



NEWSWAVE

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

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Secretary Sally Jewell joins students with the “New York Harbor Conservation and Resiliency Corps,” a partnership with the City of New York and the Student Conservation Association (SCA), as they participate in Hurricane Sandy recovery and clean-up efforts at Jamaica Bay National Wildlife Refuge in May. Photo credit: Tami Heilemann, DOI



A day’s catch of ‘stripers’ (*Morone saxatilis*), caught in Chesapeake Bay. Coastal economies benefit from a wide array of commercial and recreational activities. Photo credit: Ann Tihansky

Hurricane Sandy Recovery

Engaging Youth for a Resilient Future

By Ann Tihansky, USGS

In May, Interior Secretary Sally Jewell announced that the Department would release \$475.25 million in emergency Hurricane Sandy disaster relief funds to 234 projects that will repair and rebuild parks, refuges and other Interior assets damaged by the storm. The funding also provides investments in scientific data and studies to support recovery in the region, as well as historic preservation ef-

See Sandy page 12

Interior Announces First Offshore Wind Leases, page 5

Benefits for Coastal Economies

By Angela Li and Christian Crowley, DOI

Coastal regions are both beneficiaries and supporters of economic activity: states receive federal grants to conserve and encourage use of coastal resources, and coastal parks and refuges contribute to the economy by attracting recreation spending and supporting jobs.

The Interior Department’s 2013 Economic Report for Fiscal Year 2012, released in July, summarizes

See Economics Report page 4

Visit us online:

www.doi.gov/pmb/ocean/index.cfm

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Social Media at Interior

<http://www.doi.gov/news/Social-Media.cfm>



The Interior Department actively shares a wide array of information and multimedia resources through social media outlets: Facebook pages, Flickr, Instagram, and other multimedia galleries, podcasts, Tumblr blogs and YouTube channels. Follow selected topics via Twitter or sign up for RSS feeds for links to news releases.

Keep up with **Ocean, Coasts and Great Lakes Activities** on our own Facebook page: www.facebook.com/USInterioroceanscoastsgreatlakes

Here are some links to other resources across the bureaus:

The **U.S. Fish and Wildlife Service** just launched a Social Media Hub where they highlight their important role of protecting and enhancing America's fish, wildlife, plants, and their habitats. Learn more about how the USFWS works to perpetuate diverse and abundant wildlife that is essential to maintaining the health of our environment, our families, and our economy. At this link you can find a comprehensive overview of all USFWS social media resources: <http://www.fws.gov/home/socialmedia/index.html>



Learn more about a program eradicating acid-spitting ants that helps restore nesting habitat for Red-tailed tropicbirds, shown above, on Johnston Atoll. Photo credit: USFWS

National Wildlife Refuges (NWR): The NWR System includes 561 NWRs and 38 Wetland Management Districts. The National FaceBook page makes daily posts and can keep you up to date on activities across the nation. Or you can focus on a refuge near you or learn more about an area before you visit. Take a look for yourself: www.facebook.com/USFWSRefuges

Endangered Species: www.facebook.com/USFWSEndangeredSpecies

U.S. Geological Survey: Keep up with the latest scientific findings. USGS maintains a diverse social media presence <http://www.usgs.gov/socialmedia/> USGS shares news and updates via Twitter, Facebook, Flickr, YouTube, Podcasts (known as Corecast), Google Plus, and Instagram, plus RSS and Data Feeds that alert you about technical announcements, news releases, imagery, video, and animations. <https://www.facebook.com/USGeologicalSurvey>

National Park Service: Each National Park administers its own social media presence. Find a park at www.nps.gov/ Here are a few Facebook Pages for coastal parks to get you started:

Biscayne National Park-Florida- <https://www.facebook.com/BiscayneNPS>

Apostle Islands National Lakeshore-Michigan - <https://www.facebook.com/apostleislandsnationallakeshore>

Buck Island Reef National Monument- St. Croix, US Virgin Islands <https://www.facebook.com/pages/Buck-Island-Reef-National-Monument/115572131894>

Glacier Bay National Park and Preserve-Alaska - <https://www.facebook.com/GlacierBayNationalPark>

Fort Sumter National Monument-South Carolina- <https://www.facebook.com/FtSumterNPS>

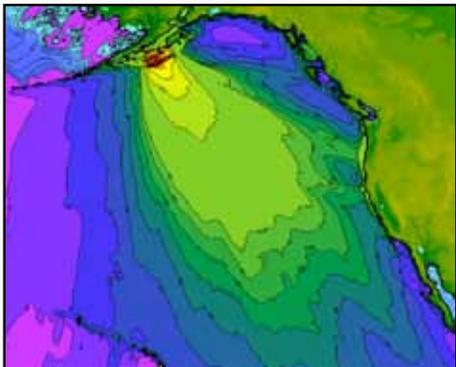
Padre Island National Seashore-Texas- <https://www.facebook.com/pages/Padre-Island-National-Seashore/137276362992142?ref=profile>

Newsletter for Hazards Science

A newsletter from the USGS is focused on raising awareness about hazard science. The Science Application for Risk Reduction, or SAFRR project helps communities reduce their natural hazard threats by directing new and existing scientific research toward addressing gaps in vulnerability, producing innovative products, and connecting experts with users of their science.

SAFRR offers user-focused research, targeted messaging, and partnerships with social and behavioral sciences relevant to hazards. (See related story page 10) USGS launched the newsletter to share information about present projects and news highlights of projects currently underway to help build resilience to natural hazards such as earthquakes, floods, wildfires, landslides, tsunamis, and coastal erosion.

The mission of the USGS SAFRR Project is to develop innovative applications for hazards science to protect the safety, security and economic well-being of the Nation. To receive the SAFRR newsletter, send an email to: SAFRR@usgs.gov
www.usgs.gov/natural_hazards/safrr/



Maximum tsunami amplitude modeled throughout the NE Pacific Ocean. Learn more about SAFRR Tsunami Scenario science: www.usgs.gov/natural_hazards/safrr/projects/tsunamiscenario.asp
Image credit: Vasily Titov, NOAA/PMEL

Forum Commemorates Asian American Pacific Islander Heritage

Interior hosted the White House Forum on Asian American and Pacific Islander Heritage, along with the White House Office of Public Engagement and the White House Asian American and Pacific Islander (AAPI) Initiative on May 9.

On September 6, Secretary Jewell led the U.S. government delegation to the Pacific Islands Forum (PIF) Post Forum Dialogue in Majuro, the Republic of the Marshall Islands, highlighting and building upon our historic relations with the peoples and nations of the Pacific.

“Asian Americans and Pacific Islanders have long been leaders in every aspect of our social fabric – in government, business, science, medicine, the arts, education and our armed forces,” said Secretary Jewell, who underscored the importance of efforts to commemorate and interpret AAPI culture and history, particularly through the National Park Service, in order to tell a more complete story of those who have contributed to our nation’s rich heritage.

Jewell also recognized Interior’s distinct responsibility, through the Office of Insular Affairs, to work with our nation’s island areas to empower them and to help find solutions to their most pressing challenges.

Eileen Sobeck, Acting Assistant Secretary for Insular Affairs, said, “this administration is working daily to find innovative approaches to highlight and showcase some of our unique cultural sites and historic artifacts that celebrate Americans in and from the Asia-Pacific region.”



Grammy nominated Hawaiian musician, Raiatea Helm, plays the ukulele as part of the White House Forum on Asian American Pacific Islander Heritage hosted by the White House Office of Public Engagement, White House Initiative on Asian Americans and Pacific Islanders, and the Department of the Interior. Photo credit: Tami Heilmann, DOI

“The Asian American Pacific Islander Theme Study is an important first step in what must be a longer journey to more completely document and preserve Asian American Pacific Islander heritage sites across our country,” said National Park Service Director Jonathan B. Jarvis.

www.interior.gov/news/photos/secretary-jewell-leads-us-delegation-at-pacific-islands-forum-dialogue.cfm

www.interior.gov/news/pressreleases/jewell-underscores-commitment-to-telling-americas-story-at-white-house-forum-on-asian-american-and-pacific-islander-heritage.cfm

For more information about National Park AAPI Heritage Projects: www.nps.gov/history/AAPI/





Olympia National Park in Washington State. Photo credit: Kimberly Reed, NPS

Economics continued from page 1

the annual economic contributions of Interior's activities describing measureable economic contributions including recreation at Interior-managed sites, and grants and payments administrated by Interior.

The report includes several measures of Interior's economic contributions, namely output (spending that cycles money through the economy), employment (jobs supported by this spending), and value added (output minus costs incurred) as measured for fiscal year 2012. Below are some examples:

Coastal Impact Assistance Program

A national total of \$485 million was provided to oil-producing states as part of the Coastal Impact Assistance Program (CIAP), which grants funds generated from offshore lease revenues for the purpose of conserving, protecting, and restoring coastal areas. CIAP grants impacted the national economy by fostering output of \$1.1 billion, supporting over 9,500 jobs with value added of \$756 million.

Sport Fish Restoration

Another federal grant program is Sport Fish Restoration (SFR), which provided \$426 million in FY

2012 to states for fishery projects, boating access, and aquatic education. Funding for SFR is raised through excise taxes on items like fishing and boating equipment. SFR grants had a national economic impact of over \$1 billion in output, supported over 8,300 jobs with \$664 million in value added.

Gulf of Mexico Energy Security Act

The Gulf of Mexico Energy Security Act (GOMESA) is a program under which the Federal government provides revenue sharing payments to the four Gulf oil and gas producing states of Alabama, Louisiana, Mississippi, and Texas. GOMESA grants had a national

impact of over \$100 million in output, supported over 600 jobs with \$53 million in value added.

Coastal Parks and Refuges Visitation

Interior oversees many coastal areas in the United States, including National Lakeshores, Seashores, and Parks under the National Park Service; and National Wildlife Refuges under the Fish and Wildlife Service. In FY 2012, 44 coastal parks and 161 refuges hosted more than 72 million visits. Visitors spent money on items such as lodging, restaurants, supplies, groceries and recreational equipment, supporting more than \$5.6 billion of total output, 57,000 jobs, and \$3.1 billion of value added in coastal states.

Land and Water Conservation Fund

In 2012, Interior awarded grants through this program that totaled \$41 million for restoring, protecting as well as implementing conservation management plans in coastal areas. www.doi.gov/ppa/economic_analysis/upload/FY2012-DOI-Econ-Report-Final.pdf



Casting at sunset at Back Bay National Wildlife Refuge in Virginia. Photo credit: Joe Milmoie, USFWS



Offshore wind turbines are a key component of the nation's offshore renewable energy strategy. Photo credit: BOEM

First Offshore Wind Energy Leases

The Interior Department has completed two competitive lease sales for renewable energy on the Outer Continental Shelf as part of President Obama's Climate Action Plan to create American jobs, develop domestic clean energy sources and cut carbon pollution.

"This is history in the making as we mark yet another major milestone in the President's all-of-the-above energy strategy," said Secretary Jewell. "We are moving closer to tapping into the enormous potential offered by offshore wind to create jobs, increase our sustainability, and strengthen our nation's competitiveness in this new energy frontier. As we experience record domestic oil and gas development, we are also working to ensure that America leads the world in developing the energy of the future."

