



NEWSWAVE

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

NEWSWAVE-Winner of NAGC's 2015 Blue Pencil Award

Fall 2015

"Steel in the Water" Nation's First Offshore Wind Farm

By Jessica Kershaw, DOI

As part of President Obama's Climate Action Plan to create American jobs, develop clean energy sources and cut carbon pollution, Secretary Jewell and Bureau of Ocean Energy Management (BOEM) Director Abigail Ross Hopper joined Rhode Island Governor Gina M. Raimondo, the state's congressional delegation, and representatives of Deepwater Wind – the project developers – in celebrating an historic "steel in the water" milestone for America's first commercial scale offshore wind farm.

See Offshore Wind page 3



From left: BOEM Director Abigail Ross Hopper, DOI Secretary Sally Jewell, and Jessica Stromberg, Jim Bennett, and Tracey Moriarty of BOEM witness "steel in the water" with the construction of the nation's first offshore wind farm in Rhode Island. Photo credit: BOEM



Secretary Jewell and Secretary Kerry met with the next generation of Arctic stewards who are participating in the U.S. Arctic Youth Ambassadors program (from left-Byron Nicholai, Barae Hirsch, U.S. Secretary of the Interior Sally Jewell, U.S. Secretary of State John Kerry, James Chilcote, Griffin Plush, and Haley Fischer (not pictured) at the GLACIER conference. Photo credit: DOI

Addressing Arctic Challenges

On August 31, Secretary Jewell delivered remarks at the Conference on Global Leadership in the Arctic: Cooperation, Innovation, Engagement and Resilience (GLACIER). Jewell discussed U.S. actions to enhance climate resilience and adaptation planning. She also met with U.S. Arctic Youth Ambassadors, a program designed to increase outreach and education during the U.S. Chairmanship of the Arctic Council.

The event was hosted by U.S. Secretary of State John Kerry, who brought together foreign ministers of Arctic nations and key non-Arctic states with scientists, policy-makers and stakeholders to discuss the most urgent issues facing the Arctic today.

See related Arctic stories in this issue.

See Arctic Youth page 3

Coastal Erosion Threatens Native Alaskan Communities

A new USGS study finds that some of the highest shoreline erosion rates in the nation are along the northern coast of Alaska.

"Coastal erosion along the Arctic coast of Alaska is threatening Native Alaskan villages, sensitive ecosystems, energy and defense related infrastructure, and large tracts of Native Alaskan, State, and Federally managed land," said

See Erosion page 5



Erosion along the Arctic coast. Photo credit: Ben Jones, USGS

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Contribute to NEWSWAVE!

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More than one billion people use Facebook to connect with family, friends, and things that matter to them. Our ocean, coasts, and the Great Lakes affect people’s lives every day, around the world.

Social media is a great way to learn more about how Interior holds up our mission to conserve and protect America’s resources.

Connect with our Facebook account to keep up with news, learn fun facts, and see how we work with our many interagency partners to understand and address resource issues and policies using collaborative science-based management, conservation, and responsible use.

Visit and ‘like’ us today!

Share your photos with Interior!

Below is a beautiful image of the Great Dismal Swamp National Wildlife Refuge captured and shared with us by Tom Hamilton. You can share your amazing pictures of America’s public lands at: flickr.com/groups/americas-public-lands



Twilight at the Great Dismal Swamp National Wildlife Refuge. This refuge is the largest intact remnant of a vast habitat that once covered more than one million acres of southeastern Virginia and northeastern North Carolina. The 112,000-acre refuge is home to forests, marsh land and Lake Drummond -- one of only two natural lakes in Virginia. Photo credit: Tom Hamilton

NEWSWAVE is a quarterly newsletter from the Interior Department featuring ocean, coastal, and Great Lakes activities across the Bureaus.

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“Interior is proud to be a partner in this historic milestone for offshore renewable energy,” Secretary Jewell said. “Deepwater Wind and Rhode Island officials have demonstrated what can be accomplished through a forward-looking vision and good working partnerships. Block Island Wind Farm will not only tap into the enormous power of the Atlantic’s coastal winds to provide reliable, affordable and clean energy to Rhode Islanders, but will also serve as a beacon for America’s sustainable energy future.”

“This is an exciting development for Block Island and also demonstrates the way forward for wind energy in federal waters off America’s coasts.”

BOEM Director Hopper

“As the Nation’s pioneering offshore commercial wind farm, the lessons learned from the Block Island project about facility design, fabrication and installation will inform future projects to be developed on the Outer Continental Shelf,” said BOEM Director Hopper.

Spurring responsible development of offshore wind energy is part of a series of Obama Administration actions to increase renewable energy both offshore and onshore by improving coordination with state, local, and federal partners. When built, these projects could provide about 14,600 megawatts – enough energy to power nearly 4.9 million homes and support more than 24,000 construction and operations jobs.

<https://www.doi.gov/pressreleases/secretary-jewell-director-hopper-laud-construction-nation%E2%80%99s-first-offshore-wind-farm>

Arctic Youth continued from page 1

This Arctic Life: Young Leaders Lend Voices on Culture and Climate Change

By Secretary Sally Jewell

“When we can excite and encourage youth to serve their communities and serve as an inspiration to the next generation of leaders, as we know these five ambassadors will, then we’ve invested wisely in our future, and more importantly, in theirs.”

“At the opening of the Conference on Global Leadership in the Arctic (GLACIER), I had the opportunity to meet some extraordinary young Alaskans who are taking important steps to make a meaningful impact on the future of their communities. These young leaders realize there is a need to increase understanding and awareness of our rapidly changing Arctic environment, among the fastest-warming regions on earth.

Their voices and solutions for how to sustain communities, cultures and the environment in a changing Arctic are the reasons why they were selected for the United States Arctic Youth Ambassadors program. In the coming months, an additional 10-15 youth ambassadors will be selected. The program was created by the U.S. Fish and Wildlife Service and the U.S. State Department in partnership with nonprofit partner Alaska Geographic to increase outreach and education during the U.S. Chairmanship of the Arctic Council.

I had the privilege of meeting James Chilcote, Haley Fischer, Barae Hirsch, Griffin Plush and Byron Nicholai, who are the next generation of conservation and community leaders – young Arctic stewards of their cultures, and our lands and resources, who we must invest in now to help us take action against a changing climate.

I learned a lot about these young students’ lives in Alaska and their plans for the future. James, a Gwich’in Athabascan from Arctic Village who will attend the University of Alaska Fairbanks this year, said his dream in life is to keep the porcupine caribou safe from environmental harm; Haley recently participated in the Inter Tribal Youth Climate Leadership Congress and is a member of a whaling crew in her home town of Barrow, Alaska; Barae is president of the West High School Green Team in Anchorage and is a teen reporter for the Alaska Teen Media Institute; Griffin is a member of Alaska Youth for Environmental Action who will study environmental policy at the University of Alaska Southeast this year; and Byron Nicholai, who remarkably, has more than 18,000 followers on Facebook, is a talented musician from Toksook Bay who performed for U.S. Secretary of State John Kerry at the Arctic Council Chairmanship reception. These young leaders are impressive!”

Read the entire blog: <https://www.doi.gov/blog/arctic-life-young-leaders-lend-voices-culture-and-climate-change>



Leaders Reconvene for National Ocean Policy

By Beth Kerttula, National Ocean Council

With the advent of the National Ocean Policy five years ago, the Administration recognized the critical role of states and local communities in ocean decisions by empowering local regions to participate in decision making that affects their coasts and our ocean. Next year, the Northeast and the Mid-Atlantic will deliver the Nation's first Regional Marine Plans.

In an important step toward a fully collaborative ocean policy, State, tribal, and local leaders charged with coordinating national ocean policies across jurisdictions recently reconvened at the White House. Known as the National Ocean Council (NOC)'s Governance Coordinating Committee (GCC), these leaders are championing important ocean issues that have enormous impacts to our economic and cultural relationship with the ocean, coasts, and Great Lakes. For the next two years, the new GCC members will guide the development of strategic action plans, policy and research priorities, and the implementation of the National Ocean Policy through meaningful dialogue with the NOC. These leaders are championing important ocean issues that have enormous impacts to our economic and cultural relationship with the ocean, coasts, and Great Lakes.

Interior's Deputy Assistant Secretary for Policy and International Affairs, Lori Faeth and Rick Murray of the National Science Foundation were invited to the GCC meeting where they provided remarks about recent accomplishments and outlined issues and priorities for the next two years.



Following her presentation at Interior, National Ocean Council Director Beth Kerttula (left) visited with Interior's Lori Faeth on World Ocean Day, June 8, 2015. Photo credit: Ann Tihansky, USGS



Members of the National Ocean Council's recently reconvened Governance Coordinating Committee. Photo credit: Brian Manwaring, Udall Foundation

National Ocean Council's New Governance Coordinating Committee (GCC) Members:

Leo Asuncion, Acting Director, State of Hawaii Office of Planning and State of Hawaii Coastal Zone Management Program (Co-Chair)

Senator Kevin Ranker, Washington State Senate (Co-Chair)

Ted Diers, Administrator, State of New Hampshire Department of Environmental Services (Vice Co-Chair)

Tribal Chairman T.J. Greene, Makah Tribe (Vice Co-Chair)

Michael Bolt, Chairman, United South and Eastern Tribes Natural Resources Committee

Council Member Elle Cochran, Maui County Council, HI

Supervisor Greg Cox, San Diego County, CA

Jennifer Hennessey, Senior Policy Lead, State of Washington Department of Ecology

Joe Oatman, Deputy Manager of the Department of Fisheries Resource Management, Nez Perce Tribe

Mayor Philip Stoddard, South Miami, FL

Nick Tew, Alabama State Geologist



NEWSWAVE Wins NAGC Blue Pencil Awards

The *NEWSWAVE*, published by Interior's Office of Policy Analysis, was selected for two 2015 Blue Pencil & Gold Screen Awards. The U.S. Government-wide competition hosted by the National Association of Government Communicators recognized *NEWSWAVE* in the category of 'Most Improved Publication' and also honored it with an Award of Excellence in the Shoestring Budget category. The awards were presented to Editor Ann Tihansky, Betsy Boynton, Liza Johnson and Lori Faeth during the Awards Ceremony this past June.

NEWSWAVE compiles ocean, coastal and Great Lakes news from across Interior's Bureaus in one place. Each issue reflects Interior's diverse roles in recreation, science, energy, conservation, restoration, climate change, natural hazards, invasive and endangered species, cultural history, tribal and native activities, international affairs, partnerships and policies. It is distributed online to over 5,000 subscribers. Sign up to receive it via email or read it online: <https://www.doi.gov/pmb/ocean/newswave>

Read NEWSWAVE today!

Erosion continued from page 1

Suzette Kimball, acting director of the USGS.

The scientists studied more than 1,600 kilometers of the Alaskan coast between the U.S.-Canadian border and Icy Cape. While changes in these areas include both erosion and expansion, the highest erosion rate exceeded 18 meters per year.

