pound Northern Snakehead a tasty prize dinner. The concern is that the benefits of the fishery might be short-lived compared to the long-term ecosystem impacts. Costs associated with controlling or eradicating Northern Snakeheads are also very high. The Chesapeake Bay Fisheries office of the Fish and Wildlife Service estimated that removal from a small pond in Crofton, Maryland cost \$110,000. Often the full impact of many invasive species is not realized until many years after it is introduced. Careful monitoring and analysis are required to prevent significant long-term damage. Interior agencies are working to answer a suite of questions about impacts, rate of spread and how to control these species. A high priority for research includes identifying what snakehead species are present and what the impacts are on native ecosystems. USFWS biologists are working with partners and developing tools to detect and control snakeheads. Scientists are developing a number of different genetic tools to improve detection methods. Once detected, these non-native fish can be targeted for removal using traditional fishery management



Northern Snakehead Facts (*Channa argus*)

- Northern snakeheads prefer shallow ponds or swamps with muddy substrate and vegetation,
- They reach sexual maturity at 2 to 3 years of age
- Once mature they can spawn 1 to 5 times per year releasing between 22,000-51,000 eggs.
- The eggs float and take about 28 hours to hatch,
- Parents guard the eggs and the young in a nest for a short period of time.
- They are capable of surviving in low oxygen waters during cold temperatures by reducing their metabolism and oxygen demand.
- The northern snakehead also has limited ability to move onto land during flood conditions when mature.

techniques such as electrofishing.

USGS Northern Snakehead Fact Sheet:
<http://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=2265>

USGS Bullseye Snakehead Fact Sheet:
<http://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=2266>

Washington Post article available at:
http://www.washingtonpost.com/local/angler-may-have-broken-world-record-with-snakehead-caught-in-occoquan-river/2012/05/17/gIQAcBD6WU_story.html
Field & Stream Article available at: <http://www.fieldandstream.com/photos/gallery/fishing/2012/05/photos-potential-world-record-snakehead-caught-potomac-river?photo=11#node-1001470044>



Poplar Island continued from page 8

terns. Incubation usually takes three weeks. Newly-hatched chicks face numerous challenges both from weather (rain, heat) and from many predators. In early July, the biologists report that the birds are having a pretty good year as compared to the last five or six, but the nesting site numbers of least terns are down from last year.” One of the greatest threats to nesting success at Poplar Island is predation. “We’ve had a serious problem with great horned owls from nearby Coaches Island and also we suspect from the mainland, about 3 miles away,” said Erwin. “The USFWS team has relocated a number of owls and tried to keep them from showing their young where the terns nest, but they are very effective predators.” At Poplar Island, there are several nesting sites within a relatively small area. Once a predator knows the eggs and chicks are there, they can devastate an entire colony by repeatedly visiting. USFWS has video footage of the owls coming in night after night. “After continued raids like this, the terns will just abandon their nests,” said Erwin. The appearance of terns in a heavily vegetated area on the ‘northern’ part of the island was a big surprise. “We think the terns may have started retreating to the vegetated areas in response to the owl predation. It’s harder to find the chicks in this type of habitat – both for us and for the owls!,” said Erwin. Poplar Island is also an important site for migrating shorebirds within Chesapeake Bay. The big open sandy and muddy flats created on Poplar Island provide critical shorebird feeding and roosting habitats. There aren’t very many places like that in the Bay. Overall, a wide variety of water-



Newly planted marsh grass (*Spartina alterniflora*) marks another phase in coastal wetland restoration efforts on Poplar Island. Photo credits: Ann Tihansky

birds are becoming well established on the island throughout the year: ospreys, eagles, terns, egrets, and many other nesting species in summer, migrant shorebirds in spring and fall, and lots of ducks and geese in winter. While they may not be following the exact plan, the birds are definitely taking advantage of these newly created habitats.

Learn more:

Poplar Island bird habitat restoration: http://www.bayjournal.com/article/poplar_island_out_of_the_spoils_into_the_spectacular
USGS Patuxent Wildlife Research Center bird research: <http://www.pwrc.usgs.gov/birds/>
USFWS Chesapeake Bay Field Office: <http://www.fws.gov/chesapeakebay/>



At left: A common tern chick, 2-3 days old, is very well camouflaged amidst the short vegetation. A biologist’s boot for scale.