The first lease sale for wind energy development, on July 31, generated \$3.8 million in high bids for 164,750 acres offshore Rhode Island and Massachusetts. It was followed by the second competitive lease sale on September 4 for \$1.6 million in high bids for 112,799 acres on the Outer Continental Shelf offshore Virginia. BOEM is expected to announce additional auctions later this year and in 2014.

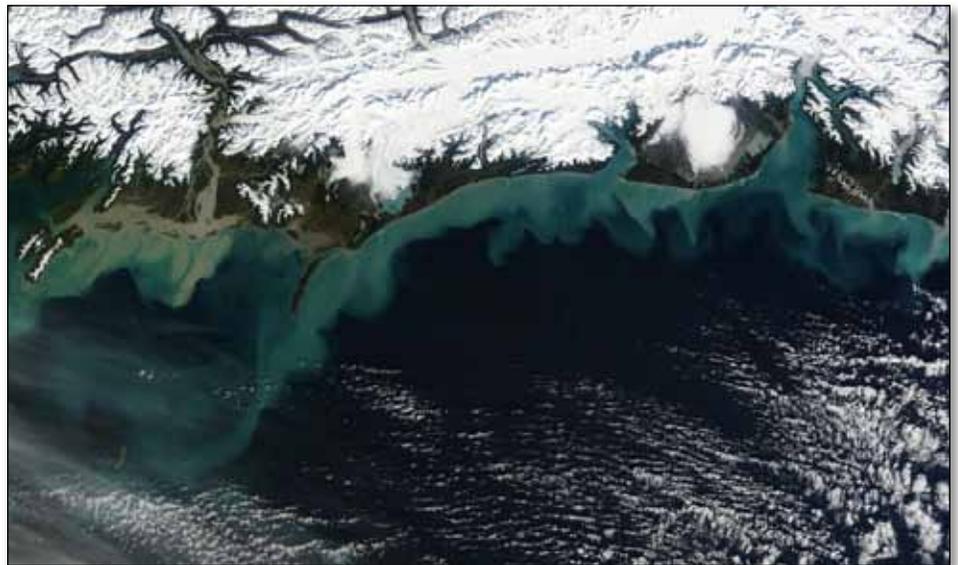
www.doi.gov/news/pressreleases/interior-announces-first-offshore-renewable-energy-lease-sale.cfm

www.doi.gov/news/pressreleases/interior-holds-second-competitive-lease-sale-for-renewable-energy-in-federal-waters.cfm

Understanding Impacts of Melting Glaciers on the Gulf of Alaska Ecosystem

By John Crusius and Ann Tihansky, USGS

The northern Gulf of Alaska (GoA) maintains a productive ecosystem, with commercially important fisheries. Virtually all of the many glaciers that line the northern GoA coast are retreating, yet the changing meltwater impacts on the marine ecosystem are poorly understood. To gain a better understanding of these processes, the USGS has carried out a set of field observations in a network of tributaries of the Copper River, the single largest source of fresh water to the GoA (and a watershed with substantial glacial coverage) and a set of research cruises on the continental shelf and slope to the south. Previous work has shown that iron is a nutrient that limits biological productivity in parts of the GoA (and glacial melt is an



A satellite image of the Gulf of Alaska shows glacial meltwater from rivers entering the coastal waters off the southern shore of Alaska in the vicinity of Yakutat Bay (right center of image) with Prince William Sound to the west (left). The water is distinctly light blue in color due to suspended sediments known as 'glacial flour'. This water mixes with seawater and some gets transported alongshore with the Alaska Coastal Current, and offshore by eddies and other mechanisms. This is a true-color image from Oct 1, 2012. Photo credit: NASA-MODIS modis.gsfc.nasa.gov/

important source of iron), while nitrate is limiting in nearshore areas. You can learn more by watching an on-line presentation with USGS scientist John Crusius. Toward the end of the program, Crusius shows a model animation (by researchers

from the University of Maine) that shows glacial meltwater discharging and moving along the coastal region during the summer of 2010. **Watch the full presentation on-line:** <http://gallery.usgs.gov/videos/698>

Interior Promotes Renewable Energy in Remote Coastal Communities

By Mary C. Shoemaker, DOI

On June 25, President Obama gave one of the few presidential addresses to ever focus solely on climate change and environmental awareness. In outlining his plan for reducing carbon pollution and preparing the country for the impacts of global warming, he pointed to carbon dioxide emissions as the largest driver of climate change and to the electricity sector as the heaviest greenhouse gas emitter. Commending the DOI for surpassing goals for renewable energy deployment on public lands, the President challenged the DOI to continue expanding its wind and solar generation.

The President's charge parallels many of the DOI's initiatives that already support responsible energy development, particularly in the realm of Arctic exploration, where climate change is tangible and electricity is costly.

The Remote Community Renewable Energy Partnership

Interior is pursuing an innovative approach to improving the energy sources of remote, off-the-grid communities in order to decrease dependence on dirty and expensive diesel fuel and support the President's Climate Change initiative. Interior is a partner with the Department of Energy's National Renewable Energy Lab (NREL), in supporting the design, development, and deployment of modular, expand-



The partnerships between The National Renewable Energy Laboratory, the Department of the Interior, and multiple other public and private entities, are developing advanced solutions for energy deployment in remote locations around the globe. Through these efforts, coastal communities like Wainwright, Alaska shown here, can become more self-reliant, address the high cost of traditional energy supply, and reduce impacts on the ecosystem. Photo credit: NOAA.

"We are in a position where we can make a difference. We have a bird's-eye view of what's happening to this planet. We see melting glaciers in Glacier National Park. We see a thawing out of the Arctic. We see the impact of devastating storms on the coast."

-- Secretary Jewell

able, and replicable small-scale renewable energy hybrid power systems. These solar/diesel or wind/diesel projects are designed for implementation in isolated, off-the-grid villages in remote places like Alaska and U.S. island territories.

On June 24, 2013, the Energy Foundation hosted a videoconference between their office in San Francisco and NREL's office in DC where DOI introduced the Remote Community Renewable Energy (RCRE) Partnership ini-

tiative. Building off of previous stakeholder workshops in Anchorage, Alaska, and Golden, Colorado, this conference solicited additional input from industry, philanthropic and interagency partnerships. Led by DOI, DOE, and NREL, the event highlighted the potential that RCRE's modular system technology approach will have for numerous communities worldwide.

This approach has the potential to greatly expand the availability of low-carbon, renewable energy solutions for millions of people who are not currently able to take advantage of abundant, clean, and local renewable energy resources.

Learn more: <http://www.doi.gov/news/blog/the-remote-community-renewable-energy-partnership-working-to-bring-renewable-energy-to-small-villages-in-alaska-and-around-the-world.cfm>

President Obama's Plan to Fight Climate Change <http://www.whitehouse.gov/share/climate-action-plan>
Sally Jewell Addresses Interior on Climate Change <http://www.youtube.com/watch?v=AiUU1foSnqc>

Contact RCRE's project manager for more information: Edward Settle, edward.settle@nrel.gov



The San Juan Islands archipelago boasts some of the most remote light stations in the Lower 48. For more info on the San Juan Islands and these lighthouses, check out this short online video: www.youtube.com/watch?v=qAxJ6bVLnNs
Photo credit: BLM

A Guidebook for Regional Marine Planning

By Deerin Babb-Brott, National Ocean Council

On July 19, the National Ocean Council released a Marine Planning Handbook to support the efforts of regions that choose to engage marine industries, stakeholders, the public, and government to advance their economic development and conservation priorities.

Each coastal region of the country has its own interests and ways of doing business, but all regions want to support their marine economies and coastal communities. Voluntary marine planning is a science-based tool that provides regionally tailored information that all ocean interests can use to reduce conflicts, grow ocean industries, and support the healthy natural resources that our economy and communities depend on.

Federal, state and local governments have a variety of roles and responsibilities when it comes to the ocean, and make decisions every day that impact ocean resources, industries and coastal communities. Regions that choose to do marine planning are guaranteeing that the public and marine stakeholders will shape these decisions early on, promoting better outcomes for everyone.

At the same time, some components of planning – like making sure the public and stakeholders have a chance to engage – are common to all regions. The Handbook provides guidance on how regions can address their priorities through a bottom-up, transparent, science-based process.

The Handbook reflects the extensive public and stakeholder input received in the development of the National Ocean Policy and its Implementation Plan.

Marine Planning Handbook:
http://www.whitehouse.gov/sites/default/files/final_marine_planning_handbook.pdf

MUST SEE! Deep Sea TV

USGS scientists conducting deep-sea research with NOAA and BOEM during a series of exploratory dives in the deepwater canyons off the coast of the north-eastern U.S. shared their discoveries via live satellite from April 30 to August 16. Coined “Deep Sea TV” by USGS scientist Christina Kellogg, the cruises are advancing understanding of the biology, ecology, geology and oceanography of canyons as well as archeological sites. If you missed the live stream, you can watch a highlights video here: http://oceanexplorer.noaa.gov/oceanos/explorations/ex1304/logs/l2_highlights_video/leg2_video.html

More videos and images here:
<http://oceanexplorer.noaa.gov/oceanos/explorations/ex1304/logs/photolog/welcome.html>



An octopus strikes a pose for the remotely operated vehicle near Shallop Canyon. Photo credit: NOAA Okeanos Explorer Program, 2013 Northeast U.S. Canyons Expedition



NOAA Ship Okeanos Explorer uses satellite technology to transmit data and video in real-time from the ship and ROVs working at depth, to a shore-based hub where the video is transmitted in high definition out on Internet2 to a variety of receiving stations on shore. This telepresence allows scientists located on shore to join the operation in real-time. Image credit: NOAA Okeanos Explorer Program



Bubblegum coral (*Paragorgia*), several colonies of *Primnoa*, an anemone, and sea star all inhabiting a boulder within a canyon. Photo credit: Deepwater Canyons 2013 - Pathways to the Abyss, NOAA-OER/BOEM/USGS



A bathysaurus in Veatch Canyon. Photo credit: NOAA Okeanos Explorer Program, 2013 Northeast U.S. Canyons Expedition.

Arctic Animals in a Changing Climate

By Mary C. Shoemaker, DOI

Declining population trends and behavioral changes have been observed in a number of different animal species inhabiting Arctic and sub-Arctic regions. From Atlantic puffins to polar bears and Arctic terns, Interior scientists and wildlife managers are tracking these species to better understand the impacts of climate change and to inform management strategies.

Thirty years of research on Maine seabirds - including Atlantic Puffins, terns, and razor-bills - show us that the marine environment is changing fast and that ocean birds may be failing to adapt (*See related story, page 18*). Over the last five years, counts of Arctic terns in Maine have dropped by 42 percent, from 4,224 pairs in 2008 to 2,467 pairs in 2012.

Similar population declines are also reported by several Scandinavian countries, indicating that climate change is a likely culprit for this trend. Arctic terns, for example, forage for small fish close to the surface of the water; however, since a fish shortage in 2007, tern colonies in Maine have not been able to find fish suitable for their chicks, so starvation and population decline has ensued.