“There is increasing need for this kind of comprehensive assessment in all coastal environments to guide managed response to sea-level rise and storm impacts,” said Dr. Bruce Richmond of the USGS. “It is very difficult to predict what may happen in the future without a solid understanding of what has happened in the past. Comprehensive regional studies such as this are an important tool to better understand coastal change.”

Compared to other coastal areas of the U.S., where four or more historical shoreline data sets are available, generally back to the mid-1800s, shoreline data for the coast of Alaska are limited. The researchers used two historical data sources, from the 1940s and 2000s, such as maps and aerial photographs, as well as modern data like lidar, or “light detection and rang-



The low-lying airstrip at Barter Island, a lifeline to the City of Kaktovik, can flood annually during summer storms, cutting this remote community off from access and transport of vital supplies. This photo is from the USGS oblique imagery archive. <http://walrus.wr.usgs.gov/infobank/a/a106ak/html/a-1-06-ak.BarterIsland.images.html>

ing,” to measure shoreline change at more than 26,567 locations.

The report is the 8th Long-Term Coastal Change report produced as part of the USGS’s National Assessment of Coastal Change Hazards project. A comprehensive database of digital vector shorelines and rates of shoreline change for Alaska, from the U.S.-Canadian border to Icy Cape, is presented along with this report. Data for all eight long-term coastal change reports are also available on the USGS Coastal Change Hazards Portal. (See related story below) <http://www.usgs.gov/newsroom/article.asp?ID=4261#.VZr0ifVhBc>



VIDEO-Coastal Erosion Timelapse

Timelapse photography of Barter Island in Alaska during three summer months in 2014 shows the pack ice melting and subsequent impact to the beach and cliffs from storms.

<http://walrus.wr.usgs.gov/climate-change/hiLat.html>

Mapping Technologies Track Climate Change Impacts in Alaska

The USGS-National Geospatial Program, in partnership with the State of Alaska, is leading efforts to fly the Alaskan Arctic with new sensors, generating Interferometric Synthetic Aperture Radar (IfSAR) data that will complement Alaska and Arctic digital elevation models (DEMs), improving maps and elevation models of these regions to unprecedented levels of accuracy. By November 2016, USGS expects to acquire over 30,000 square miles of new ifSAR data over northeast Alaska, including critical coastal lands within the Alaska National Wildlife Refuge. More than 1,000 new digital U.S. Topo quad maps will be produced for Arctic Alaska, providing highly detailed maps for many coastal communities. Some of the north Alaska coastal lidar data can already be downloaded from the USGS Earth Explorer website. <http://earthexplorer.usgs.gov/>

Funding is provided by a variety of Interior programs including the Bureau of Land Management, USFWS Arctic Landscape Conservation Cooperative, and USGS’ Alaska Science Center, National Geospatial Program, and Coastal and Marine Geology Program.

NPS Assets at Risk from Sea-Level Rise

By Cheryl Fossani, DOI

More than \$40 billion of National Park Service assets, including infrastructure and historic and cultural resources, are at high risk of damage from sea-level rise caused by climate change according to a report released in June.

The report, “Adapting to Climate Change in Coastal Parks: Estimating the Exposure of Park Assets to 1 m of Sea-Level Rise,” is the first in a series of risk assessments, being conducted by scientists from NPS and Western Carolina University to present a broad overview of the level of exposure NPS faces with rising sea levels.

“Climate change is visible at national parks across the country, but this report underscores

the economic importance of cutting carbon pollution and making public lands more resilient to its dangerous impacts,” said Secretary Jewell.

Scientists considered the impacts on 40 of the 118 National Parks that are vulnerable to sea-level rise, including urban areas such as Gateway National Recreation Area in New York City, Golden Gate National Recreation Area in San Francisco, and Cape Hatteras National Seashore in North Carolina.

Data sources included USGS’ Coastal Vulnerability Project Data, which also provided the basis for selecting the 40 parks used in the first phase of this study.

The report categorized park assets such as infrastructure, historic sites, museum collections, and other cultural resources, as high- or limited-exposure based on risk



In 1999, NPS moved the Cape Hatteras Light Station and seven historic structures 2,900 feet from their 1870 location due to coastal erosion and encroaching sea level. Photo credit: NPS

of damage from one meter of sea level rise. More than 39 percent of assets in this subset of parks, valued at more than \$40 billion, are in the high-exposure category.

“Many coastal parks already deal with threats from sea-level rise and from storms that damage roads, bridges, docks, water systems and parking lots,” said NPS Director Jarvis. “This infrastructure is essential to day-to-day park operations, but the historical and cultural resources such as lighthouses, fortifications and archaeological sites that visitors come to see are also at risk of damage or loss.”

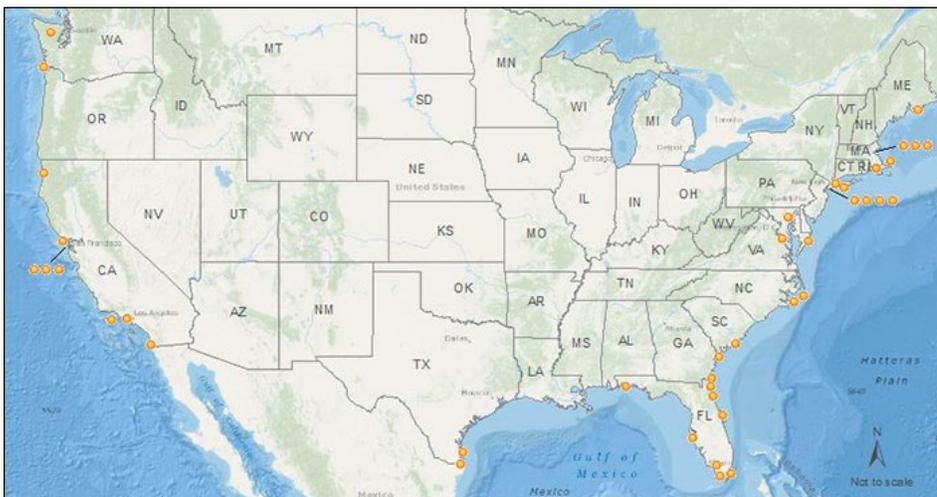
At Cape Hatteras National Seashore, for example, current replacement value of rebuilding lighthouses, visitor center exhibits, historic structures and other areas is almost \$1.2 billion, not including billions in revenue associated with loss of lands and tourist income.



Storm surge damaged docks at NPS’ Statue of Liberty National Monument. Photo credit: Tami Heilemann, DOI

Find the report: **“Adapting To Climate Change in Coastal Parks: Estimating the Exposure of Park Assets to 1 m of Sea-Level Rise”** Natural Resource Technical Report NPS/NRSS/GRD/NRR—2015/916 <http://go.nps.gov/coastalassets>

Watch a video on shoreline dynamics and barrier islands:
<http://www.nps.gov/fis/learn/nature/shoreline-dynamics.htm>



Map of locations (yellow dots) of the 40 national coastal parks included in the first phase of the climate-change risk assessment. While projections of sea-level rise vary by site and time, scientists expect a one-meter rise to occur in the next 100-150 years. Low-lying barrier islands constitute the majority of the high exposure category. These are popular natural beach retreats: Assateague (MD/VA), Cape Cod (MA), Fire Island (NY), Cape Hatteras (NC), Cape Lookout (NC), Canaveral (FL), Cumberland Island (GA), Gulf Islands (FL/MS), Point Reyes (CA), and Padre Island (TX). Image credit: NPS

Guide to Paddling Trails

Exploring a park or refuge by canoe or kayak combines adventure with physical activity and an intimacy with nature that's hard to beat.

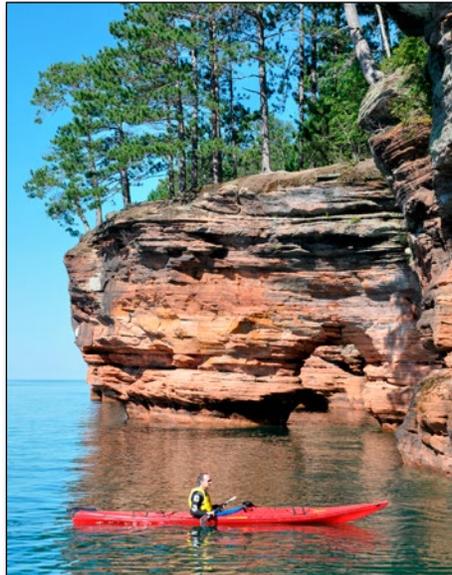
The USFWS National Wildlife Refuge System boasts some 1,000 miles of marked water trails. Whether you navigate on your own or take a guided trip, bring your own boat or rent one, many refuges make wonderful paddling destinations. Besides providing a close-up glimpse of shorebirds, mammals and other wildlife, refuges offer serenity, mapped water trails, and, sometimes, the option of multi-day camping excursions.

“When you're in a canoe, you're not as intimidating to wildlife,” said Nancy Brown, a public outreach specialist at the South Texas Refuge Complex, where guided canoe and kayak outings on the Rio Grande and the Laguna Madre are sellouts. “We've paddled right beneath hawks and past white-tailed deer. When you're in a canoe, animals don't appear to see you as a predator.”

A boat is a must for those who wish to explore the Upper Klamath National Wildlife Refuge in Oregon where a marked canoe trail is open all year-round, as well as at the Okefenokee National Wildlife Refuge, which crosses southern Georgia and northern Florida. “The vast majority of the refuge you can see only by water,” said Blaine Eckberg, park ranger at Okefenokee Refuge. “Paddling lets you enter one of the largest wilderness areas east of the Mississippi River, full of egrets, cranes and of course alligators. Mild temperatures and the lack of biting insects make



Canoeing is a great way to explore the Okefenokee National Wildlife Refuge, a vast watery wilderness that crosses between northeast Florida and Southeast Georgia. Photo credit: USFWS



Kayaking at the Apostle Islands National Lakeshore, WI. Photo credit: NPS

spring the most popular paddling season.”

More than 42 million people visit refuges each year, generating almost \$1.7 billion in sales for regional economies. In addition to wildlife observation, refuges provide rich opportunities for wildlife photography, hunting, fishing, environmental education and nature interpretation.

Find a trail to explore:
<http://www.fws.gov/refuges/observation/WaterTrails.html>

Forecasting Coastal Change Leaps Forward

By Ann Tihansky and Hilary Stockdon, USGS

USGS scientists have taken coastal change forecasting a leap ahead. Emergency managers and residents now have a new resource to help them better understand what to expect – a detailed forecast of how the storm may change the coast.

Is the sand below houses likely to erode? Are evacuation routes potentially going to be covered with sand? What's the probability that water may inundate a community?

For the past several decades, the USGS has been studying the coast and refining its ability to predict how beaches respond to extreme storms. Since 2011, the agency began using continually evolving models to begin forecasting the probability of coastal change before a storm makes landfall.