Bottom left: Two least tern eggs in a typical sandy ‘scrape’.



Bottom right: A newly-hatched common tern chick among eggs in a nest.

News from the Regions

Across the Nation, the Interior Department provides leadership and coordination for ocean, coastal and Great Lakes activities. Federal partners support state-led regional ocean partnerships and efforts to address common concerns within the regions.

There are nine regional planning areas:

1-The Northeast, 2- Mid-Atlantic, 3-South Atlantic, 4-Caribbean, 5-Gulf of Mexico, 6-West Coast, 7-Great Lakes, 8-Pacific Islands, 9-Alaska/Arctic.



Great Lakes Restoration Initiative

Phyllis Ellin (NPS), Norman Grannemann (USGS)
(Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin)

<http://www.epa.gov/glnpo/glri/>
Hundreds of advocates, scientists, public officials and conservation leaders will highlight restoration efforts during Great Lakes Week 2012, in Cleveland, OH, September 10-14. The theme of this year's event, is "Taking Action, Delivering Results" will focus public attention on efforts to rid the Great Lakes of toxic hotspots, reduce polluted runoff, restore fish and wildlife habitat, and prevent Asian carp and other invasive species from entering the lakes. Great Lakes Week advances the Federal Great Lakes Restoration Initiative, the largest investment in the Great Lakes in two decades.
www.glweek.org

Visit us online: <http://www.doi.gov/pmb/ocean/index.cfm>



Deputy Assistant Secretary for Fish and Wildlife and Parks, Eileen Sobeck, gives a keynote at the Gulf of Mexico Alliance All-Hands meeting June 19. Photo credit: Jeanne Allen, EPA.

Gulf of Mexico Alliance

Linda Kelsey (FWS – DOI Lead)
<http://www.gulfofmexicoalliance.org/>
(Alabama, Florida, Louisiana, Mississippi, Texas)

The Gulf of Mexico Alliance conducted their 7th annual All Hands Meeting focused on shared ecological issues of the five U.S. Gulf States from June 19 - 21, 2012. Deputy Assistant Secretary for Fish and Wildlife and Parks, Eileen Sobeck, was a keynote speaker during the Opening Plenary Session along with Buddy Garcia, Commissioner, Texas Railroad Commission; Jerome Zeringue, Executive Director, Louisiana Coastal Restoration & Protection Authority; David Kennedy, Assistant Administrator, NOAA National Ocean Service; Ben Scaggs, Director, EPA Gulf of Mexico Program; and Duane Armstrong, Chief of Applied Science & Technology, NASA. The first day's program also presented updates on the Gulf Coast Ecosystem Restoration Task Force and the National Ocean Policy. Deerin Babb-Brott of the National Ocean Council discussed the National Ocean Policy's Implementation Plan and Coastal and Marine Spatial Planning in the Gulf Region. Both efforts are aimed to enhance and sustain long-term ecological recovery in the Gulf and are engaged with the Alliance to coordinate efforts, reduce duplication, build on existing successes and a unified approach to regional ecosystem management. Invited industry leaders from key sectors such as Shell E&P Co., Alabama Gulf Coast Convention

and Visitors Bureau, the Port of Corpus Christi, and Florida Coast Charters joined in a panel discussion entitled "Integration with Business and Industry" to offer insight on working together effectively and explore the challenges and rewards of doing business along the Gulf of Mexico.

Mid-Atlantic Regional Ocean Council

Maureen Bornholdt (BOEM)
(Maryland, New York, New Jersey, Delaware, Virginia)
<http://www.midatlanticocean.org/>

In September, the Mid-Atlantic Federal Representatives/future Regional Planning Body (RPB) members, MARCO's state leads, and representatives from the Shinnecock Nation will participate in a training webinar coordinated through the Udall Foundation. The webinar, "Principles of Tribal Consultation and Engagement", is tailored to benefit RPB entities as they move toward establishing the Mid-Atlantic Regional Planning Body, which will be led by BOEM. It will focus on government-to-government consultation and tribal engagement with an overview of topics essential to understanding the process of planning in the coastal and marine environment, such as the rights and responsibilities of sovereign nations, and acceptable trust-based protocols for interaction.