The disruption of their food chain means that birds are not finding the sustenance they need to fly between Maine and Antarctica (36,000 miles), much less breed and raise healthy offspring. While monitoring these



Tasul, an Oregon Zoo polar bear, sports a high-tech collar that will help researchers study her endangered wild counterparts in the Arctic. Photo credit: Michael Durham, courtesy of the Oregon Zoo.

populations in these remote and inhospitable regions is challenging, a variety of new tracking technologies have greatly improved and expanded research capabilities. The observation of arctic species has become more accessible as a result of technological advances such as bird tracking devices and accelerometer-collars.

The USGS, in partnership with the Oregon Zoo, has outfitted a polar bear named Tasul with a high-tech tracking collar, used to understand her behavior at her home at the Zoo. More than just a unique accessory, the band is an accelerometer that detects and records motion. The device turns Tasul's everyday behaviors like walking, eating, sleeping, and swimming into electronic signals. Data collected from the collar is then matched to Tasul's video-recorded movements and used to make inferences about general behavioral tendencies of wild polar bears, notoriously difficult to observe in the field. Tasul is the first of what scientists hope to be many test subjects. Collars placed upon wild polar bears will be equipped with quick-release

mechanisms so scientists can open them remotely and let them drop off the bears after data has been obtained. By fitting other polar bears with collars, biologists at the USGS Alaska Science Center hope to understand how the species is responding to climate change.

The increasing vulnerability of arctic ecosystems necessitates a greater understanding of the animals that inhabit these areas. From Arctic seabirds to polar bears, science and technology are helping to protect populations in the midst of a changing global climate.

www.usgs.gov/newsroom/article.asp?ID=3653&from=rss_home#UfpplkGIHT4



An Atlantic puffin at Seal Island National Wildlife Refuge in Rockland, Maine. Photo credits: USFWS

Sandcastles, Community, and Conservation

Oregon Islands National Wildlife Refuge Provides Scenic Backdrop

By Julia Ledbetter, USFWS

For 49 years, the community of Cannon Beach, Oregon, comes together every June to celebrate Sandcastle Day. The event started in 1964 when a tsunami washed out the bridge into town, leaving residents somewhat isolated until a new bridge could be built. To pass the time and build morale, the community gathered for a sandcastle contest. It has evolved into a three-day festival that now includes live music, a ‘Bucket and Shovel’ dinner, bonfire and a 5-K Fun Run. Seven divisions of sandcastle builder contestants create opportunities for children, teens, amateur builders and professional sand sculptors to express themselves artistically. Each team is given a plot of beach to build on and sand cannot be added or removed. There is no theme and teams can only use natural materials such as shells and sticks for decoration.

The scenic backdrop for all of this activity is Haystack Rock, a 235-



Haystack Rock, part of the Oregon Islands National Wildlife Refuge, provides a scenic backdrop for Sandcastle Day, a popular event that will celebrate a 50-year-old tradition in 2014. Photo credit: George Vetter, cannon-beach.net

foot tall sea stack, one of 1,854 rocks, reefs and islands that make up Oregon Islands National Wildlife Refuge (NWR). Originally established in 1935, additional lands (including Haystack Rock) were added between 1968 and 1996, creating a coastal refuge that now spans 320 miles along the Oregon Coast. In 1970, almost all of the rocks and islands in Oregon Islands NWR were designated as wilder-

ness, adding to and strengthening wildlife protection. Oregon Islands NWR provides a refuge and breeding ground for pinnipeds and most of Oregon’s approximately 1.2 million nesting seabirds.

On Sandcastle Day as well as all through the summer, these resources are a prominent feature in the community. In 1985, local, state and federal agencies established a

See Sandcastles page 10



Left, a smiling octopus sand sculpture greets visitors. Right, Haystack Rock Awareness Program’s Coordinator, Nala Cardillo, looks through binoculars, for wildlife to point out to visitors. The program helps educate visitors about the unique resources found at Haystack Rock and other features along the Oregon coast. Photo credits: George Vetter, cannon-beach.net

Science Informs Tsunami Resilience in California

While scientists can't predict when a great earthquake will produce a pan-Pacific tsunami, new tools being developed by federal and state officials now offer more accurate insight into the likely impacts when tsunamis do occur. This knowledge can lead officials and the public to reduce the future risks and impacts of tsunamis in California.

A hypothetical yet plausible scenario was developed where a tsunami is created by an earthquake offshore from the Alaskan peninsula and extends to the California coast. This is detailed in a new report titled, "The SAFRR Tsunami Scenario". (See related story page 3)

Some of the issues highlighted in the scenario include public safety and economic loss. In this scenario approximately 750,000 people would need to be evacuated, including 90,000 tourists and visitors. Additionally, one-third of the boats in California's marinas could be damaged or completely sunk, resulting in \$700 million in losses. Neither of California's nuclear power plants would likely be damaged by this particular event.

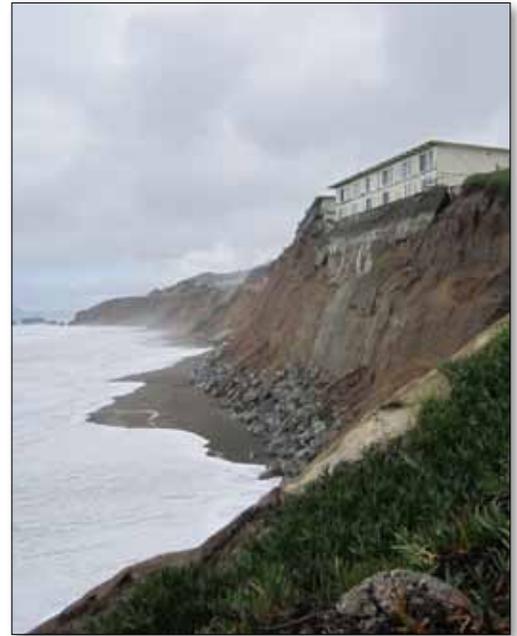
Looking back to 2011, not only was Japan devastated by the magnitude 9.1 Tohoku earthquake, but the resulting tsunami also swept to California and caused \$50-100 million of damage. This shows that tsunamis near and far can lead to billions of dollars in losses in California.

The SAFRR Tsunami Scenario is a collaborative effort between the USGS, the California Geological Survey, the California Governor's Office of Emergency Services, the National Oceanic and Atmospheric Administration, other agencies, and academic and other institutions.

www.usgs.gov/newsroom/article.asp?ID=3679

Learn more about how USGS science helps us understand and forecast coastal change impacts:

<http://pubs.usgs.gov/fs/2013/3077/pdf/fs2013-3077.pdf>



Houses near the edge of a rapidly eroding section of cliff in Pacifica, CA., illustrate the risk that sea cliff erosion poses to residences and infrastructure in many locations along the U.S. West Coast. Photo credit: Gary Griggs, Univ. of California-Santa Cruz



Sandcastles continued from page 9

cooperative venture to help educate and enhance visitor experiences. The Haystack Rock Awareness program (HRAP) has volunteers and staff on the beach at Haystack Rock at low tide every day from May through Labor Day to share National Wildlife Refuge resources and mission with the public. In one season, HRAP staff and volunteers



interact with 70,000 visitors, helping protect to the intertidal and bird ecology of the Marine Garden and Oregon Islands NWR at Haystack Rock as well as guiding visitors to appreciate the wonders of the creatures and birds that depend on these intertidal habitats.

Sandcastle Day helps promote the value of natural resources in many ways. The 50th anniversary of Sandcastle Day will be held on June 21, 2014.

On Sandcastle Day, some of the sculptures were true sandcastles while others were inspired by the sea. Note: All photos were donated by Cannon Beach photographer, George Vetter. See more photos at: www.cannon-beach.net

BSEE Revises “Rigs to Reefs” Policy

Greater Flexibility for States

The Bureau of Safety and Environmental Enforcement (BSEE) recently revised its policy for evaluating proposals to convert obsolete, offshore oil and natural gas production platforms into artificial reefs. The changes to the policy were informed through a collaborative effort with five other federal agencies, officials from the Gulf of Mexico coastal states, and stakeholders representing various interests and uses of areas in the federal waters of the Outer Continental Shelf.

Federal regulations and leasing contracts require offshore oil and gas operators to permanently seal wells that are no longer producing and remove any associated infrastructure, including the production platform.

BSEE can grant a departure from the removal requirement in a process commonly known as “rigs to reefs” provided the platform meets certain structural criteria and other federal and state requirements, and is accepted by a state into its artificial reef program. After all hazardous materials are removed, the platform structure can be dismantled and towed to a designated reefing area, or may be reefed in place under certain conditions. In each case, the state assumes the liability for the structure.

Following several destructive hurricanes, BSEE’s predecessor agency in 2010 issued a Notice to Lessees clarifying the regulations requiring companies to decommission infrastructure that was no longer being used and to permanently plug wells that are no longer



Offshore oil rig structures often attract fish in open water areas. This fish eye view is from the Gulf of Mexico. Photo credits: Greg Boland, BOEM

producing. Several organizations representing recreational and charter fishermen and the diving community raised concerns regarding the impact to marine life and fisheries as a result of the decommissioning of decades-old facilities that had essentially become temporary artificial reefs.

BSEE teamed with the Bureau of Ocean Energy Management, the

National Oceanic and Atmospheric Administration, the U.S. Army Corps of Engineers, the Environmental Protection Agency, and the U.S. Coast Guard to hold public meetings bringing together state officials and concerned stakeholders to discuss concerns and explore ideas for increasing the number of offshore facilities that could be converted to artificial reefs.

The result is a revised policy that provides the states greater flexibility in the incorporation of oil and gas infrastructure into their artificial reef programs. The policy removes a requirement for a five mile buffer zone between reefing areas and allows some facilities to be reefed in place as opposed to being dismantled and towed to a previously designated reefing area.

The revised policy reinforces case by case evaluation of each reefing proposal with balanced consideration of future oil and gas development, pipeline rights of way, decommissioning operations and other uses such as charter and commercial fishing, shrimping and recreational diving. In addition to the policy, BSEE is working to build a mapping tool that will provide data regarding offshore oil and gas infrastructure that is scheduled to be decommissioned in addition to data regarding shrimping areas, local fishing and diving areas, and myriad other data points to assist states and stakeholders in identifying platforms that would be beneficial to reefing programs so they can then work with the oil and gas companies to encourage the conversion of those facilities into artificial reefs. www.bsee.gov/Exploration-and-Production/Decommissioning/Rigs-to-Reefs.aspx.

Sandy continued from page 1

forts. “We will continue to focus our efforts on rebuilding to welcome visitors, help jumpstart local economies, and make communities stronger and more resilient to help withstand potential damage from future storms,” said Jewell, who followed up on May 30, by launching the “National Parks of New York Harbor Conservation and Resiliency Corps,” a partnership with the City of New York and the Student Conservation Association (SCA). The partnership will provide approximately 200 jobs for young people in 2013 to participate in Hurricane Sandy recovery and clean-up efforts.