This year for the first time, new USGS coastal-change forecasts, as well as information about dune elevations and modeled water levels, were made available to the public as Hurricane Joaquin approached the Atlantic seaboard. The forecasts, which integrate information produced by the USGS and National Oceanic and Atmospheric Administration and its National Hurricane Center, were updated daily and posted to the USGS Coastal Change Hazards Portal. They provide a wealth of information for coastal residents, emergency managers, and community leaders.

When the next storm approaches, watch for the 'Active Storm' tab on the portal's web page.

<http://marine.usgs.gov/coastalchangehazardsportal/>

Proposed Deepwater Horizon Oil Spill Settlement Accompanied by Comprehensive Restoration Plan for Gulf of Mexico, Seeks Public Comment

By Nanciann Regalado, USFWS

On October 5, 2015, U.S Attorney General Loretta Lynch, announced a “major step forward in our effort to deliver justice to the Gulf region.” Flanked by four cabinet-level leaders, Lynch explained, “We have secured an historic resolution of our pending claims against BP, totaling more than \$20 billion, and making it the largest settlement against any entity in American history.”

If ultimately approved by federal district court judge Carl J. Barbier, Lynch explained, this settlement agreement would bring an end to a long and arduous legal journey that brought the U.S. Department of Justice together with five Gulf States and four federal agencies to make BP, the party primarily responsible for the largest environmental disaster in U.S. history, pay penalties for Clean Water Act violations and damages for injuries to natural resources.

While expressing her appreciation for the momentous progress made by Justice Department lawyers and their many collaborators, Lynch also remarked that much work remains. The 350-page written agreement, known as the consent decree, is a proposed agreement; it will be finalized only after Justice takes and considers all public comments made during a 60-day public comment period that ended Dec. 4, 2015.

\$5.5 billion provided for RESTORE Act projects

The \$20 billion total agreed to by BP includes a \$5.5 billion penalty under the Clean Water Act. In accordance with the RESTORE Act of 2012, 80 percent of these funds will go to environmental restoration, economic recovery projects, and tourism and seafood promotion in FL, AL, MS, LA and TX.



Mock graveyard at Grand Isle, LA protests Deepwater oil spill in 2010. Photo credit: Tom MacKenzie, USFWS

“The largest settlement in U.S. history is the punishment BP deserved; the oil spill left a uniquely American way of life hanging by a thread”

U.S. Attorney General
Loretta Lynch

A RESTORE Council composed of representatives of the five Gulf states and six federal entities - the U.S. Departments of the Interior, Commerce, Agriculture, and Homeland Security as well as the Army and the U.S. Environmental Protection Agency - has been hard at work since 2012 identifying potential restoration projects and developing new regulations related to fund allocation with the goal of making the Gulf coast environment and economy more sustainable and more resilient.

\$8.8 billion provided in natural resource damages

The agreement also stipulates that BP must pay \$8.1 billion in natural resource damages to compensate for injuries to the Gulf of Mexico ecosystem caused by the spill and spill-response activities. This sum includes \$1 billion already made available by BP to jump start “early restoration,” that is, to fund restoration activities prior to approval of a settlement or resolution

of litigation. BP has also agreed to pay up to \$700 million for injuries not now recognized but possibly identified in the future.

The guidance for using the damages compensation, which will be paid over 15 years, is described in a proposed restoration plan published by the Deepwater Horizon Natural Resource Damage Assessment Trustees shortly after Justice filed the consent decree. The 1,400 page Draft Programmatic Damage Assessment Restoration Plan and Draft Programmatic Environmental Impact Statement were written as an ecosystem-scale comprehensive restoration plan because the Trustees found that oil spill and response injuries occurred across a vast geographic area and affected a wide array of natural resources, habitat types, and species. The proposed plan identifies restoration goals and restoration approaches – identification of individual restoration projects will be accomplished by future working groups that will focus on restoration needs in specific geographic areas.

Consent decree: www.justice.gov/enrd/deepwater-horizon

Restoration Plan: www.gulfspillrestoration.noaa.gov

Multimedia: <http://www.fws.gov/home/dhoilspill/multimedia.html>

Interior Announces Nearly \$1M for Coral Reef Initiatives

In August, Interior Assistant Secretary for Insular Areas Esther Kia’aina announced \$926,328 in grant assistance for fiscal year 2015 under the Office of Insular Affairs’ Coral Reef Initiative Program. These funds will support a variety of projects and initiatives designed to improve the health and management of coral reefs in American Samoa, Guam, the Commonwealth of the Northern Mari-

ana Islands, the U.S. Virgin Islands and the freely associated states of the Federated States of Micronesia, the Republic of Palau and the Republic of the Marshall Islands.

“These projects range from restoration of threatened coral species in the Caribbean to protecting Micronesian mangrove forests, and curating one of the largest collections of Pacific coral specimens,” said Assistant Secretary Kia’aina. “I trust they will help build capacity, promote healthy coastal ecosystems, and help inform management of coral reefs in the jurisdictions.”

The 2015 projects to be funded:

Guam Museum Foundation, Inc. (Guam) - \$73,150 to support a graduate-level internship program to curate the Richard Randall Coral Collection. This rare collection, consisting of more than 30,000 specimens of corals from around the Pacific, will be digitized into a database for future scientific use and study. Richard Randall, a retired Professor Emeritus of Marine Biology from the University of Guam, has been studying corals for 50 years and

is recognized as the coral expert for the tropical Pacific. This unique collection is currently housed at the Guam Museum Foundation.

Guam Bureau of Statistics and Planning (Guam) - \$131,800 to promote conservation awareness through education and outreach on the importance of Guam’s reefs to the island’s culture; to establish a Coral Reef Resilience Coordinator; to conduct a hydrological study of the Toguan Watershed to develop strategies for its management; and to support participation in the U.S. Coral Reef Task Force meetings.

The Nature Conservancy (USVI) - \$50,000 for coral reef restoration within the St. Croix East End Marine Park by transplanting elkhorn and staghorn coral colonies, grown in The Nature Conservancy’s coral nursery, to sites characterized as high-value for restoration and recovery of these two threatened species of Caribbean coral.

USVI Department of Planning and Natural Resources - \$131,088 to develop a strategic plan to improve the enforcement capacity and effectiveness of the Division of Environmental Enforcement; and to evaluate the connectivity of coral reef species between managed and unmanaged



Aerial view of coral reefs on the island of Kwadjalien. Photo credit: Curt Storlazzi

See Coral Initiatives page 10

Community-based Management: Protect coral reefs, sustain local fisheries, and support native traditions

Hawai’i’s Governor David Ige signed into law, the first ever Community-Based Subsistence Fishing Area (CBSFA) for Ha’ena, Kaua’i. The community of Ha’ena on the North Shore of Kaua’i, Hawai’i worked with the U.S. Fish and Wildlife Service’s Coastal Program, Hawai’i Department of Land and Natural Resources, and others to develop and implement a management plan for the 3,583-acre subsistence fishing area.

A result of decades of work, overwhelming support from the local community and strong recognition that government cannot do it alone, community-based management and buy-in is critical to sustaining natural resources now and for future generations.

<http://governor.hawaii.gov/newsroom/dlnr-news-release-hawaii-first-community-fishing-area-signed-into-law-by-governor-ige/>



A school of manini, or convict tang (*Acanthurus triostegus*) eat algae on a Pacific coral reef. They are common to all nearshore habitats in tropical IndoPacific waters. Image credit: Kydd Pollock

Coral Initiatives continued from page 9

areas to strengthen local management of the 43 Marine Protected Areas in the U.S. Virgin Islands and Puerto Rico.

Palau International Coral Reef Center (Republic of Palau) - \$110,000 to characterize and manage the recovery of Palauan coral reefs following recent catastrophic damage from super-typhoons Bopha and Haiyan.

Micronesia Conservation Trust (Federated States of Micronesia) - \$150,000 to work with local governments, non-governmental organizations, and communities to conduct a vulnerability assessment on Pohnpei's 5,500 hectares of mangrove forest to identify threats and specific adaptation actions; assess the feasibility of funding habitat conservation by marketing carbon credits; and share project results to catalyze similar projects throughout Micronesia and help achieve the goals of the Micronesia Challenge.

College of the Marshall Islands (Republic of the Marshall Islands) - \$121,572 to establish a national, publicly-accessible, spatial analytics facility on the campus of the College of the Marshall Islands (CMI); to build capacity in participatory Geographic Information System (GIS) management by training CMI and government staff on building a national geospatial clearinghouse; to compile and augment the conservation database; and to conduct a short-course on GIS for use in sustainable coastal management.

American Samoa Department of Commerce (American Samoa) - \$138,718 for a pilot project at Utulei Beach, a popular spot for swimming and snorkeling on Tutuila Island, to identify, and ultimately eliminate, outflows of litter into the Fagaloa Tourism Priority Zone. This project complements other initiatives such as the Utelei Beach Recovery project and redevelopment of the old Rainmaker Hotel property.

Commonwealth of the Northern Mariana Islands (CNMI) - \$20,000 to support the Garapan Field Surveillance Project that seeks to reduce littering and illegal dumping in the Garapan area by using volunteers to assist with reporting and enforcement.

Hold Onto Balloons!

Did you ever wonder where your balloons go when they are released? Balloons seem great at birthdays, weddings, graduations and more, but once they get loose, they pose a threat to many animals.

These images are hard to look at, but they make the message clearer than any words:

Balloons Harm Wildlife

Birds, turtles, and other animals commonly mistake balloons for food, which can harm or even kill them. In addition, many animals can become entangled in balloon strings, which can strangle and hurt them.



A dead bird hangs by a balloon string that was tangled around the powerline and ultimately strangled the bird. Photo credit: Pamela Denmon, USFWS

At left: An egret attempts to eat a latex balloon. Photo credit: BalloonsBlow.org

Creative alternatives to

balloons: <http://balloonsblow.org/environmentally-friendly-alternatives/>

Learn more:

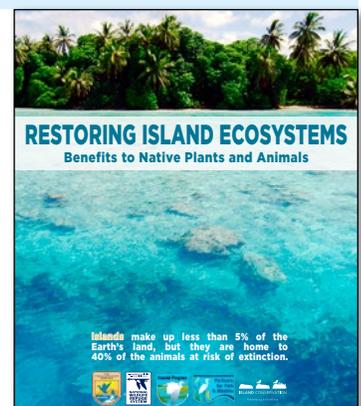
<http://www.fws.gov/news/blog/index.cfm/2015/8/5/Balloons-and-Wildlife-Please-Dont-Release-Your-Balloons>

Restoring Island Ecosystems

Because islands are isolated ecosystems they are often home to unique species. However, they are especially vulnerable to invasive species. Restoring island ecosystems is an unmatched opportunity to save unique and imperiled plants and animals. There have been over 1,000 successful invasive species removal projects on islands worldwide.