Caribbean Regional Ocean Partnership

Sherri Fields (NPS)
(Puerto Rico, U.S. Virgin Islands)
Governors of Puerto Rico and the U.S. Virgin Islands signed the Caribbean Regional Ocean Partnership (CROP) Agreement in May and followed up on July 20th with a ceremony that officially launched the Partnership to better manage and preserve coastal and ocean resources. According to the Agreement, the CROP will "enhance transparency and accountability of decision-makers" and will provide a opportunity to "evaluate the best way to balance marine uses such as providing access for recreation, conservation, and areas for fishing,

See Regions page 17

Regions continued from page 17

renewable energy siting and electrical grids." The Nature Conservancy has received a grant from NOAA to support the governments of Puerto Rico and the U.S. Virgin Islands in moving forward with establishing and implementing the CROP. Part of this support will be working with partners to establish data sharing and management protocols for key regional spatial data sets, ultimately establishing a GIS portal for easy access and viewing of data.

Governor's South Atlantic Alliance

Eric Strom (USGS)
(North Carolina, South Carolina, Georgia, Florida)

<http://www.southatlanticalliance.org>

The Governors' South Atlantic Alliance will have their second annual meeting Sept. 6-7, 2012 in Charleston, SC. The meeting will include reports from the Federal Co-Chairs (DOI, NOAA, and USEPA), the State Steering Group, Partners, and Researchers. The forum will include prioritizing actions, coordination, outreach, and implementation of the action plan. Many members of the Federal Regional Planning Body will also be in attendance.

West Coast Governor's Alliance

Joan Barminski (BOEM)
(California, Washington and Oregon)

<http://westcoastoceans.org>

In June, BOEM Pacific Region and NOAA's National Ocean Service began collaborating on the Pacific Regional Ocean Uses Atlas Project through an interagency agreement. The Atlas Project is designed to document coastal community use of ocean resources across a full range of activities and sectors (recreation, industry, commercial fishing) in Washington, Oregon, and Hawaii (California already has an Ocean Uses Atlas). Ocean-use data will be gathered using an interactive participatory mapping approach to capture the knowledge of community experts. The Atlas will enhance ocean planning for offshore renewable energy development and inform other planning strategies with insights on how and where ocean areas are used.



At left, Deb Rocque, FWS Deputy Director Northeast Region, and Sharon Marino, FWS Project Manager, on right, meet with Interior's Eileen Sobeck during a tour of the Long Beach West Restoration project area. Photo credit: Virginia Tippie.

Partnership Award for Coastal Restoration

The Long Beach West Restoration Team received Coastal America's Partnership Award for outstanding efforts in restoring 35 acres of beach in Stratford, Conn. back to its natural state. The unique team included U.S. Fish and Wildlife Service (FWS), Environmental Protection Agency (EPA), Connecticut Department of Energy and Environmental Protection (DEEP), Town of Stratford, the Trust for Public Land, Audubon Connecticut, National Fish and Wildlife Foundation, Land-Tech Consultants, Inc., and Ducks Unlimited. Eileen Sobeck, Interior's Deputy Assistant Secretary for Fish and Wildlife and Parks presented the awards on June 4, 2012. "The project partners created jobs, enhanced recreation, and provided habitat for wildlife - a win-win for people and nature," said Sobeck. U. S. Congresswoman Rosa L. DeLauro joined other agency officials at the ceremony. <http://recovery.doi.gov/press/us-fish-and-wildlife-service/barrier-beach-restoration-on-long-beach-west/>

Historic Trails continued from page 1

local and conservation community leaders in a ceremony designating four river trails in five states as components of the existing Captain John Smith Chesapeake National Historic Trail (CJSCNHT). These designations recognize the significance of the four rivers – the Susquehanna, Chester, Upper Nanticoke and Upper James Rivers – to 17th century Native American history. The CJSCNHT allows visitors to follow John Smith's routes in the Chesapeake Bay from 1607-1609, while Smith's crew mapped nearly 3,000 miles of the Bay, rivers and American Indian communities. Part of President Obama's America's Great Outdoors initiative, these trails help establish community-based conservation by encouraging community connections to cultural resources, and promoting tourism that fuels local economies. Learn more:

<http://www.nps.gov/cajo/index.htm>



Best Beaches continued from page 1

resources are healthy, resilient, and sustainable economic assets for all citizens. In 2010, coastal national park units alone contributed an estimated \$3.5 billion to local economies, and wildlife refuges contributed over \$900 million. Similar economic information is available in a new report, The Department of the Interior's Economic Contributions for FY 2011. Released in July, the report includes chapters on the impacts of the Department's investments in restoration and conservation. One of the highlighted restoration projects is Ni-les'tun, a restored 418-acre tidal marsh, Oregon's largest such project to date. The estuarine foodweb is being rebuilt, benefitting migratory shorebirds, waterfowl and commercial fisheries like the Chinook and Coho salmon, as well as recreational activities like birdwatching, hunting and fishing. This restoration project annually contributed about \$1.1 million and supported 5 jobs for the local economy.

The Department of the Interior's Economic Contributions report is available online: http://www.doi.gov/ppa/upload/2011-Econ-Report-FINAL-07_09_2012.pdf

For more information on the economic contributions of National Parks, see the National Park Service report, *Economic Benefits to Local Communities*, which includes information on visitor spending by park and by state, available online: <http://nature.nps.gov/socialscience/docs/NPSSystemEstimates2010.pdf>

Learn more about Interior's ocean and coastal parkland resources: <http://www.nature.nps.gov/water/oceancoastal/>



Above - Acadia National Park, Maine attracts summer vacationers with its rugged shoreline and cooler temperatures. It is famous as the best place to watch the sun rise in the nation. One of the most popular national parks, Acadia attracted 2.5 million visitors in 2010; the tourists contributed \$186 million and 3,147 jobs to the local economy. Photo credit: John Kelly (NPS).

Below - The California Coastal National Monument comprises more than 20,000 small islands, rocks, exposed reefs, and pinnacles between Mexico and Oregon protected as part of the Bureau of Land Management's (BLM) National Landscape Conservation System. The combination of spectacular coastal scenery, windswept beaches, and some of California's largest seabird colonies in the offshore rocks and islands attracts many visitors. Photo credit: Robert M. Wick (BLM).

View some of America's "best beaches" in this on-line photo gallery of images from Interior's 85 marine and coastal parklands, 180 marine and coastal wildlife refuges, and 1,100 miles of the California coast.

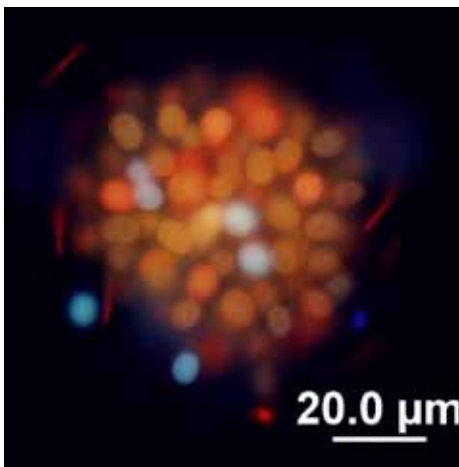
<http://www.doi.gov/news/photos/Photos-Americas-Great-Outdoors-Beaches.cfm>



Sea Otters continued from page 6

cally warm, stagnant and nutrient-rich freshwater ponds, lakes and rivers. Human-associated pollution contributes to cyanobacterial blooms and microcystin production through runoff contaminated with fertilizer and animal waste, or leakage from sewage or septic systems. The discovery that declining water quality in coastal lakes and rivers, like Pinto Lake, and the health of Monterey Bay's sea otters are intricately connected, was important news to a wide array of natural resource managers.

Since that first discovery, 31 microcystin-positive sea otters have been identified in California. Because sea otters are a state and Federally-protected threatened species, and because microcystin is a highly-toxic, regulated pollutant, scientists and policymakers must work together to trace and mitigate this environmental pollution. At present, it is believed that sea otters may be exposed to microcystin through the shellfish that they eat.



This cyanobacteria, *Microcystis*, is a known producer of the algal toxin microcystin and is commonly found in fresh water lakes. This microscopic image was taken using a special technique called ultraviolet epifluorescent microscopy. (Photo credit: Barry H. Rosen, USGS).