“In addition to cleaning up damage from the hurricane, the National Parks of New York Harbor Conservation and Resiliency Corps will be restoring habitat, rebuilding trails and other projects,” said NPS Director Jonathan B. Jarvis. “These efforts not only help the parks recover from the effects of Hurricane Sandy, but also begin to mitigate the effects of future storms and sea level rise.”

“President Obama has made Hurricane Sandy response efforts a top priority for his Administration. This youth corps will not only strengthen recovery and mitigation efforts in our National Parks throughout the region, but it will also serve as a model for the power of public-private partnerships to boost youth employment and connect young people to the great outdoors,” said Jewell.

In FY14, the federal government and DOI will continue developing partnering opportunities to improve coastal resiliency in the areas affected by Sandy.

Sandy Recovery Efforts:

The **U.S. Geological Survey (USGS)** will allocate \$18.8 million for scientific monitoring, mapping, modeling, and forecasts to support broader recovery efforts throughout the impacted region. USGS Sandy Science Plan: <http://pubs.usgs.gov/circ/1390/circ1390.pdf>

The **Bureau of Ocean Energy Management (BOEM)**, as the agency responsible for managing sand and gravel resources on the Outer Continental Shelf (OCS), will use \$11.7 million to address critical needs for OCS sand and gravel throughout the coastal areas undergoing recovery and rebuilding.

The **Bureau of Safety and Environmental Enforcement (BSEE)** will allocate \$2.85 million to make repairs to the Ohmsett oil spill research facility in Leonardo, New Jersey.

The **U.S. Fish and Wildlife Service (USFWS)** will allocate \$64.6 million for 55 projects to repair and restore refuges, hatcheries, and other facilities and to restore wildlife habitat.

The **National Park Service (NPS)** will allocate \$329.8 million for 158 projects to rebuild, repair and restore parks facilities, lands and replace equipment.

Youth Corps

www.doi.gov/news/pressreleases/secretary-jewell-announces-youth-corps-to-help-restore-new-york-new-jersey-parks-after-hurricane-sandy.cfm

Apply, follow, and learn: <http://sandy.thesca.org/>

Watch the video and hear from SCA participants: www.youtube.com/watch?v=wx24bztoBwc

www.doi.gov/news/pressreleases/interior-announces-475-million-in-hurricane-sandy-relief.cfm

Statue of Liberty Reopens: www.doi.gov/news/pressreleases/secretary-jewell-mayor-bloomberg-celebrate-fourth-of-july-with-reopening-of-statue-of-liberty-for-the-first-time-since-hurricane-sandy.cfm



Artist Nora Raggio (second from left), at the Earth-Science-Art exhibit. A unique project partnered Raggio with USGS scientist Jim Hein, who is a USGS scientist and internationally-recognized geologic expert on deep sea minerals. Through their exchanges, Raggio created digital prints that represent the redistribution of deep sea resources as the demands for rare earth metals grow. See related story page 19. Photo credit: Ann Tihansky, USGS



USFWS Cracks Down on Wildlife Trafficking

Ensuring legal and sustainable wildlife trade for many ocean and coastal species

By Nicole Bransome, DOI

Illegal wildlife trade is a multi-billion dollar business that has seen an unprecedented spike in recent years. Wildlife trafficking, the poaching, smuggling, and illegal sale of protected species, not only affects the sustainability of wildlife, but has increasingly been linked to organized crime. Well-armed poachers tap into extensive criminal networks to generate illicit revenue that fuels instability of governments and threatens the security of the United States.

CITES -- The Convention on International Trade in Endangered Species of Wild Fauna and Flora, was originally signed in 1973 and is now implemented by 178 countries.

The USFWS International Wildlife Trade program (IWT) and the USFWS Office of Law Enforcement carry out CITES functions for the U.S. This includes reviewing the best available science to determine if trade for a given species is sustainable and regulating import and export of protected species through the issuance of permits. The IWT program also oversees trade permitting in compliance with wildlife laws like the Endangered Species Act and Lacey Act.

The USFWS plays a major role in seeing that wildlife trade into, out of, and within the U.S. is legal and sustainable. Through



Swooping Manta Rays show off their gill rakers in the Pacific. These creatures, harvested for their gill plates, have recently received trade protection under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Photo Credit: Dez Paroz

its Office of Law Enforcement, the USFWS pursues businesses and individuals involved in the illegal trade of protected species. Wildlife inspectors work alongside U.S. Customs and Border Protection officers and also USDA inspectors at U.S. ports of entry to check shipments for CITES compliance and intercept smuggled animals and plants. Special agents investigate wildlife crimes nationwide with help from the National Fish and Wildlife Forensics Lab. USFWS works with enforcement partners such as NOAA and with the Department of Justice to investigate and prosecute wildlife crimes. In the last year, these efforts have included marine wildlife trafficking cases involving: sea turtles, coral species, walrus tusks, swim bladders of an endangered Gulf of California fish, whale meat, and narwhal tusks, to name a few.

In March 2013, at the 16th Meeting of the CITES Conference of the Parties, nations voted to increase

protections for the oceanic whitetip shark, three species of hammerheads, porbeagle sharks, and manta rays. Under the protection of CITES Appendix II, trade will still be allowed for these species but will be controlled at biologically sustainable levels. This recent victory for some of the oceans' most iconic species illustrates how international cooperation can overcome unsustainable global trade.

Bryan Arroyo, Assistant Director of USFWS International Affairs Program, who served as the alternate head of the U.S. delegation at the CITES conference, said, "through the cooperation of the global community, we can begin addressing the threats posed by unsustainable global trade in shark fins and other parts and products of shark and ray species."

USFWS CITES:

www.fws.gov/international/cites/cop16/

SPECIAL FEATURE-- Interior's Diverse Role in Fisheries Resources

By Nicole Bransome, DOI

Since 1871, the Department of the Interior has managed many of our nation's fisheries resources and continues to be a primary steward for fisheries today. Across the Department, each Bureau plays a role in fisheries management either specifically related to its mission or in overall support of the Department. However, the U.S. Fish and Wildlife Service (USFWS) is the Department's primary fisheries management program, playing a vital role in conserving America's fisheries as well as connecting the American public with those resources. Through diverse partnerships and Federal mitigation programs, the USFWS conserves, restores and maintains fish and other aquatic resources at self-sustaining levels for the benefit of the American public.

Some of the important ways Interior bureaus contribute to the Department's role of managing fisheries include: restoring fish populations to self sustaining levels, restoring habitat, providing recreational fishing opportunities, supporting hatcheries, providing food and economic security, supporting cultural and subsistence needs, controlling invasive species, providing scientific research, and balancing multiple uses of natural resources.

Partners include other federal agencies, states, tribes, as well as non-governmental organizations, commercial and private entities. In many instances,



Partnerships for fisheries bring science to management issues. Here, University of Maine students and scientists with the USGS Maine Cooperative Fish and Wildlife Research Unit are conducting research about the life cycle history of sea-run brook trout in coastal Maine. Photo credit, David Kazyak

Interior bureaus work together, bringing a diverse range of expertise to address specific needs for managing a fishery or set of fisheries-related resources. Below are brief examples of fisheries-related activities across the bureaus.

U.S. Fish and Wildlife Service www.fws.gov/fisheries/

The Division of Fish and Aquatic Conservation or "Fisheries Program" provides shared leadership in assessing, restoring, and monitoring freshwater, anadromous, and coastal fisheries. Facilities nationwide include Fish and Wildlife Conservation Offices (including a Conservation Genetics Laboratory), National Fish Hatcheries, Fish Health Centers, Fish Technology Centers, the Aquatic Animal Drug Approval Partnership program, Aquatic Invasive Species, and Marine Mammals Program offices. The USFWS also provides shared leadership in habitat conservation through the National Fish Habitat Action Plan and the National Fish Passage Program. The USFWS supports recreational fishing

through outreach and education activities and fish stocking. It also provides funds to states through the "Federal Aid in Sport Fish Restoration program," which in FY2012, provided \$360 million to states for sports fish restoration, research, and boat access programs (such as boat ramps). USFWS also participates in interjurisdictional coordination such as participating in the Atlantic State Marine Fisheries Commission and having an ex officio seat on marine fisheries management councils. Contact: Richard Christian, richard_christian@fws.gov

National Park Service (NPS)

The NPS has a strong stewardship role and mission to preserve unimpaired natural and cultural resources for the enjoyment, education, and inspiration of current and future visitors. Fisheries management is often focused on the restoration of native species and the management or eradication of invasive or non-native species including, in some cases,

non-native sport fish to enhance the visitor experience and fulfill its stewardship role. Many parks allow recreational fishing where it is authorized or not specifically prohibited by federal law and emphasizes fisheries based on native species. Contact: John Wullschleger, john_wullschleger@nps.gov

U.S. Geological Survey

www.usgs.gov/ecosystems/fisheries/

As the Nation's largest water, earth, and biological science and civilian mapping agency, the USGS collects, monitors, analyzes, and provides scientific understanding about natural resource conditions, issues, and problems on the health of our ecosystems and environment, the natural hazards that threaten us, the natural resources we rely on, the impacts of climate and land-use change, and information science systems that help us provide timely, relevant, and useable information.

The USGS Fisheries Program focuses on the study of aquatic organisms and aquatic habitats. USGS works closely with bureau partners across the Department and other resource management agencies to provide scientific research about fish diseases, invasive species management, and informs restoration and habitat enhancement activities. The USGS also supports the Cooperative Research Unit program, which are partnerships between USGS, a state natural resource agency, and a host university to enhance graduate education in fisheries and wildlife sciences and produce research on topics of mutual concern. Contact: Mark Hudy, mhudy@usgs.gov

Bureau of Ocean Energy Management (BOEM)

BOEM's Environmental Studies Program, now in its 40th year, is a leading contributor to scientific knowledge about the nation's marine and coastal environment. One of the ways BOEM supports fisheries management is by conducting extensive studies of fishes and other marine life on the Outer Continental Shelf to prevent or minimize impacts from offshore oil and gas, renewable energy or marine mineral development. BOEM also participates in regional ocean planning initiatives. BOEM funds projects to evaluate the potential impact of offshore activities on fisheries while helping to develop best management practices to reduce operational risks to developers and fishers. Contact: Caren Madsen, caren.madsen@boem.gov

Bureau of Safety and Environmental Enforcement (BSEE)



Stakeholders representing both commercial fishing industry and wind energy developers engage in roundtable discussions about activities in the Atlantic outer continental shelf. The workshops were part of a series BOEM held in New Bedford, MA. Photo credit: Ecology and Environment, Inc.



Fish, sponges, molluscs and other organisms have established a submarine community on an offshore oil platform in California. Photo credit: BOEM. See related story page 11.