The USFWS along with Island Conservation adopted an Island Restoration Memorandum of Understanding (MOU) to promote invasive species removal for the benefit of native plants and animals on islands. Other agencies and organizations are encouraged to become members of the MOU. By working together, we can restore island ecosystems and prevent the extinctions of native island species.

Island Conservation: www.islandconservation.org/
www.facebook.com/preventingextinctions



Islands make up less than 5% of the Earth's land, but they are home to 40% of the animals at risk of extinction. This brochure highlights successful island restoration projects.

<http://www.fws.gov/coastal/pdfs/FinalIslandRestorationBrochure.pdf>

The Value of Coastal Recreation

By Cheryl Fossani and Sarah Cline, DOI

The Department of the Interior’s mission, “*Protecting America’s Great Outdoors*

and Powering our Future,” affects the lives of all Americans through many aspects. Defining the value of natural resources and tying that value back into the economic impact that these resources have on the nation, can be tricky. While DOI traditionally measured progress in terms of environmental benefits, many of our activities, such as providing recreational opportunities or leasing mineral rights, have been shown to be very valuable assets to our nation and have vital connections to the economy because they enable industry to create wealth and jobs.

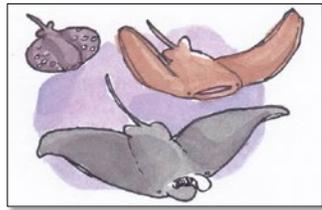


Illustration credit: Cole Goco

The Economic Value of Coastal Lands

In 2014, more than 103 million people visited 87 coastal parks (including National Lakeshores, Seashores, and Parks) managed by the NPS, 180 National Wildlife Refuges, managed by the USFWS, and additional coastal lands managed by the Bureau of Land Management.

Together these coastal conservation lands supported more than \$7.7 billion of total output, 83,000 jobs, and \$4.6 billion of value added in coastal states by spending money on items such as lodging, restaurants, supplies, groceries, and recreational equipment.

Interior’s 2014 Economic Report:

<https://my.usgs.gov/doidv/>

In June, DOI released its annual economic report showing how Interior’s activities contributed billions of dollars into the National and local economies during fiscal year 2014. This report includes several measures of Interior’s economic contributions as measured for the fiscal year: **output** (spending that cycles money through the economy), **employment** (jobs supported by this spending), and **value added** (output minus costs incurred).

Coastal regions are both beneficiaries and significant supporters of economic activity. Coastal parks, refuges,

Protecting and Improving Coastal Lands

The USFWS Coastal Program released its annual accomplishments report for 2014 demonstrating that is one of the USFWS’s most effective tools for restoring and protecting fish and wildlife habitat on public and privately-owned lands.

Coastal Program staff use science-based conservation designs to address the habitat conservation priorities of the USFWS and partners and to provide effective stewardship of the nation’s coastal and estuarine natural resources.

“The annual report showcases examples of these accomplishments working with our conservation partners, including other federal, tribal, state and local agencies, nonprofit organizations, universities, corporations and private landowners,” said Jim Kurth, Deputy Director of the USFWS.

In 2014, by working with nearly 600 partners, the Coastal Program protected or improved more than:

- **22,070 acres of wetlands**
- **12,640 acres of uplands, and**
- **45 miles of stream habitats with 260 projects benefiting threatened and endangered species.**

USFWS staff are located in 24 priority coastal areas, including the Atlantic, Pacific, Gulf of Mexico, Great Lakes, and Caribbean. These locally-based staff possess an intimate knowledge of the community, its natural resources, environmental challenges, potential partners, and political and economic issues. This knowledge enables USFWS to develop long-term, diverse partnerships that leverage technical and financial resources to strategically conserve habitat at a landscape-scale.

“Through the Coastal Program, the Service has restored approximately 517,670 acres of wetland and upland habitat, more than 2,200 miles of stream habitat, and helped permanently protect over 2,079,655 acres. We will continue to build a strong legacy of wildlife stewardship through strategic habitat conservation and effective partnerships,” said Kurth.

Report on-line: issuu.com/nationalwildliferefugesystem/docs/cp_2014_annual_accomplishment_repor

Follow USFWS’s Coastal Program on Facebook:

<https://www.facebook.com/CoastalProgram>

Learn more: <http://www.fws.gov/coastal/>

Economics continued from page 11

and other conserved lands are sustainable economic assets that contribute to the economy by providing opportunities for recreational activities such as fishing, boating, hiking and camping, bird watching and other wildlife viewing.

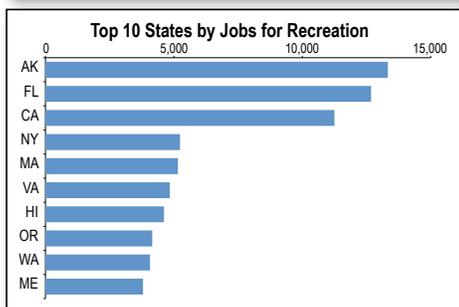
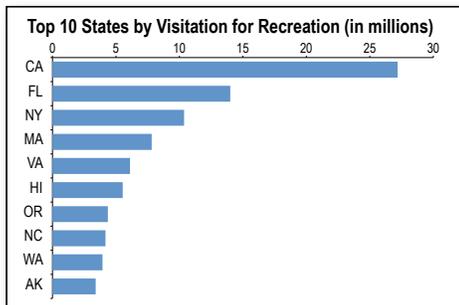
“Find Your Park” and “Find Your Refuge” today!

Take advantage of all the great coastal recreational opportunities that our nation has to offer!

Find your ocean and coastal National Park: <http://www.nature.nps.gov/water/oceancoastal/oceancoastalmap.cfm>.

Find your coastal National Wildlife Refuge: <http://www.fws.gov/refuges/whm/pdfs/OceanCoastalNationalWildlifeRefuges.pdf>

See related story on pg. 7



In 2014, DOI’s coastal lands hosted over 103 million recreational visitors and these visitors supported over 83,000 jobs. The upper chart shows the top 10 states for visitation. Highest numbers of visitors occurred in California, Florida, and New York. The lower chart shows the top 10 states where 2014 coastal recreation supported jobs. Image credits: DOI

Study Looks at Acoustic Water Guns as Deterrent for Asian Carp Migrating into Great Lakes

By Debra Becker and Rachel Reagan, USGS

The Bighead Carp and Silver Carp are two Asian carp species that pose a threat to the Great Lakes ecosystem if they move from the Mississippi River basin into the Great Lakes. Introduced into the Mississippi River basin during the 1970s, they spread across the basin. If these carp get into the Great Lakes they may deplete resources that are normally consumed by native fish species and could adversely affect the sport and commercial fisheries industries in the Great Lakes.

The current problem is how to keep the Asian carp from entering the Great Lakes. The Chicago Sanitary and Ship Canal (CSSC) was completed in 1990 and is the shipping link between the Great Lakes Waterway and the Mississippi River system. To keep Asian carp from entering the Great Lakes, an electric dispersal barrier (EDB) was installed within the CSSC and went into operation in 2002. This barrier was followed by two additional barriers in 2009. However, research has shown that fish may be getting through the barrier and that additional deterrents are necessary.

A 2015 USGS study evaluated the efficiency of a water gun array which produces an acoustic pulse in the surrounding water. Researchers studied the behavior of acoustically-tagged Bighead Carp and Silver Carp exposed to the water gun array in a closed shallow pond. The research showed that water



Speeding boats seems to especially frighten invasive Silver carp with dozens of the fish becoming airborne at once, sometimes reaching heights of ten feet in the air. Photo credit: USGS

guns could be used as a barrier, but because they were not 100 percent effective at preventing carp from moving past them, they would need to be used in combination with other types of barriers. However, the water guns tended to school the carp together, so this method could be beneficial for herding, which could help with removing fish and moving them to another location. Researchers concluded that more testing and evaluation is needed before fully understanding how best to use the water gun as a means to control Asian carp.

Find this and other stories in the Western Fisheries Science Newsletter: <http://wfrsc.usgs.gov/newsletter/>

Video: Mullet Run

Watch a densely packed school of white mullet at Biscayne National Park. <https://www.facebook.com/BiscayneNPS/videos/977476708941235/>

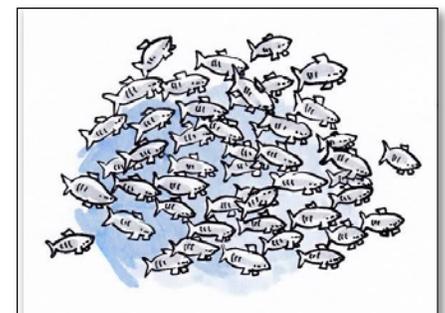


Illustration credit: Cole Goco

Reaching Youth through Ocean and Coastal Topics

Across the Department, Interior bureaus engage with youth to raise awareness about ocean and coastal topics. Here are a few examples.

Science Camp, Our Ocean

From October 3-5, in Valparaiso, Chile, Interior's International Technical Assistance Program (DOI-ITAP) organized and ran "Science Camp, Our Ocean," to promote youth involvement in marine conservation and stewardship. The program selected 56 students between 10-15 years old and 13 science teachers, based on merit and interest in ecological challenges facing the ocean. Accompanied by 27 university students with higher education careers in marine science from Santiago and Valparaiso, the group participated in activities that included museum visits, hands-on experiments, discussions with marine science experts, beach clean-ups, and a visit aboard the Chilean Navy's *R/V Cabo de Hornos*.

Funding for this camp was provided by U.S. Dept. of State's Bureau of Oceans and International Environmental and Scientific Affairs, DOI, and additional support from 30 international and national partners from non-governmental organizations, scientific centers, military, academia, and government.

DOI-ITAP is working to replicate this marine science camp in Chile and Peru in 2016. Learn more:

<http://chileesmar.cl/camp/>

At right: BOEM biologists Nicole Hughes and Mark Mueller meet with student Spencer Johns (at right) about marine science careers and education. Photo credit: BOEM



US Ambassador Michael Hammer, Chilean Foreign Minister Heraldo Muñoz, Chilean Naval Rear Admiral Arturo Undarraga, other officials, invited guests and Science Camp, Our Ocean Chilean student participants in front of the Chilean Navy's *R/V Cabo de Hornos*, docked in Valparaiso, Chile. Photo credit: Cristóbal Barros, DOI-ITAP In-Country Coordinator for Chile

Ocean Science Career Plans

Texas high school student Spencer Johns was intrigued by marine biology-focused articles recently published in BOEM's *Ocean Science* and wanted to learn more about this field. So he traveled to BOEM's Gulf of Mexico OCS Region office in New Orleans, Louisiana where he met with biologists to better understand how specific coursework can prepare a college graduate for a wide variety of careers in marine science. BOEM biologists shared their own experiences and perspectives and offered recommendations for networking and volunteer opportunities.