Because microcystin pollution is a worldwide problem and because people also rely on shellfish as a food source, it's important to conduct collaborative research that supports solutions to this problem.

The sea otter investigation demonstrates the value of working across scientific disciplines and in partnership with multiple agencies at local, state and Federal levels. USGS scientists from California, Kansas and Florida shared expertise ranging from mammalian biology, water chemistry and algal physiology that was instrumental in advancing our understanding of the role and linkages of cyanobacteria, their associated toxins and ecosystem health. Miller's research is a collaborative component of Interior's Pacific Nearshore Project that is studying wild sea otters as a health barometer for nearshore waters along the Pacific coast from California north to Alaska. Tim Tinker, a biologist with the USGS Western Ecological Research Center supervises the annual population survey for California sea otters and regularly leads expeditions to tag and perform health exams on wild sea otters.

The Pacific Nearshore Project is led by the USGS Alaska Science Center, Western Ecological Research Center, Western Fisheries Research Center, and in partnership with U.S. Fish and Wildlife Service, National Park Service, Bureau of Ocean Energy Management, Canadian Department of Fisheries and Oceans, Monterey Bay Aquarium, Seattle Aquarium, Santa Barbara Zoo and various state agencies and non-governmental institutions. As Miller points out, sea otters are an important sentinel species for monitoring

environmental health. Based on prior investigations, sea otters are often the first animals to be visibly harmed by land-based pollutants of many types. This is because they live right along the shoreline and eat clams, mussels and other shellfish that can retain and concentrate pollutants from freshwater runoff and other contaminant sources. The case of the mysterious otter deaths highlights the close environmental connections between healthy inland watersheds and survival of coastal marine wildlife. Miller's discoveries on *Microcystis* toxins adds to understanding how land-use activities can impact freshwater and marine fisheries and overall ecosystems. Continued research will be vital, not only for ensuring the survival of threatened species like sea otters, but also for protecting the health of these ecosystems upon which humans also depend.

Learn more:

Interior's USGS Pacific Nearshore Project: <http://on.doi.gov/nearshore>
 Related New York Times story: <http://www.nytimes.com/2012/02/28/science/sea-otters-failure-to-thrive-confounds-researchers.html>

USGS Sea Otter video: Precipice of Survival: <http://online.wr.usgs.gov/outreach/otter/>

USGS publication linking cyanobacteria to sea otter deaths: <http://www.plosone.org/article/info:doi/10.1371/journal.pone.0012576>

USGS Fact Sheet on Harmful Algal Blooms: <http://pubs.usgs.gov/fs/2006/3147/>

Listen to the USGS podcast on Harmful Algal Blooms: <http://gallery.usgs.gov/audios/359#.UAh0M0RZ1jA>

Santa Cruz Sentinel article about Lake Pinto: http://www.santacruzsentinel.com/rss/ci_15783704

Apostle Islands - The Jewels of Lake Superior

<http://www.nps.gov/apis/index.htm>

The Surfing Bison is a regular feature that explores Interior's Coastal, Ocean and Great Lakes topics found on the internet.



The Apostle Islands National Lakeshore became part of the National Park Service system in 1970. The park protects 21 of the 22 islands in this scenic rocky archipelago, also known as the 'Jewels of Lake Superior', 12 miles of mainland coastline, and over 27,000 acres of Lake Superior waters in northern Wisconsin.

The Park hosts a unique blend of scenic, historical, cultural and natural resources. The wooded islands are lined with sea caves, sandstone cliffs and miles of pristine beaches. It has more lighthouses than any other National Park Service area (8 historic towers on 6 islands) and four shipwrecks in park and nearby waters. http://www.wisconsinshipwrecks.org/explore_map_superior.cfm

The iron-rich sandstone that forms the islands was quarried at the end of the 19th century to build some of the most distinctive landmarks in midwestern cities like Chicago, Milwaukee, Detroit, Cleveland, Minneapolis, and St. Paul.. Native Americans, voyageurs, loggers, stone cutters, farmers, and commercial fishermen all left their marks on these unique islands.



Learn more about your coastal Parks and Refuges: <http://www.nature.nps.gov/water/oceancoastal/>