BSEE supports marine fish habitat and recreational fishing interests by working with several other partners to implement the Rigs-to-Reefs policy. Generally, after the useful life of an oil and gas platform, it must be decommissioned according to terms of the DOI lease by which the platform was authorized. "Rigs-to-Reefs" is a disposal option that, under certain circumstances, allows keeping a biologically valuable structure in the marine environment as an artificial reef. Contact: David Smith, david.smith@bsee.gov

Bureau of Land Management (BLM)

BLM manages over 245 million surface acres of federal land. This includes managing, restoring, and conserving habitat for game and non-game fish populations including over 116,400 miles of perennial stream habitat and 602,400 acres of reservoir habitat. For example, BLM implements program strategies under the National Fish Habitat Partnership. Contact: Thomas Mendenhall, tmendenh@blm.gov

Office of Insular Affairs (OIA)

Island communities maintain strong cultural ties to the ocean and many islanders depend heavily on subsistence fishing, as they have for thousands of years. The OIA provides technical and financial aid to US island territories and freely associated states that helps preserve and sustain these resources and cultural practices. For example, OIA’s Coral Reef Initiative program has provided significant funding to support the Micronesia Challenge, launched at the U.S. Coral Reef Task Force meeting in Palau in FY 2005 by the region’s heads of governments. The Micronesia Challenge is a bold initiative to conserve 30 % of near-shore marine resources and 20 % of forest resources by 2020.

OIA has also provided technical and financial support for community-based marine conservation planning and management. This includes the ‘Natural Resource Assessment Surveys’ www.nras-conservation.org in communities of the Marshall Islands, including Namdrik, Mili, Rongelap, Namu, Ailinginae and Ailuk Atolls. The goal is to assist communities with managing their marine resources, and especially local fish stocks, in all of the 21 inhabited atolls by 2014.

OIA has also funded research on protecting spawning aggregations in Pohnpei and developing management recommendations with the communities in Ulithi, Yap, that are in line with culturally and historically relevant management practices. Together these efforts are strengthening



With support from the Office of Insular Affairs, schoolchildren on Namu, Marshall Islands, learn about their fisheries resources and the importance of protecting them. Photo credit: Karen Koltes, DOI

capacity in the islands to manage their coral reefs, address climate change as well as maintain food security to prepare their communities for the future. Contact: Karen Koltes, karen_koltes@ios.doi.gov

Bureau of Indian Affairs (BIA)

The BIA provides services (directly or through contracts, grants, or compacts) to federally recognized American Indian tribes & Alaska Natives in the U.S. In one regional example, the Subsistence Branch of the Alaska Region, Bureau of Indian Affairs, assists Alaska Tribes and Native organizations with addressing their many natural resource management needs. Their activities include supporting and advocating for the rights of Alaska Natives to continue their harvest of fish, wildlife, and other natural resources in order to continue their subsistence lifestyles (an important foundation of native culture and traditions) and providing financial and technical assistance and science/management training to support their efforts in co-managing Alaska’s fisheries, wildlife, and

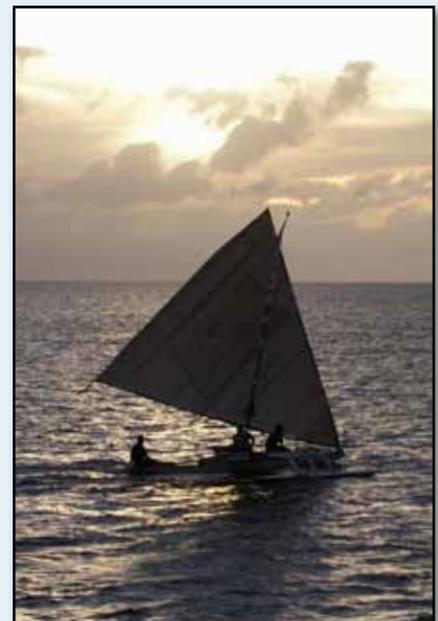
other natural resources. Contact: Glenn Chen, glenn.chen@bia.gov

Bureau of Reclamation (Reclamation)

Reclamation’s mission is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. While managing dams, power plants and canals in the West, the Bureau of Reclamation also supports a multipurpose mission of fish and wildlife enhancement.

Contact: Lauren Meredith, meredith@usbr.gov

Watch a video about Reclamation fisheries biologists working with the USFWS, U.S. Forest Service, and the State of Idaho to study bull trout and their habitat in the Boise River basin: <http://www.usbr.gov/pn/snakeriver/esa/bulltrout/index.html>



U.S. insular areas are able to preserve and sustain centuries-old cultural practices as well as address challenges for the future with technical and financial assistance through the Office of Insular Affairs. Photo credit: Karen Koltes, DOI

San Francisco Bay Could Lose Marshes to Sea-Level Rise by 2100

By Ben Young Landis, USGS

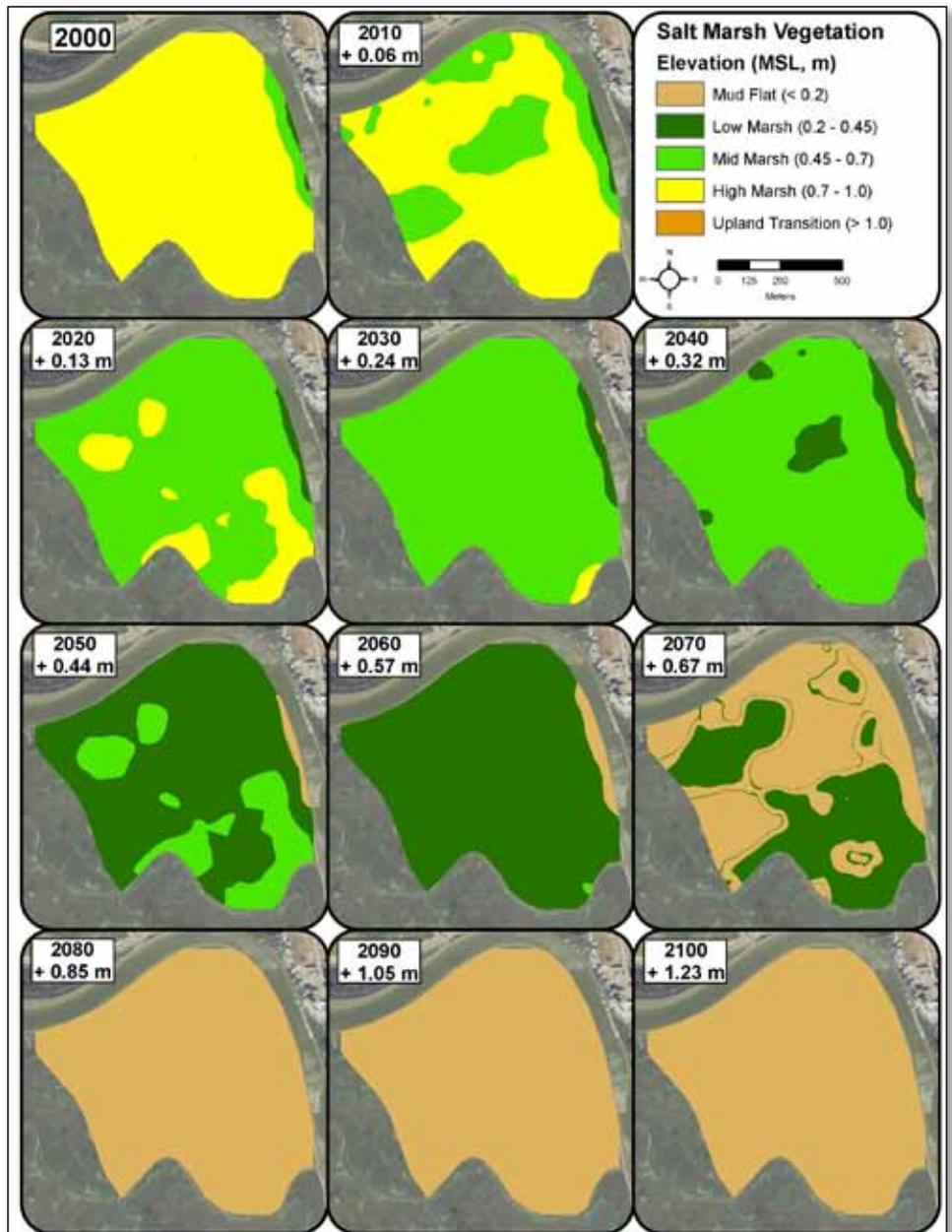
San Francisco Bay has already lost the majority of its marsh habitat since the 19th Century, but could lose even more marshes by the year 2100, due to sea level rise.

The **International Panel on Climate Change** has identified coastal ecosystems as areas that will be disproportionately affected by climate change. Current sea-level rise projections range widely with 0.57 to 1.9 meters increase in mean sea level by 2100. The expected accelerated rate of sea-level rise through the 21st century will put many coastal ecosystems at risk.

Using a new computer model, USGS researchers from the Western Ecological Research Center and the California Water Science Center found that 95 percent (4,798 acres) of the Bay's 12 marshes will be inundated by 2100.

The findings have implications for habitat restoration efforts for San Francisco Bay's national wildlife refuges, and the implications of the study are not necessarily bleak.

“San Francisco Bay is home to one of the world's most vibrant centers of society and commerce, but it also means that our remaining marshes are often fenced in by urban barriers, and there's little high ground left for marsh plants to naturally spread and adapt to rising seas,” says Don Brubaker, manager of the San Pablo Bay National Wildlife Refuge. “But if there are other things we can do to help our existing marshes become more resilient to future changes and give migratory birds and endangered



Modeled Petaluma marsh plant community response to projected sea-level rise from 2000 through 2100 is one example of how USGS science is looking at possible responses to sea-level rise in the San Francisco Bay estuary. You can find similar analyses at other locations around the Bay www.werc.usgs.gov/ProjectSubWebPage.aspx?SubWebPageID=3&ProjectID=238 Image credit: USGS

wildlife more habitat and time to adapt to sea level rise effects, then we might be able to keep pace with sea-level rise.”

“This new report actually underscores the need to restore more marshes to San Francisco Bay,” says Eric Mruz, refuge manager at the Don Edwards San Francisco Bay National Wildlife Refuge, also one of the sites of the South Bay Salt Pond Restoration Project.

“The study is based on current conditions. But if we change that equation, and have more acres of marshes and healthier marshes on hand to begin with, then maybe we'll have a different outcome 100 years from now.”

The report, Open-File Report 2013-1081, and animated sea-level rise scenarios can be viewed at the project website: www.werc.usgs.gov/SFBaySLR.

Wetlands and Sharks are Back in San Francisco Bay

The largest wetlands restoration project ever undertaken on the West Coast is bringing results: return of the leopard shark.

Don Edwards San Francisco Bay National Wildlife Refuge is a partner in restoring thousands of acres of former industrial salt ponds that ring the bay's shoreline. Already, ducks, herons and fish are back. Now, researchers from the University of California Davis are finding large numbers of leopard sharks, some as big as six-feet long, swimming through breached levees into the former salt ponds, where they are gorging on herring, crabs and other species that have exploded in number as the ponds have been opened to bay waters.