SCUBAnauts Visit USFWS National Wildlife Refuge Staff

While in Washington, D.C. to participate in Capitol Hill Ocean Week, the Florida Chapter of SCUBAnauts International visited with

staff from the National Wildlife Refuge System at USFWS Headquarters on June 8. After providing an overview of their program, the 'nauts' gave presentations about their SCUBA experiences and coastal research projects along the west coast of Florida. The team was excited to be learning about marine science and were interested in finding ways to support the National Wildlife Refuges. The discussion explored the potential for how SCUBAnaut data and research might be useful in managing marine habitats.



The Florida Chapter of SCUBAnauts International visited with the USFWS Headquarters in VA. From left to right: Diana Philips, Taylor Rejsek, Beth Vrable, Zack Haeberle, Vivian Foisy, Tyler Williams, Cole Kolasa, Grace Carter, and Michael Murphy, Chris Darnell (USFWS) and SCUBAnauts Science/Education Outreach Coordinator Keith Kolasa. Photo credit: Chris Darnell, USFWS



Preparing for Threats to Pacific Coasts and Islands

Many Atolls May be Uninhabitable Within Decades

A new study shows that the combined effect of storm-induced wave-driven flooding and sea-level rise on island atolls may be more severe and happen sooner than previous estimates predicted by passive “bathtub” modeling.

USGS scientists and their colleagues at the Deltares Institute in the Netherlands, and University of Hawai‘i, Hilo report that waves will synergistically interact with sea-level rise, causing twice as much land forecast to be flooded for a given future sea level than currently predicted by models that do not take wave-driven water levels into account.

More than half a million people live on atolls throughout the Pacific and Indian Oceans, and although the modeling was based on the Northwestern Hawaiian Islands, the results from the study apply to almost all atolls. The study explored the combined effect of storm-induced wave-driven flooding and sea-level rise on atoll islands within the Northwestern Hawaiian Islands, including Laysan and Midway Islands, which are home to many threatened and endangered endemic species.

“Many atoll islands will be flooded annually, contaminating the limited freshwater resources with saltwater, and likely forcing inhabitants to abandon their islands in decades, not centuries, as previously thought,” said USGS scientist Curt Storlazzi, lead author of the study. <http://www.usgs.gov/newsroom/article.asp?ID=4346#.Vh2NBBFViko>



An example of severe coastal bluff erosion that occurred during the 2009-2010 El Niño, along the southern end of Ocean Beach, San Francisco, CA. On average, these conditions eroded the shoreline 55 meters that winter. Photo credit: Jeff Hansen, USGS

Understanding the effects of severe storms fueled by El Niño or La Niña helps coastal managers prepare communities for the expected erosion and flooding associated with this climate cycle.

Multi-agency study shows El Niño and La Niña will Exacerbate Coastal Hazards Across Entire Pacific

A new multi-agency study published in Nature Geoscience shows the projected upsurge of severe El Niño and La Niña events will cause an increase in storm events leading to extreme coastal flooding and erosion in populated regions across the Pacific Ocean.

“This study significantly advances the scientific knowledge of the impacts of El Niño and La Niña,” said Patrick Barnard, USGS coastal geologist and the lead author of the study.

Linking coastal erosion to natural climate patterns, such as El Niño/Southern Oscillation and the Southern Annular Mode, can be challenging.



A large wave at the south shore of Laysan Island, HI with endangered Laysan teal in the foreground. Photo credit: Michele Reynolds, USGS

Sea-level rise will result in larger waves and higher wave-driven water levels along atoll islands’ shorelines than at present.

“Shoreline behavior can be controlled by so many different factors, both locally and regionally, that it’s been difficult to isolate the signal until now. However, utilizing the many years of data we were able pull together in this study enabled us to definitively identify how the major climate drivers affect coastal hazards across the Pacific,” said Barnard. “This will greatly enhance our ability to predict the broader impacts of climate change at the coast.”

<http://www.usgs.gov/newsroom/article.asp?ID=4336#.VIS09r9jYfh>



Illustration credit: Cole Goco

Understanding Tsunami Threats and Associated Hazards in the Caribbean

USGS, U.S. Coast Guard, and Woods Hole Oceanographic Institution Collaborate for Science

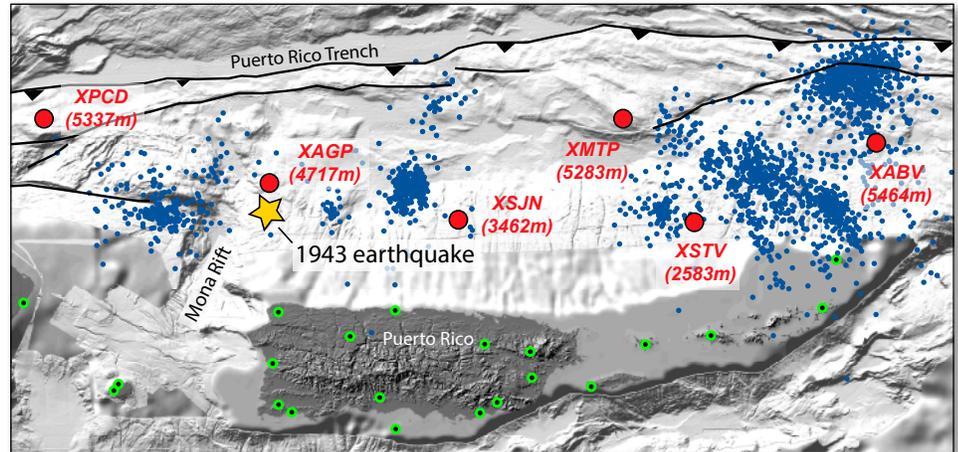
By Anthony Soto, USCG and Nathan Miller, USGS

The crew of the U.S. Coast Guard (USCG) Cutter *Oak*, scientists and engineers from the USGS, and the Woods Hole Oceanographic Institution (WHOI) collaborated this past summer on a mission to deploy six ocean-bottom seismograph instruments (OBS) on the seafloor in an area of the Caribbean Sea known as the Puerto Rico Trench.

The work is part of a USGS project to better assess the seismic and tsunami hazards in the tectonically active Caribbean region.

“Large tsunamis associated with earthquake activity have affected this area historically. Many geologic structures observed in submarine areas may pose additional hazards,” said USGS project lead Uri ten Brink. “Because four million U.S. citizens live along the coastlines of Puerto Rico and the Virgin Islands, the risk to life and economic infrastructure is high. This work is fundamental to determining the likely hazards and their causative mechanisms and will help the USGS provide the scientific information needed to improve building codes, zoning, and educating the public on how best to respond to these kinds of hazards.”

The instruments, designed by WHOI, were deployed approximately 100 miles north of Puerto Rico in water depths up to 3.5 miles. They will be recording data for approximately one year to supplement land-based seismograph instruments operated by the Global Seismograph Network, the Puerto Rico Seismic Network, and others.



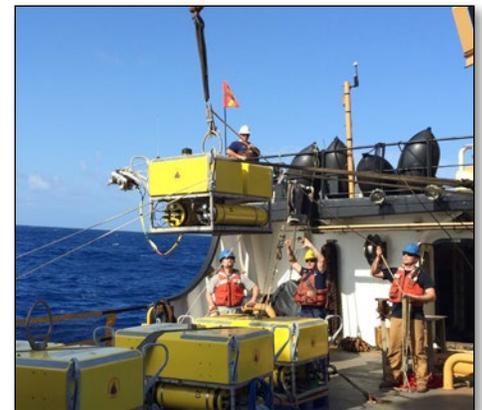
A map of the ocean floor north of Puerto Rico, displays the locations for newly deployed ocean bottom instruments (red), land-based seismograph instruments (green), and previously recorded earthquakes (blue).

In the 20th century alone there have been several very large earthquakes north of Puerto Rico with surface-wave magnitudes, Ms: 7.3 in 1918; 7.8 in 1943 (shown with yellow star); 8.0 in 1946 and four major aftershocks of Ms 7.6, 7.0, 7.3, 7.1 between 1946 and 1953. Map image credit: USGS

Historically, large tsunamis have hit Puerto Rico and Hispaniola, reportedly killing 40 people in 1918 and 1,800 people in 1946. Massive slope failure scars, as much as 50 km across, observed along the slope north of Puerto Rico probably generated tsunamis along the north shore of the island. Other margins of the island are also associated with massive tectonic features and may pose additional hazards.

Learn more: <http://woodshole.er.usgs.gov/project-pages/caribbean/>

“The OBS instruments are key to improving our ability to image the fault systems along the major plate boundary,” said Dr. Nathan Miller, USGS chief scientist on the research cruise. “The temporary instruments expand the seismic network near Puerto Rico significantly and allow us to record seismic waves along paths we cannot sample using land instruments. This improves our ability to record and locate earthquakes associated with tectonic plate motion around the Puerto Rico Trench.”



Crewmembers aboard the Coast Guard Cutter *Oak*, along with staff of the USGS and the Woods Hole Oceanographic Institution, prepare to deploy an ocean-bottom seismograph in the Atlantic Ocean north of Puerto Rico. Photo credit: U.S. Coast Guard

The Cutter *Oak* was selected for this mission primarily due to its open deck space and its crane, which can lift the 1,200-pound ocean bottom sensors.

“The sensor deployment went very well, and both teams integrated seamlessly,” said USCG Lt. Cmdr. Whitney Houck, commanding officer of the Cutter *Oak*.

Elegant Terns at the San Diego Bay National Wildlife Refuge

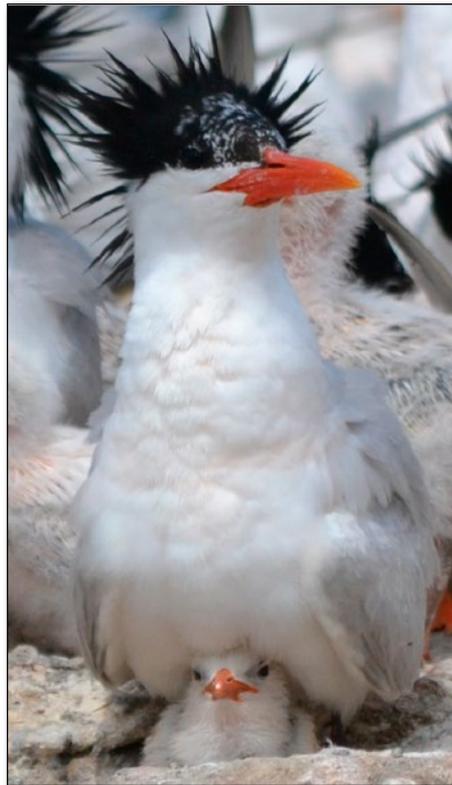
A glimpse back at the 2015 summer nesting season

By Kate Goodenough, Biologist collaborating with the USFWS San Diego Bay NWR

The summer seabird nesting season was an astounding sight to see at the South San Diego Bay Unit (also known as the Salt Works) of the San Diego Bay National Wildlife Refuge.