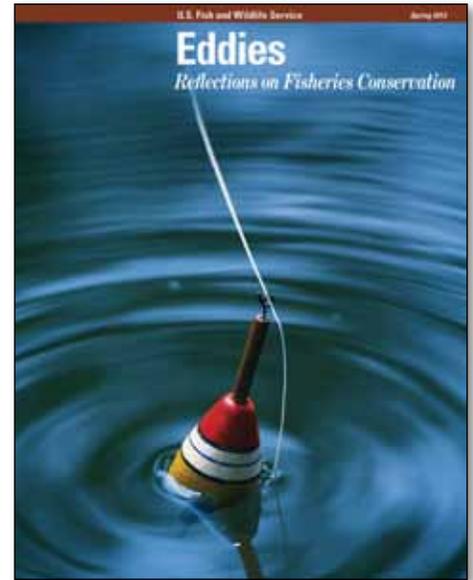
“This tells us the water quality is getting better,” says refuge manager Eric Mruz. The salt pond restoration began in 2003, with the purchase of 15,100 acres of former commercial salt ponds. These wetland habitats serve as giant filters, removing toxic pollution and nutrient runoff that otherwise impact the Bay's fragile ecosystem. Historically, Bay wetlands have also worked as natural sponges that protect communities from tidal flooding by absorbing and slowly releasing storm water.

“The restoration of these lands is the culmination of decades of work,” said Florence LaRiviere, founding member of the Citizens Committee to Complete the Refuge.

Learn more: www.fws.gov/refuges/news/TheyBackWetlandsSharks.html



Researcher Amy Chandros displays a large leopard shark captured off Bair Island, CA. Photo credit: Nick Buckmaster



USFWS Eddies: Reflections on Fisheries Conservation, is now available on-line: www.fws.gov/eddies/

Do You Have a Passion for Puffins?

The numbers of Atlantic puffins in Maine may be on the decline because of climate change. *See related story page 8.* In the Gulf of Maine, scientists worry Atlantic puffins have been dying of starvation and losing body weight, possibly because of shifting fish populations as ocean temperatures rise. The warming waters might be contributing to a boom in the butterfish population, crowding out the herring that puffins need to feed their young. <http://www.fws.gov/refuges/news/Sea-birdsWarnOceanChange.html>
<http://usfwsnortheast.wordpress.com/author/usfwsnortheastblog/>



Atlantic puffins at Seal Island National Wildlife Refuge in Rockland, Maine. Photo credits: USFWS

Earth-Science-Art

By Ann Tihansky, Jane Reid, USGS,
Lisa Hochstein, Artist

“When Santa Cruz-based artist Lisa Hochstein approached our Center with her idea for combining art and science together in an exhibit, we immediately understood the value of seeing our work through new eyes. The exposure to USGS science through this exhibit has connected audiences more intuitively with some of the complex natural resource issues facing our nation,” said Jane Reid, Pacific Coastal and Marine Science Center (PCMSC)’s Deputy Director.

“Through an innovative collaboration, we have been able to present USGS research in an entirely new way,” said PCMSC’s Director Bob Rosenbauer.

Inspired that the R. Blitzer Gallery and the USGS Coastal and Marine Geology research facilities shared a wall in the former Wrigley chewing gum factory in Santa Cruz, CA, Hochstein said, “I found this configuration to be an apt metaphor for the commonly held perception of art and science as distinct and unrelated disciplines ... in reality the two have much in common.”

Working with Reid, Hochstein developed a project in which 16 individual artists from California’s Monterey and San Francisco Bay areas were invited to pair up with 16 scientists from the USGS PCMSC. Together the partners explored their respective fields and generated new artwork and scientific posters for the resulting exhibit.

The scientists’ research topics included the study of migratory bird patterns, movement of sediment by wind, waves, and currents, deep sea precious metal deposits, and climate change effects on human communities and natural environments. The artists used painting, printmaking, video, and sculpture in creating their perspective on the scientists’ coastal and marine research. The exhibit presented artwork side-by-side with research posters, effectively highlighting the various ways that art and science study, interpret and describe the world.

The exhibit, “Earth-Science-Art,” was hosted by the R. Blitzer Gallery along with two public panel discussions between the scientists and artists in June 2012. In May 2013, the exhibit traveled to USGS headquarters in Reston, VA where it was on public display for six weeks.

“Communicating science in a clear and effective manner to the public is one of the most important challenges scientists face. This project provided an opportunity to present our science in an innovative manner.”

--participating USGS scientist
Patrick Barnard



Artist Margaret Niven's multi-paneled oil-on-paper painting (on right) echoes the imagery in USGS scientist, Peter Dartnell's video mosaic that depicts the seafloor over the Izor's Reef, off the southern California coast. Photo credit: Lisa Hochstein

An exhibit catalogue showcases the project and the creative partnership spirit. It is available from Lisa Hochstein at hochstein@sbcglobal.net

Learn more: www.earth-scienceartsc.com/

USGS press release: www.usgs.gov/newsroom/article.asp?ID=3210#.UjnJnI0qaCI

Informing Management at Marine Protected Areas

By Lauren Wenzel, NOAA

The outdoor industry generates \$289 billion annually in retail sales and services, and provides 6.5 million jobs. Marine protected areas (MPAs) are important to the American economy, and serve a crucial role in promoting healthy lifestyles. (See related story page 1.)

“There’s no question that MPAs can be important economic drivers by supporting recreation and tourism, but we need to make sure that these activities don’t harm the resources the MPAs were established to protect,” said John Jensen, chair of the MPA FAC’s Subcommittee on Recreation and Tourism.

To ensure that there is a balance between protection and use, the Marine Protected Areas Federal Advisory Committee (MPA FAC) advises both the Department of the Interior and NOAA on ways to strengthen, connect and expand the nation’s MPA programs. The MPA FAC is a group of 20 individuals representing diverse marine interests including recreational fishing, offshore energy and conservation organizations. It has been specifi-



Snorkeling is becoming an increasingly popular activity at the Florida Keys National Marine Sanctuary. Managers at Marine Protected areas work to make sure these activities do not harm the resources they were established to protect. Photo credit: NPS

cally asked to focus on how MPAs can help support national and community efforts to promote tourism and recreation, while ensuring that these activities are managed sustainably. Examples of measures and regulations that have been implemented to help protect and minimize harmful impacts to coral reef resources include: requiring the use of mooring buoys instead of anchoring on fragile coral reefs, education, outreach, restoration

and scientific studies to inform management decisions.

To learn more, the MPA FAC and the National Marine Protected Areas Center conducted a survey of 62 MPA managers, from the National Park Service, National Wildlife Refuges and National Marine Sanctuaries.

The survey indicated that 79% of managers reported common or intense recreational uses at their MPAs, with 75% seeing increased use. Increasing use, coupled with widespread information gaps on the ecological and socio-economic impacts of recreation within MPAs, has led to a growing concern from managers about the impact that recreation may have on other management goals and long-term site sustainability. “It’s uses we have not anticipated, or future incompatible uses that are a concern, as well as uses that occur in areas outside our jurisdiction but directly affect our trust resources,” said one respondent. Do you have some experiences or lessons to share? Contact Lauren Wenzel, Acting Director of the National Marine Protected Areas Center at lauren.wenzel@noaa.gov or Charles Wahle at charles.wahle@noaa.gov

BOEM ‘Science Notes’

BOEM ‘Science Notes’ keeps the Bureau of Ocean Energy Management’s community of stakeholders informed of ongoing research as it is taking place in the field, ie:

-Largest Survey of Marine Protected Species on East Coast Moves into 4th Year

-Scientists Discover New Marine Life in Atlantic Canyons (see related story page 7)



At left- Desray Reeb of BOEM, washes down ‘bongo nets’ (used for sampling small plankton) during a research cruise conducting the largest scientific study of marine protected species on the U.S. East Coast. The July-August 2013 research cruise aboard NOAA Ship Henry B. Bigelow was part of the collaborative Atlantic Marine Assessment Program for Protected Species. Photo credit: Danielle Cholelwiak, NOAA

Keep up with BOEM science!

Subscribe here:

www.boem.gov/Science-Notes/

Federal Leadership for Arctic Resource Challenges

By Cathy Coon, James Kendall, BOEM

Alaska presents “frontier land” challenges. With a land area more than three and a half times that of California, an offshore area greater than all other coastal states combined, extreme climatic conditions, and large remote regions with little infrastructure and population, it is Alaska that makes the U.S. an Arctic Nation. Because of Alaska, the U.S. is a member of a small but important cadre of nations addressing a variety of issues critical to the Arctic such as: changes in ice coverage and impacts to coastal communities, potential shifts in weather patterns, sea conditions, and ecosystem functions; increases in shipping and tourism; and renewed interest in energy and mineral extraction. Together these bring a plethora of stewardship, economic, emergency preparedness, and national security challenges, as well the need for critical new research to inform them.

Strong ties to climate and ocean resources put the State of Alaska at the forefront for addressing these challenges. Federal support is critical for managing the natural resources, working with tribal communities, improving administrative efficiencies, as well as developing and disseminating sound scientific and technical information. Most federal agencies have offices in Anchorage and have been collaborating daily to keep current. Federal representatives participate regularly in established forums such as the Alaska Climate Change Executive Round-table, the Alaska Cooperative Planning Group, the

North Slope Science Initiative, the Arctic Landscape Conservation Cooperative and others. State, tribal, Alaska Native corporation, and University of Alaska System offices, as well as local offices of the Alaska Ocean Observing System, the U.S. Arctic Research Commission, the North Pacific Research Board, and the Institute of the North. Through effective collaboration with state, tribal, and local partners, marine industries and other stakeholders, the federal partners serve a critical role in supporting balanced and informed decision making and response.

Key Arctic policy and strategy documents

“Managing for the Future in a Rapidly Changing Arctic,” Inter-agency Working Group on Coordination of Domestic Energy Development and Permitting in Alaska. This report supports an Integrated Arctic Management approach to inform the orderly and environmentally sound development of renewable and conventional energy in the oceans, coastal regions, and interior of Alaska. that is science-based and integrates and balances environmental, economic, and cultural needs and objectives. www.doi.gov/news/upload/ArcticReport-03April-2013PMsm.pdf

National Ocean Policy: The Arctic is the only geographical area identified as a National Ocean Policy priority. www.whitehouse.gov/administration/eop/oceans/implementationplan

“The Interagency Arctic Research Policy Committee’s (IARPC) Arctic Research Plan, Fiscal years 2013-2017,” sets the

science priorities and coordinates Arctic research among 14 Federal agencies and facilitates cooperation with partner organizations including the State of Alaska, indigenous organizations, academic institutions, non-governmental organizations, the Arctic Council, and international partners. www.whitehouse.gov/sites/default/files/microsites/ostp/2013_arctic_research_plan.pdf

“Goals and Objectives for Arctic Research:” the U.S. Arctic Research Commission (USARC) set priorities and goals necessary to construct a federal program plan for basic and applied scientific research to observe, understand and respond to environmental change in the Arctic; improve Arctic human health; understand natural resources; advance civil infrastructure research; and assess indigenous language, identities and cultures. www.arcus.org/witness-the-arctic/2013/2/article/19966

Interior’s Assessment of the 2012 offshore drilling program in the Beaufort and Chukchi Seas: combined BOEM and BSEE rule-making processes to develop Alaska OCS Standards. www.bsee.gov/BSEE-Newsroom/Press-Releases/2013/Press03142013.aspx

The U.S. Coast Guard’s Arctic Strategy for improving maritime awareness, safety and security in a rapidly changing Arctic environment. www.uscg.mil/seniorleadership/DOCS/CG_Arctic_Strategy.pdf



Ocean Exploration 2020 DOI Participates in National Forum

By James Kendall, BOEM

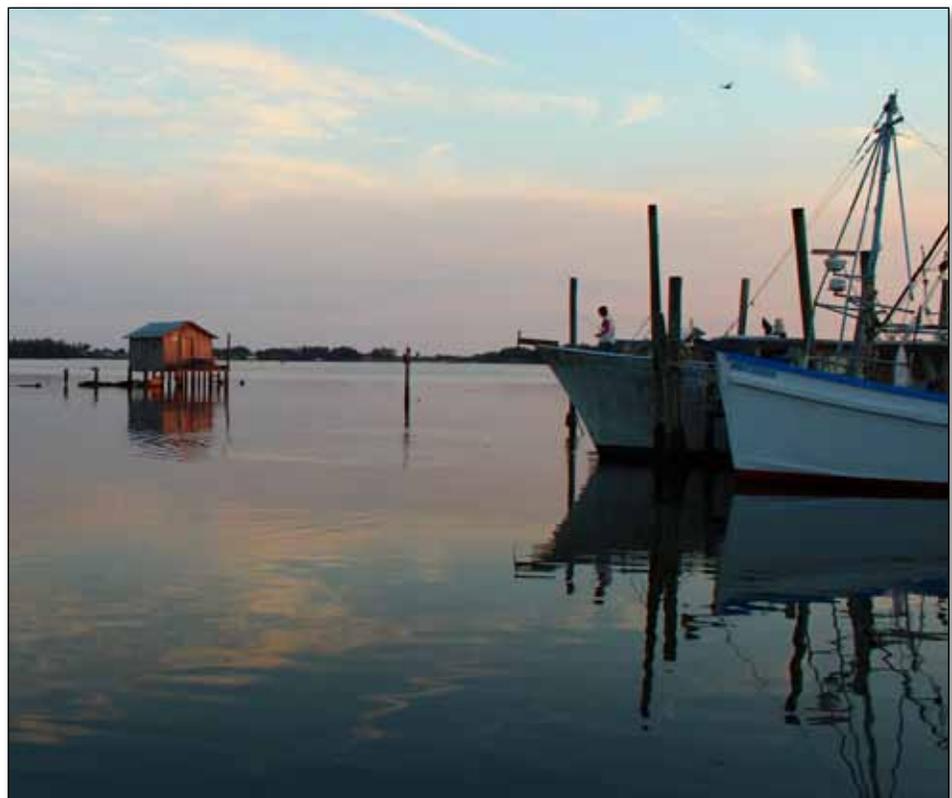
Interior participated in an ocean event aimed at shaping the directions for national ocean exploration in the next decade.

From July 19 to July 21, NOAA and the Aquarium of the Pacific co-hosted Ocean Exploration 2020: A National Forum in Long Beach, Calif. The first two days of the forum convened some of the most notable ocean-exploration scientists and stakeholders from academia, foundations, government agencies and the private sector including Google Ocean, OpenROV, Woods Hole Oceanographic Institute, Monterey Bay Aquarium Research Institute among others. Jim Kendall (BOEM), Suzette Kimball (USGS), and Uri S. ten Brink, (USGS) represented Interior. Others interested in ocean exploration participated virtually via an online community.

Participants met to develop a national strategy for ocean exploration - a framework that would include all stakeholders and their contributions to such an endeavor. Kendall coordinated Interior's message articulating the complementary and synergistic relationship between exploration and research and how ocean exploration can be a valuable tool. He illustrated this concept through examples in a poster format that highlighted collaborative ocean exploration projects conducted by BOEM, USGS, and NOAA, in support of the Department's mission.



Part of the Interior Department's poster that was presented at Ocean Exploration 2020: A National Forum to illustrate the vital role that ocean exploration shares with research and enhanced management of natural resources. <http://oceanexplorer.noaa.gov/oceanexploration2020/>



Cortez fishing village along Florida's west coast. Photo credit: Laura Torresan, USGS

Veazie Dam Removal: Restoring the Penobscot River

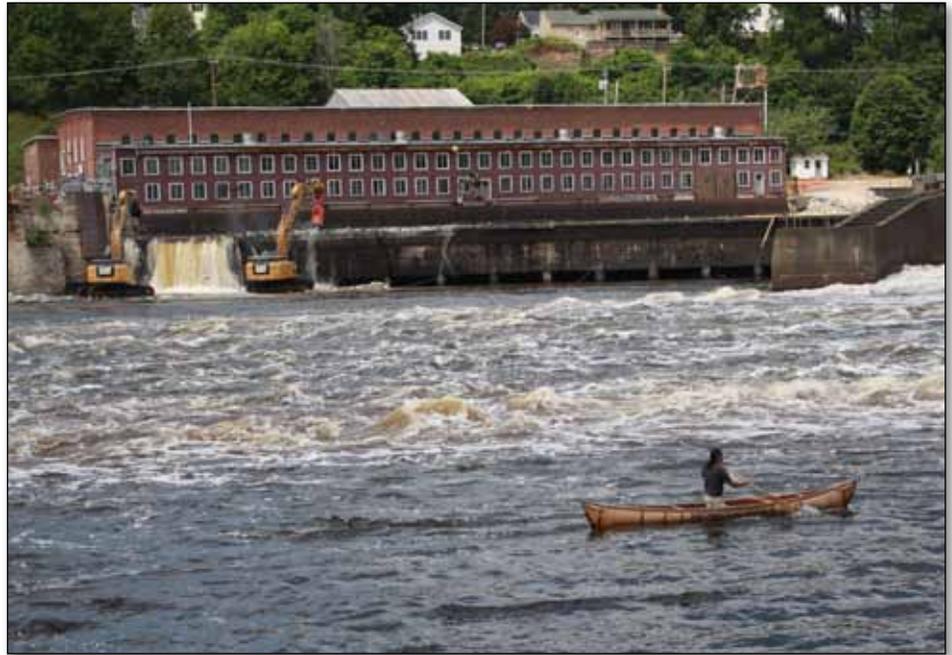
By Nicole Bransome, DOI

On July 22, Veazie Dam on Maine's Penobscot River was breached, a concrete example of how the USFWS' National Fish Passage Program is working. The dam breaching coincided with the release of the USFWS' National Fish Passage Program 2012s annual report.

The Veazie Dam is among an estimated 74,000 dams and other structures nationwide that impede passage for native fish. Such impediments may eliminate access to key spawning habitat, and degrade water quality by preventing stream flow that cleanses rivers. In addition, potential failure of aging dams pose threats to human safety.

The Veazie Dam blocked passage of Atlantic salmon, American shad, river herring and other native sea-run fish for nearly two centuries.

The Penobscot River Restoration Trust owns the Veazie dam and has worked with the USFWS, the Penobscot Indian Nation, the State of Maine and other partners to remove this barrier. Veazie is the dam closest to the sea within the Penobscot watershed. Combined with the removal of the Great Works Dam in 2012, this is the largest river restoration project in the country. It restores more than 1,000 miles of native habitat -- now available for federally-listed Atlantic salmon and other aquatic species and is a cultural and natural



Joseph Dana of the Penobscot Indian Nation paddles a traditional birch-bark canoe while construction equipment breaches the dam. Below, Northeast Regional Director of USFWS, Wendi Weber attended the dam breaching and highlighted the partnerships critical to these accomplishments. Photo credits: Meagan Racey, USFWS

resource for the Penobscot Indian Nation.

“We could not do this without our partners,” said Wendi Weber, Northeast Regional Director of the USFWS the event. The Annual Report highlights efforts in more than 40 states in cooperation with approximately 300 partners. Projects included fish passage barrier removals, engineering, partnership coordination, monitoring, and barrier inventories. The Program also provides leadership in the science of fish passage engineering including a 2012 project at the Bozeman Fish Technology Center in Montana to study fish swimming capabilities under varying conditions to guide the design of fish passage projects.

“I'm pleased to report last year the Service and its partners reconnected more than 2,500 miles of streams and 36,000 associated wetland acres,” said USFWS Director Dan Ashe. “The projects will ben-



efit aquatic species by protecting, restoring and enhancing stream, lake and coastal habitat as well as anglers by improving recreational fisheries, giving a boost to communities that benefit from the outdoor recreation economy.”

Since 1999, the program has removed 1,345 fish passage barriers and opened up more than 20,000 miles of streams, supporting more than 200,000 jobs and \$11 billion in economic value to local communities. www.fws.gov/northeast/feature_archive/Feature.cfm?id=794592318

Measuring Coral Growth

A Valuable Tool for Reef Researchers and Managers

By Ilsa Kuffner, Ann Tihansky, Hannah Hamilton, and Helen Gibbons

An innovative weight-based approach to monitoring coral growth in the wild has been developed by U.S. Geological Survey (USGS) researchers and is expected to lead to more definitive answers about the status of coral reefs.

Corals and other marine organisms build their skeletons and shells through calcification, the biological process of secreting calcium carbonate obtained from seawater.

Using the weight-based approach, USGS scientists established a new calcification-monitoring network in 2009 to study coral growth in the Florida Keys. The researchers measured growth rates of the reef-building coral *Siderastrea siderea* (massive starlet coral) at four sites in the Florida Keys Reef Tract. Comparison of the weight data and linear-growth data confirmed their

expectation that weight measurement would prove a more precise and efficient way to calculate calcification rates.

The new method is a valuable tool for researchers and managers seeking to understand the global decline in coral reefs.

“A coral may grow two millimeters in height on the left side of the colony and five millimeters on the right, so linear measurements are inherently variable and require sampling hundreds of corals to detect changes in growth over time... our method requires only 10 corals per site,” said Ilsa Kuffner, USGS scientist and lead author of the study.

Kuffner’s team has provided important baseline information on spatial and seasonal variability in calcification rates of reef-building corals in the Florida Keys. For example, they found that colonies of the massive starlet coral calcified about 50 percent faster in summer compared to winter. They also discovered that, during the study period, the coral grew about

50 percent faster in the remote Dry Tortugas National Park than at three other outer-reef tract sites offshore of Miami, Key Largo, and Marathon, Florida. The reasons behind this surprising pattern are not clear, leaving a mystery sure to pique the interest of many reef managers.

Measuring changes in growth is becoming increasingly important as corals face challenges from ocean acidification (decreasing pH caused by increasing atmospheric CO₂) and other climate-change and land-use impacts. Additionally, the method uses inexpensive and easy-to-find materials, and no corals are harmed in the process.

“This tool provides the kind of scientific information needed to manage coral reefs at the ecosystem scale by looking at the relationships between coral health, climate change, and water-quality. It provides partners and reef managers with better, more sensitive metrics to assess coral growth, identify the most important vari-

See Coral Growth page 25



Above, Massive starlet coral, *Siderastrea siderea*. Photo credit: Ilsa B. Kuffner, USGS

At right, USGS Scientist and SCUBA diver, Ilsa Kuffner, works on a calcification station at Fowey Rocks, Biscayne National Park, Florida. Photograph by Carlie Williams, USGS.