Although closed to public access to protect the nesting birds during this very sensitive and delicate time of year, biologist Kate Goodenough took these images as she conducted monitoring research.

Since 2003, peaks in breeding pair abundance have occurred several years at the Salt Works and are correlated with crashes in reproduction of the tern further south at the Isla Rasa nesting site in the Gulf of California. These crashes appear to result from warm oceanographic anomalies and overfishing of sardines in the Gulf causing mass northward movement of the terns into southern California. In 2010, 2014, and 2015, over 20,000 breeding pairs were documented nesting at the Saltworks, exceeding the typical colony size of 3,000-5,000 breeding pairs.



Elegant tern parents take turns brooding their chicks for two weeks. They also share parenting responsibilities with other parents through a behavior called 'creching'.



At left: This Elegant Tern chick is between 7 to 10 days old and will move into a creche soon.

Above: Two adults caring for an older chick which will soon learn to fly. The period between 20-35 days of a chick's life is especially important as they begin to grow their flight muscles and flight feathers. The refuge becomes busy with adults constantly bringing in fish for the chicks. The chicks, in turn, constantly beg for food as growth is a very metabolically demanding process.

At right: Competition for food can be fierce at the colony.

Photo credits: Kate Goodenough

Facts about Elegant Terns

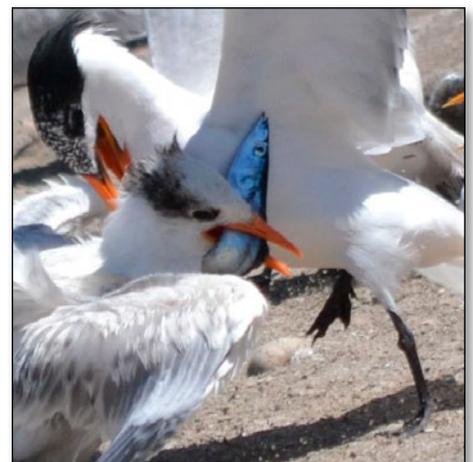
The **Elegant Tern** (*Thalasseus elegans*) is a seabird of the family Sternidae that has a very limited breeding range with greater than 90% of breeding occurring at a single island - Isla Raza in the Gulf of California, Baja Mexico. Smaller breeding groups occur at three managed locations in Southern California at the South Bay Unit- San Diego Bay NWR, the Bolsa Chica Ecological Reserve, and the Port of LA Pier 400.

In the winter, the terns migrate south to Guatemala, El Salvador, Nicaragua, Costa Rica, Panama, Colombia, Ecuador, Peru, and Chile.

Tern diet consists of a wide variety of surface occurring fishes, but the majority of prey diet (up to 75%) consists of northern anchovy, kelp pipefish, and Pacific sardines. Having a breeding colony near abundant food resources is critical for successful reproduction.

The majority of Elegant Tern chicks hatch within the same time frame and separate from their parents, forming "creches." The creches are supervised under the watchful eyes of a small number of "guardians" that keep a lookout while other parents have more time to forage.

The Elegant Tern is listed within the USFWS Seabird Conservation Plan and is considered Near Threatened by the International Union for Conservation of Nature (IUCN) due to the restricted breeding range, large population fluctuations, likely negative affects by climate change, human intrusions, and overfishing.



Interior Plays Major Role in U.S. Arctic Council Chairmanship Agenda

By Sarah Abdelrahim and Randal Bowman, DOI

The United States assumed the two-year rotating chairmanship of the Arctic Council on April 24, 2015. Given the increased strategic importance of the region, and the President's recent trip to Alaska, this two-year period will bring much greater attention to our Arctic policy objectives and on-going Arctic activities.

The Arctic Council was established in 1996 as a high level intergovernmental forum for promoting cooperation, coordination and interaction among the Arctic States, particularly on issues of sustainable development and environmental protection in the Arctic. The Arctic Council consists of the eight Arctic states: Canada, Denmark (including Greenland and the Faroe Islands), Finland, Iceland, Norway, Russia, Sweden and the United States. Six international organizations representing Arctic indigenous peoples have permanent participant status. A number of non-Arctic nations and organizations have observer status.

The Arctic Council meets at the Ministerial/Secretary level every two years. The Council also has a small Secretariat based in Tromso, Norway. Most work of the Council is done through permanent Working Groups and various short-term Task Forces.



This special issue of BOEM Ocean Science is dedicated to BOEM's role, and that of our federal, state, and Alaska Native partners, as the United States assumes a two-year term to chair the Arctic Council, an intergovernmental forum that addresses issues faced by Arctic Nations and the indigenous peoples who live there. http://www.boem.gov/Ocean_Science_Jan_Feb_Mar_2015/

Improving economic and living conditions in Arctic communities

DOI is active in promoting the development of renewable energy technology, funding work by the National Renewable Energy Laboratory for the Rural Community Renewable Energy program (RCRE), which is developing a universally applicable control system to allow seamless switching between diesel, solar, wind and battery power in rural village microgrids. Absent such a control system, one must be custom-designed for each village at considerable expense, or the power must be turned off to make the switch. The RCRE system would make it much easier and less expensive to use renewable energy in remote areas to replace costly and polluting diesel fuel, and would be useable on islands as well as Arctic villages.

The United States Arctic Council Chairmanship is focused on three thematic areas:

- *Improving economic and living conditions in Arctic communities;*
- *Arctic Ocean safety, security and stewardship*
- *Addressing the impacts of climate change.*

Several Arctic Council working groups, with involvement from DOI bureaus such as USFWS and USGS, will address water security for Arctic residents through an Arctic freshwater assessment and development of a water resources vulnerability index.

Arctic Ocean safety, security and stewardship

The acceleration of maritime activity in the Arctic increases risk in an already harsh and challenging environment. U.S. Chairmanship priorities include building upon existing preparedness and response programs; enhancing the ability of Arctic states to execute their search and rescue responsibilities; and emphasizing safe, secure, and environmentally sound shipping as a matter of high priority. The Arctic Council's Emergency Prevention, Preparedness and Response (EPPR) working group will conduct an international oil spill exercise in 2016. The Bureau of Safety and Environmental Enforcement (BSEE) will make up a large part of the U.S. delegation for the exercise, and in advance of that, is leading an effort to develop a circumpolar pollution response equipment database. BSEE has also taken the lead in creation of a Council-related Arctic Oil Regula-

Arctic Council continued from page 17

tors' Forum, which held its initial meeting at DOI earlier this year.

Two working groups - PAME and CAFF- in which several DOI bureaus (BOEM, USFWS, BLM, and others) are involved, are leading a series of initiatives related to Marine Protected Areas (MPAs). These include assisting in the implementation of a common vision for international cooperation in MPA network development and management; providing technical information, including mapping areas of high species abundance at a scale appropriate for use in planning; and analyzing existing Arctic MPAs to identify priorities, including connectivity gaps and Arctic areas most resilient to climate change.

Addressing the impacts of climate change

Arctic Council activities to increase scientists', communities', policymakers' and the public's understanding of the impacts of climate change and enhance resilience to climate change stressors are also key priorities. DOI is coordinating a suite of activities during the U.S. chairmanship that will advance our scientific understanding of climate change impacts, develop tools and services to enhance the resilience of communities and ecosystems in the face of rapid Arctic change, and develop and encourage sound actions and policies across the Arctic that respond to these changes.

DOI is co-leading the development of the Arctic Resilience Report: <http://www.arctic-council.org/arr/> with Sweden. The Arctic Resilience Report (ARR) will provide key insights about the ability of

Arctic ecosystems and communities to absorb shocks and respond to changes, and will evaluate strategies for governments and communities to adapt to changes. The full ARR will be released in 2016 and will provide a knowledge foundation for Arctic Council members to better respond to changes in the Arctic. Also as part of the U.S. Chairmanship's resilience priority, DOI will lead the development of a pan-Arctic strategy to prevent, detect, and respond to invasive species in Arctic coastal, marine, freshwater, and terrestrial ecosystems. The interaction of climate change with other driving forces, such as the introduction of invasive species, can lead to significantly more rapid regime shifts. Preventing and managing the introduction of invasive species will make ecosystems (as well as the communities that depend on these ecosystems) more resilient to climate change.

The USGS is leading the development of a high-resolution Pan-Arctic Digital Elevation Model (DEM), which will improve topographic information in the Arctic. Several DEMs exist, but there is not a reliable high-resolution full DEM across the Arctic that is publicly available. USGS is leading the harmonization of existing national-level DEMs. A pan-Arctic DEM will enhance scientific analyses and could inform a range of decisions that deal with community planning, economic development, resource development, and land management. In addition, a pan-Arctic DEM will serve as a benchmark against which future landscape changes (due to, for instance, coastal erosion, extreme events, or climate change) can be measured. *(See related story p.3)*

Arctic Council Working Groups:

(with corresponding lead United States agencies and lead participating Interior bureaus):

- **Arctic Monitoring and Assessment Program (AMAP)** – U.S. Lead: Executive Office of the President/Global Change Research Program, DOI Lead Participant: USGS
<http://www.amap.no>
 - **Arctic Contaminants Action Program (ACAP)** – U.S. Lead: Environmental Protection Agency
<http://www.arctic-council.org/index.php/en/acap-home>
 - **Protection of the Arctic Marine Environment (PAME)** – U.S. Lead: Department of Commerce/NOAA, DOI Lead Participant: BOEM
<http://www.pame.is>
 - **Emergency Prevention Preparedness and Response (EPPR)** – U.S. Lead: Department of Energy/National Nuclear Security Administration, DOI Lead Participant: BSEE
<http://www.arctic-council.org/eppr/>
 - **Conservation of Arctic Flora and Fauna (CAFF)** – U.S. and DOI Lead Participant: USFWS
<http://www.caff.is>
 - **Sustainable Development Working Group (SDWG)** – U.S. Lead: Department of State, DOI Lead Participant: Office of the Secretary
<http://www.sdwg.org>
- Learn more:**
Arctic Council:
<http://www.arctic-council.org>
The U.S. Department of State:
<http://www.state.gov/e/oes/ocns/opa/arc/uschair/index.htm>

Seals on the Move

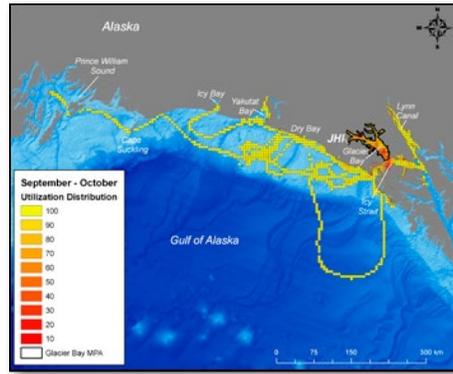
By Erin Kunisch and Jamie Womble, NPS

Harbor seal populations in Glacier Bay may be some of the most protected, as Glacier Bay is one of the largest marine protected areas (MPA) in the northern hemisphere.