Elkhorn coral (*Acropora palmata*). Photo credit: USGS

Coral Growth continued from page 24

ables, and prioritize strategies to protect and preserve these valuable ecosystems,” said Acting USGS Director Suzette Kimball. “It is also one of the ways USGS science is advancing the National Ocean Policy by supporting a number of on-the-ground priority actions.”

A next step in understanding declines in coral growth is discerning the different components of water-quality that are driving calcification rates, and this can only be achieved through the cooperation of reef managers and scientists around the world. The real power in the new approach will be realized if it is applied across many reefs that naturally have different temperature regimes, water quality, and pH conditions.

“The study results suggest that we should pay more attention to different aspects of water-quality if we hope to understand and predict what will happen to coral reefs as oceans continue to change,” said Kuffner.

According to Kuffner, managers already know that coral reefs are in decline, but they want to know why. They need a linkage between cause and effect that explains why

reefs are not growing like they used to or are not recovering from disease or die-off events. Correlating finely measured coral growth rates with water quality and other environmental information is an important step toward making these linkages so they can inform management decisions.

<http://link.springer.com/article/10.1007%2Fs00338-013-1047-8>

<http://coastal.er.usgs.gov/crest/>

<http://coralreefs.wr.usgs.gov/>

Note: The coral-growth study was conducted under scientific permits from the Florida Keys National Marine Sanctuary and the National Park Service.

Upcoming 30th U.S. Coral Reef Task Force Meeting

Governor John P. de Jongh, Jr., of the U.S. Virgin Islands will host the 30th meeting Nov. 11-15, 2013 in St. Croix. The meeting will highlight local and regional efforts to build partnerships, develop strategies, and support on-the-ground actions to conserve coral reefs in the U.S. Virgin Islands and the Caribbean. For more information about the USCRTF please visit: www.coralreef.gov.



USGS emeritus geologist Michael E. Field (left) receives the Department of the Interior's highest honor, the Distinguished Service Award, from USGS Pacific Coastal and Marine Science Center Director Bob Rosenbauer. Photo credit: Helen Gibbons, USGS

USGS Emeritus Geologist Receives Interior's Distinguished Service Award

Michael E. Field has been awarded the highest honor of the Department of the Interior, the Distinguished Service Award, “in recognition of his outstanding scientific contributions to the study of coastal and marine geology and his exemplary leadership” within the USGS and the scientific community. The honor was announced at a Pacific Coastal and Marine Science Center awards ceremony in Santa Cruz, Calif., on June 19, 2013. The citation letter, signed by Interior Secretary Sally Jewell on May 2, 2013, commends Field for his “four-decade career as a geologist for the U.S. Government” performing “complex research that spans the globe from deep-sea fans to shallow coral reef environments.”



Two BSEE engineers are hard at work ensuring safe and responsible operations in the offshore environment. The establishment of the Ocean Energy Safety Institute will provide training and exchange of technical expertise across the sectors of industry, academia, government and non-government organizations to further enhance safe operations with limited impacts to the environment. Photo credit: BSEE

BSEE To Establish an Ocean Energy Safety Institute

The Bureau of Safety and Environmental Enforcement (BSEE) is establishing an Ocean Energy Safety Institute (OESI) to further enhance safe and responsible operations across the offshore oil and gas industry.

Over the past several decades, offshore energy development has transitioned from shallow water environments with conventional oil and gas reservoirs to more technically challenging deepwater environments. The continued shift of the offshore oil and gas industry into deeper water and frontier areas requires new expertise for offshore workers and the regulators who oversee leasing, environmental reviews, exploration, development and production operations. The Institute will serve as a center of expertise in oil and gas exploration, development and production technology and will help federal regulators keep pace with new processes employed by the industry. By providing unbiased, independent cooperative research, technical assistance, education, and a forum for dialogue

between academia, government, industry and other non-government organizations, the Institute aims to enhance safe operations with limited impact to the environment. Applications for management of the Institute are being sought through grants.gov. For more information www.bsee.gov/BSEE-Newsroom/Press-Releases/2013/Press05292013.aspx BSEE is encouraging “Safety at all levels” www.bsee.gov/Safety/Videos/index.aspx

Facing the Challenge of Marine Debris

During June and July 2013, Bret Wolfe, USFWS Marine Program Coordinator for the National Wildlife Refuge System, gathered marine debris off a quarter mile stretch of beach on Sand Island, part of the Midway Atoll NWR. The picture below represents about three months of accumulation. Along with fishing buoys, plastic water bottles, and shoes, the most plentiful debris is small indistinguishable plastic fragments. To help raise awareness about this problem, Wolfe has shared some of the debris with the Smithsonian National Museum of Natural History for a current exhibit about the impacts of marine debris and the challenges in managing them. The exhibit opened on September 17, 2013 in the Sant Ocean Hall in Washington, D.C.





Mid-Atlantic Regional Planning Body Meeting

The Mid-Atlantic Regional Council on the Ocean (MARCO) hosted the Regional Ocean Planning Workshop in Arlington, VA in April. This collaboration brought regional and federal partners together to launch regional ocean planning. On September 24-25, the group held their inaugural in-person meeting of the Regional Planning Body at Monmouth University, West Long Branch, New Jersey. Learn more:

<http://www.boem.gov/Mid-Atlantic-Regional-Planning-Body/>

Key summary resources are now available on-line. The workshop summary and proceedings are here: <http://www.midatlanticocean.org/index.htm>

Video segments are here:

<http://www.youtube.com/playlist?list=PLQq-vKQuml-2s9XvlykiDWuj4R89louhp1>

Regional News

Regional marine planning moves forward

The National Ocean Policy proposed Federal-State-Tribal partnerships for marine planning at regional levels. Four geographic regions now have regional planning bodies operational – Northeast, the Mid-Atlantic, the Caribbean and the Pacific Islands.

Three other regions are close to joining the process – the South Atlantic, the Gulf of Mexico and the West Coast

Interior contacts and related links for activities in the nine regions:

Northeast

Bob LaBelle (BOEM)

Leanne Bullin (BOEM)

(Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut)

<http://northeastoceancouncil.org/>

Mid-Atlantic

Maureen Bornholdt (BOEM)

Leanne Bullin (BOEM)

(Maryland, New York, New Jersey, Delaware, Virginia)

<http://www.midatlanticocean.org>

Caribbean

Sherri Fields (NPS)

(Puerto Rico, U.S. Virgin Islands)

Pacific Islands

Richard Hannan (USFWS)

(American Samoa, Commonwealth of Northern Mariana Islands, Guam, Hawaii)

South Atlantic

Eric Strom (USGS)

(North Carolina, South Carolina, Georgia, Florida)

<http://www.southatlanticalliance.org>

Gulf of Mexico

Linda Walker (USFWS)

(Alabama, Florida, Louisiana, Mississippi, Texas)

<http://www.gulfofmexicoalliance.org>

West Coast

Joan Barminski (BOEM)

Ellen Aronson (BOEM)

(California, Washington and Oregon)

<http://westcoastoceans.org>

Great Lakes

Phyllis Ellin (NPS),

Norman Grannemann (USGS)

(Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin)

<http://www.epa.gov/glnpo/glri/>

<http://www.cglg.org/>

Alaska/Arctic

Jim Kendall (BOEM)

(Alaska)



Coral colonies of *Eusmilia* sp. and *Porites* sp. at Isla de Mona in Puerto Rico. Photo credit: JP Zegarra

Social Media Connects YOU to Interior's ocean, coasts and Great Lakes

The Surfing Bison



Like, share, tweet, follow, post, and comment. Discovering and connecting to your natural resources through social media can be an exciting way to learn more about them!

By Franklin Berman and Ann Tihansky, DOI

Social media offers up a great way to stay connected and see what kind of activities are taking place at Interior's ocean, coasts and Great Lakes. Here we have highlighted a few sites where you can start exploring. Discover Parks, Refuges, restoration activities, image galleries, blogs, videos, and other resources.

<http://www.doi.gov/news/Social-Media.cfm> See page 2 for other suggested links.

Interior Instagram

<http://instagram.com/usinterior>

ReadWrite.com picked Interior's Instagram account as one of ten that "science geeks should follow." "The Department tasked with conserving the nation's natural resources makes a compelling case through its Instagram, showcasing stunning shots of U.S. national parks that speak for themselves." "Whether you're interested in biodiversity or just happy to be pointed toward your next travel destination, the DOI account is well worth exploring."

<http://readwrite.com/2013/09/25/best-instagram-accounts-for-science-geeks#awesm=~oijWAWWW2B940x>

Bureau of Ocean Energy Management's (BOEM)

Stay updated on achievements in promoting economic development, energy independence, and environmental protection through responsible, science-based management of Federal offshore resources. Like us and share us with your friends. www.facebook.com/BureauOfOceanEnergyManagement



The National Park of American Samoa (Paka Fa'asao o Amerika Samoa) is on three volcanic and mountainous islands. On Ofu, a secluded sand beach and fringing reef offer ideal places to snorkel or enjoy the solitude. The National Park preserves and protects tropical rainforests, coral reefs, fruit bats, and the Samoan culture. With a bit of the explorer's spirit, you will discover pristine vistas of land and sea. Photo credit: NPS

On Facebook: www.facebook.com/pages/National-Park-of-American-Samoa

The Bureau of Land Management (BLM)

In the Pacific Northwest, the BLM manages hundreds of thousands of oceanic acres ranging from the beautiful Oregon coast up to the San Juan Islands National Monument in Washington state. Follow the BLM in Oregon & Washington on Facebook for daily news, photos, and videos. www.facebook.com/blm.oregon.5?fref=ts

U.S. Fish and Wildlife Service Coastal Program

The U.S. Fish and Wildlife Service's Coastal Program delivers amazing habitat restoration for federal trust species through technical and financial assistance to communities and partners for the benefit of these and other species. USFWS works with local communities to address coastal resilience and protect important fish and wildlife habitat. Coastal Program staff are working with landowners to protect 5,000 acres of extraordinary habitat for Pacific salmon and migratory birds on Knik Island, Alaska. In addition to delivering on-the-ground conservation projects, USFWS works with partners to develop landscape-scale conservation plans, implement the National Ocean Policy and the Coral Reef Conservation Act of 2000. You can 'like' us on Facebook to learn about other ways we are conserving vital habitat.

www.facebook.com/CoastalProgram

National Park Service

There are 85 ocean and Great Lakes parks, seashores, lakeshores and monuments across 26 states. Established for their beauty and national significance, these parks conserve over 11,000 miles of coast and 2.5 million acres of ocean and Great Lakes waters, including coral reefs, kelp forests, glaciers, estuaries, beaches, wetlands, historic forts and shipwrecks. For a list of ocean and Great Lakes parks, seashores, and lakeshores visit: www.nature.nps.gov/water/oceancoastal/

USGS Multimedia-coastal and marine geology series

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

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