Closeup of a harbor seal wearing a transmitter. Photo credit: John Jansen, NOAA National Marine Mammal Laboratory

The National Park Service, in collaboration with the National Marine Mammal Laboratory and Oregon State University, quantified the post-breeding season (September-April) movement patterns of harbor seals in relation to the MPA boundaries of Glacier Bay. Satellite-linked transmitters were attached to 37 juvenile and adult female harbor seals in September of 2007 and 2008 in Johns Hopkins Inlet. Harbor seal tracks were analyzed using state-space models and utilization distributions were created in GIS to quantify space use of seals relative to the marine protected areas of Glacier Bay. Harbor seals traveled extensively through-



This map shows the track of a single harbor seal—the longest recorded migration for this species. Image credit: Jamie Womble, NPS

out southeastern Alaska, the eastern Gulf of Alaska, and Prince William Sound, using an area of approximately 25,325 km². These movements included the longest migration yet recorded for a harbor seal (3,411 km) and extended use (up to 23 days) of pelagic areas by some seals. Although the collective distribution of harbor seals during the post-breeding season was expansive, there was a substantial degree of individual variability in the percentage of days that seals spent in the MPA. Nevertheless, the majority of the harbor seals (93%) returned to Glacier Bay the following breeding season (May-June).

Results demonstrate the importance of better understanding the threats that a highly mobile species may interact with outside the MPA boundaries of Glacier Bay. <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0055386>

This work is possible through collaboration between the National Park Service, the University of Fairbanks-Geophysical Institute, and the National Marine Mammal Laboratory. (NOAA MMPA Permit #358-1787-01)



A harbor sea hauled out on floating ice. Photo credit: Jamie Womble, NPS

Habitats on Ice:

The role of glacier ice for harbor seals

By Erin Kunisch and Jamie Womble, NPS

Tidewater glaciers calve icebergs into the marine environment, which then serve as pupping and molting habitat for some of the largest seasonal aggregations of harbor seals in Alaska.

Although tidewater glaciers are naturally dynamic, advancing and retreating in response to local climatic and fjord conditions, most of the ice sheets that feed tidewater glaciers in Alaska are thinning and, as a result, many of the tidewater glaciers are retreating. Climate change models predict rapid loss of glacial ice with unknown impacts to seals that rely on tidewater glacial habitat.

Scientists are currently working on a project that uses aerial digital imagery, remote sensing technology, and geospatial models to assess



Aerial view of harbor seals on ice. Photo credit: Jamie Womble, NPS

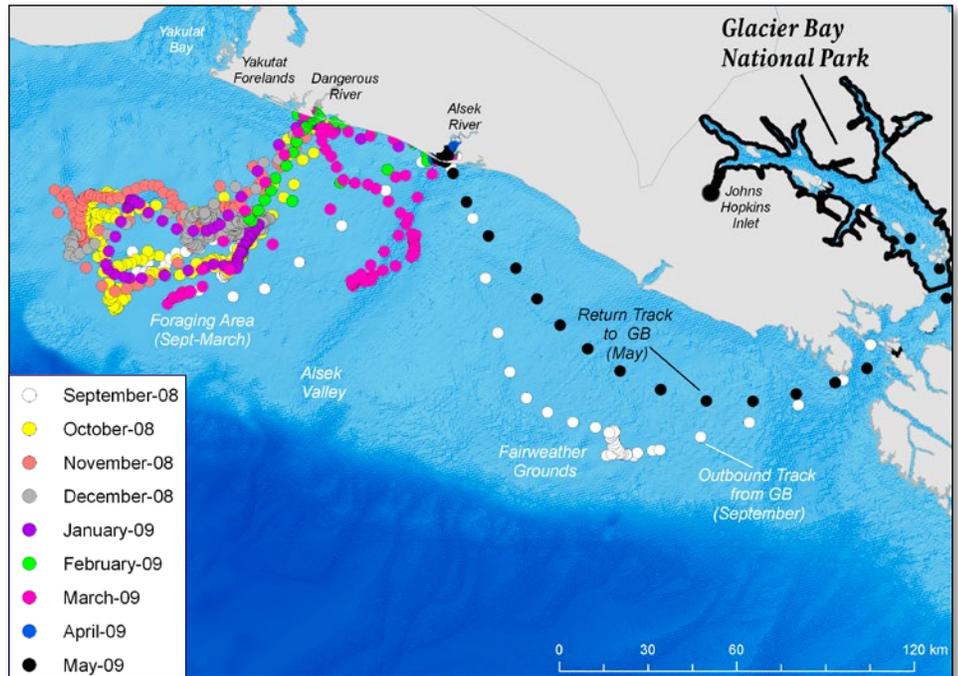
Seals continued from page 19

seasonal and annual changes in the availability and characteristics of glacial ice as habitat for seals in Johns Hopkins Inlet, a tidewater glacier fjord in Glacier Bay National Park. Systematic aerial photographic surveys are conducted of seals and ice during the pupping (June) and molting (August) seasons. Surveys are flown along a grid of 12 transects and high-resolution digital photos are taken directly under the plane using a vertically aimed camera. Seals are mapped in GIS and spatial statistical models are used to create an intensity surface from mapped seal densities. Remote sensing image analysis is used to quantify iceberg size, percentage ice cover, and percentage open water in the fjord.

Harbor seals exhibit high seasonal fidelity to tidewater glacial fjords during the pupping and molting seasons, thus understanding relationships between glacial ice dynamics and harbor seal distribution and abundance will be critical for understanding how future changes in tidewater glaciers may impact harbor seals.



Aerial view of harbor seals on ice. Photo credit: Jamie Womble, NPS



Calculated utilization distributions in the southeast Alaska coastal region of all the tagged seals in this study. Image credit: Jamie Womble, NPS

Learn more about these projects:

<http://www.nps.gov/glba/learn/nature/glacial-ice-and-seals-study.htm>

<http://www.nps.gov/glba/naturescience/seal.htm>

New USGS 5-year Arctic Science Strategy

<http://pubs.usgs.gov/fs/2015/3049/fs20153049.pdf>

The rapid changes facing the Arctic region resulting from climate change requires reliable scientific research and up-to-date information to help policy makers make informed resource management decisions. USGS established the science strategy to be responsive to national priorities and objectives for the region.



Arctic Boundary as defined by the Arctic Research and Policy Act (ARPA)

The USGS Arctic science portfolio and its response to climate-related changes focuses on landscape-scale ecosystem and natural resource issues and provides scientific underpinning for understanding the physical processes that shape the Arctic. In the strategy, the USGS lays out goals and actions to provide sound and relevant scientific information that supports the goals identified in the National Strategy for the Arctic Region to pursue responsible Arctic region stewardship, strengthen international cooperation and make decisions using the best available information.

USGS Alaska science in one place

A new USGS portal serves up information on more than 200 subjects currently being studied by USGS in the Nation's largest State. It is a searchable, web map-based tool designed to facilitate public and partner access to the ongoing science activities. Search by investigators, major initiatives, programs or text string. You can also select from a wide variety of basemaps to view this information--including satellite imagery, oceans or several types of topographic maps. <http://alaska.usgs.gov/portal/>

Tracking Kittlitz's murrelets population

A priority for conservation

By Chris Sergeant, Mike Bower, Erin Kunisch, NPS

Kittlitz's murrelets (*Brachyramphus brevirostris*), also referred to as KIMU, are small diving birds related to puffins and murres.

They are one of the rarest and least known seabirds in North America. In most of its range, the Kittlitz's Murrelet seems to nest in rugged mountains near glaciers or in previously glaciated areas, sometimes up to 45 miles inland. During summer, it usually feeds near tidewater glaciers, among icebergs, and outflows of glacial streams. The bird's association with such ancient ice flows has earned it the nickname, "Glacier Murrelet."

In 2013, the USFWS estimated the minimum global population at over 33,000 birds. Annual monitoring of KIMU abundance confirms that Glacier Bay supports a large proportion of the global KIMU population every summer.

The Southeast Alaska Network murrelet monitoring program is currently the only existing long-term KIMU monitoring program in the world. While KIMU are no longer a candidate species for listing on the Endangered Species Act, they remain a priority conservation concern for the Pacific Seabird Group, who recently advocated for continued long-term research and monitoring.

Because the KIMU may serve as an important indicator of terrestrial and marine ecosystem health within Glacier Bay, there are additional benefits to this monitoring. KIMU breed on bare, rocky ground which is often associated with areas where glaciers have



Left: Kittlitz's murrelet in flight. Image credit: Tim Melling. Right: Scientists monitor Kittlitz's murrelets in Glacier Bay National Park. Photo credit: NPS

recently retreated. According to the USFWS, approximately 66% of the global KIMU population is associated with glacially influenced landscapes, which are subject to climate change-induced stressors. Additional research is needed to better understand the connection between glacial habitat changes and KIMU population dynamics. Because KIMU are pelagic (open ocean) predators, they use many of the same resources as marine mammals, including humpback whales, making them good indicators of the health of the marine food web. Continuing to monitor KIMU, climate, and glacial extent will advance our understanding of important changes occurring in the

dynamic Glacier Bay ecosystem. <http://science.nature.nps.gov/im/units/sean/>

Kittlitz's murrelets-(KIMU)

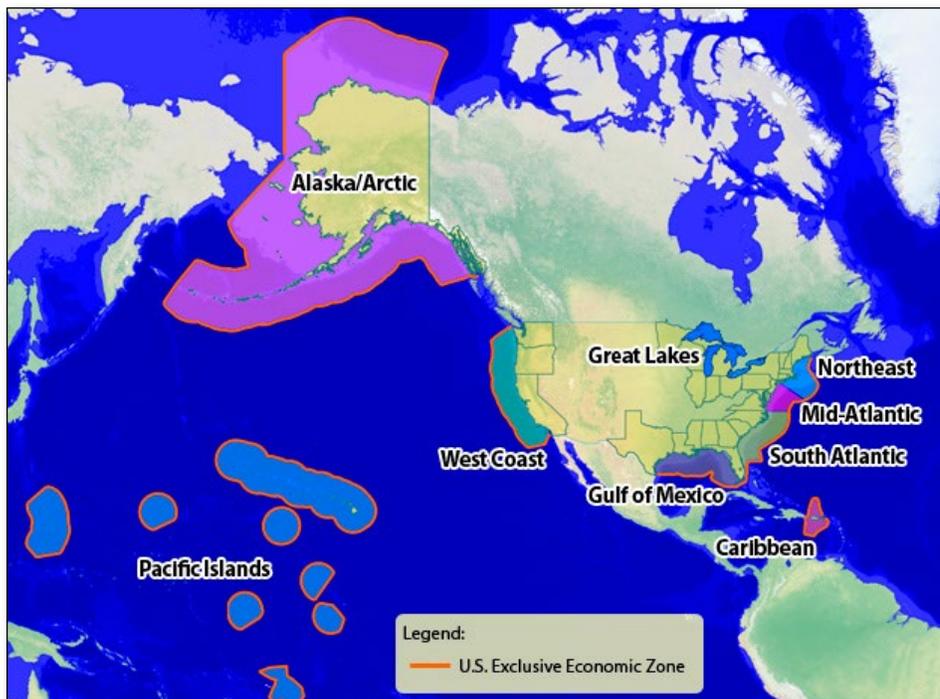
- From 2009 to 2014, summertime KIMU abundance estimates in Glacier Bay proper have ranged from 7,210 to 16,429.
- KIMU are wide-ranging each summer, but perennial Glacier Bay hotspots include Reid Inlet, Hugh Miller-Scidmore Complex, and the west side of Russell Island.
- Information on the distribution and abundance of KIMU in Glacier Bay informs research on the extent of interactions between visiting cruise ships and murrelets.

Reports and Data Access: http://science.nature.nps.gov/im/units/sean/FQ_main.aspx



All of the North American and most of the world population of Kittlitz's Murrelets breed, molt, and winter in Alaska. Photo credit: Tim Melling

Learn more: <http://www.fws.gov/alaska/mbsp/mbm/seabirds/pdf/kimu.pdf>



UMass Amherst doctoral student Pamela Loring uses 17 antenna towers along the northeast Atlantic coast to track bird flight patterns. Photo credit: USFWS

Science to Support Birds and Offshore Wind Energy Development

By Marjorie Weisskohl, BOEM

A new video shows innovative field work being conducted in the Mid-Atlantic region to inform offshore wind energy development.

Funded by BOEM and administered by the USFWS Northeast Region Migratory Bird program, University of Massachusetts Amherst doctoral student Pamela Loring is fitting mini transmitters onto plovers and terns and tracking their flights with 17 antenna towers along the Northeast coast.

Watch the video here: <http://www.boem.gov/Tracking-Endangered-Birds/>



A piping plover is handled very carefully as it is fitted with a mini-transmitter. Photo credit: USFWS

Regional Contacts

DOI leadership supports state-led regional ocean partnerships (ROP's), as well as Federal-state-tribal marine planning partnerships called regional planning bodies (RPBs) Five geographic regions now have operational RPBs: Northeast, Mid-Atlantic, Caribbean, the Pacific Islands and the West Coast.

Gulf of Maine

Susan Russell-Robinson (USGS)

(U.S., Canada)

ROP: <http://www.gulfofmaine.org/2/>

Mid-Atlantic

Bob LaBelle (BOEM)

Leann Bullin (BOEM)

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

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

ROP: midatlanticocean.org

West Coast

Joan Barminski (BOEM)

Ellen Aronson (BOEM)

(California, Washington and Oregon)

RPB: www.westcoastmarineplanning.org

ROP: www.westcoastcoceans.org

Northeast

Bob LaBelle (BOEM)

Leann Bullin (BOEM)

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

RPB: neoceanplanning.org

ROP: northeastoceanCouncil.org/

Great Lakes

Phyllis Ellin (NPS)

Norman Grannemann (USGS)

Charlie Wooley (USFWS)

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

Great Lakes Research Initiative:

www.epa.gov/glnpo/glri/

ROP: www.cglg.org/

Alaska/Arctic

Jim Kendall (BOEM)

(Alaska)

Gulf of Mexico

Linda Walker (USFWS)

(Alabama, Florida, Louisiana, Mississippi, Texas)

ROP: www.gulfofmexicoalliance.org

Caribbean

Sherri Fields (NPS)

(Puerto Rico, U.S. Virgin Islands)

ROP: <http://caribbean-mp.org/en/>

Pacific Islands

Richard Hannan (USFWS)

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

RPB: www.PacificIslandsRPB.org

South Atlantic

Eric Strom (USGS)

(North Carolina, South Carolina, Georgia, Florida)

ROP: www.southatlanticalliance.org



NEW! Sea-Level Rise Handbook

A new USGS handbook comprehensively describes the various models used to study and predict sea-level rise and its potential impacts on coasts.

The new resources guide is designed for the benefit of land managers, coastal planners, and policy makers in the United States and around the world. The handbook explains many of the contributing factors that account for sea-level change. It also highlights the different data, techniques, and models used by scientists and engineers to document historical trends of sea level and to forecast future rates and the impact to coastal systems and communities. “A handbook of this nature was identified as a high priority need by resource managers,” said Virginia Burkett, USGS Chief Scientist for Climate and Land Use Change.

The scope and content of the handbook was developed from feedback received at dozens of training sessions held with coastal managers and planners of federal, state, and private agencies across the northern Gulf of Mexico.

“We provide a simple explanation of the complex science and simulation models from published sources to help inform land management and adaptation decisions for areas under risk of rising sea levels,” said Thomas Doyle, lead author of the guide.

<http://www.usgs.gov/newsroom/article.asp?ID=4309&from=rss#VmXKkhFVhBc>

Find the handbook here: <http://pubs.er.usgs.gov/publication/pp1815>



Dead oak, cedar and pine trees litter the beach on Bulls Island, Cape Romain NWR in South Carolina. The sea is creeping up at a rate of about 25 to 30 feet a year, slowly overtaking a maritime forest. Photo credit: Stacy Shelton, USFWS

Great Lakes Coastal Wetlands: Securing a Resilient Future

By Christie Deloria, USFWS

Along more than 5,100 miles of Great Lakes shoreline lays a rich diversity of freshwater wetland habitats critical to migratory birds, fish, wildlife, plants, and people.

Although 8.5 million acres remain, more than two-thirds of Great Lakes wetlands have been lost or degraded due to being converted to other land uses.

For decades, partners have worked to restore and protect wetlands to reverse these losses and improve fish and wildlife habitat, water quality, floodwater retention, and recreational opportunities. But the questions remain, how many restored wetland acres will be “enough?” For what purposes should conservation target? And what coastal wetland areas and features are predicted to maintain these benefits under a changing climate?

Uncovering answers to these questions in a collaborative and structured way is the focus of an



Emergent freshwater wetland mosaic in western Lake Erie. Photo credit: USGS

effort spanning Saginaw Bay in Lake Huron to Western Lake Erie. Recently highlighted under the Resilient Lands and Waters Initiative, the project, spearheaded through the Upper Midwest and Great Lakes Landscape Conservation Cooperative, <http://greatlakeslcc.org/> will develop a decision support tool and a landscape conservation design to help land managers and funders direct their efforts to the highest priority, climate resilient, coastal wetland restoration and protection projects. A future phase will expand the effort to coastal wetlands across the entire Great Lakes basin-wide.

Great Lakes Restoration Initiative: <http://www.fws.gov/glri/newsroom.htm>

Past Water Patterns in the Everglades Drive Present Wading Bird Numbers

By James Beerens, Gabrielle Bodin, Hannah Hamilton, USGS

Wading bird numbers in the Florida Everglades are driven by water patterns that play out over multiple years according to a new study by the USGS and Florida Atlantic University. Previously, existing water conditions were seen as the primary driving factor affecting numbers of birds, but this research shows that the preceding years' water conditions and availability are equally important.

“We’ve known for some time that changes in water levels trigger a significant response by wading birds in the Everglades,” said James Beerens, the study’s lead author and an ecologist at USGS. “But what we discovered in this study is the importance of history. What happened last year can tell you what to expect this year.”

From 2000 to 2009, scientists examined foraging distribution and abundance data for wading bird populations, including great egrets, white ibises, and threatened wood storks. They found climate and water management conditions going as far back as three years influenced current bird population numbers and distribution.

This new information has allowed scientists to improve existing wading bird distribution models providing a more accurate tool to estimate wading bird numbers under climate change scenarios and hydrological restoration scenarios proposed for the Everglades.

Beerens and computer scientists from the USGS have also devel-



Wading birds like the white ibis (left) and wood stork (right) depend on specific water level conditions for foraging in wetland areas. Photo credit: USGS

Below: A roseate spoonbill (middle) and a great egret (bottom) hunt in shallow wetland waters. Photo credits: Ann Tihansky, USGS



oped publicly available software as an extension to this work that predicts wading bird numbers in the Everglades based on real-time, current conditions in addition to historical settings. This new model allows managers to simulate the effect of various management strategies that can have an impact on future bird numbers. The number and distribution of wading birds serve as an important indicator of ecosystem health in the Everglades. Beerens further explained that “increased seasonal water availability in drier areas of the Everglades stimulates the entire ecosystem, as reflected in the wading birds.”

“Our findings also suggest that we can continue to improve the Everglades and its wading bird community by restoring water availability to areas that are over drained,” said Beerens. “There is increasing understanding that water availability and proper management make this entire ecological and economic engine work.”

Florida generates more than \$3 billion in annual revenue from resident and nonresident wildlife watchers according to estimates from the U.S. Fish and Wildlife Service. Of the 1.9 million people who view wildlife in Florida while ‘away-from-home’ each year, more than 1.3 million watch wading birds and other water-dependent birds. <https://www.census.gov/prod/2013pubs/fhw11-fl.pdf>

<http://www.usgs.gov/newsroom/article.asp?ID=4256#.VZqYSvnddoN>

The study, “Linking Dynamic Habitat Selection with Wading Bird Foraging Distributions across Resource Gradients,” can be found online. <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0128182>

Building a Stronger Atlantic Coast in Hurricane Sandy Recovery

By Hope Kelley, USFWS

Three years after Hurricane Sandy, Department of the Interior bureaus have been investing in hundreds of projects throughout the Atlantic Coast and working with partners to build a stronger Atlantic Coast to better withstand future storms. DOI is investing \$787 million for projects to clean up and repair damaged national parks and wildlife refuges; restore and strengthen coastal marshes, wetlands and shoreline; connect and open waterways to increase fish passage and improve flood resilience; and bolster local efforts to protect communities from future storms. These investments have the dual benefit of providing jobs while supporting the goal of President Obama's Climate Action Plan to make communities more resilient to future storms predicted with a changing climate. Interior is also supporting the development of new science to better understand impacts of storms and sea level rise on coastal ecosystems and help managers respond and adapt to changing environmental conditions.

Here are few examples of Sandy-funded projects completed or under way:

U.S. Fish and Wildlife Service:

Working with nature to engineer a more resilient Prime Hook National Wildlife Refuge, DE

A \$38 million marsh restoration project is currently working to build storm and sea-level rise resilience into the natural landscape at Prime Hook National Wildlife Ref-



Restoring marshes with dredges working to drain flooded marsh areas in Prime Hook National Wildlife Refuge, DE. Photo credit: USFWS Watch a video of dredging activities here: https://www.youtube.com/watch?v=X7mNWz_cfeg&list=PLZb5DyVcCk95pH-zhsTMICM1Z9ffXQAlz&index=13

uge in Milton, Delaware. The project is repairing breached marshes and reconstructing severely damaged shoreline, including critical dune restoration. Approximately 4,000 acres of back-barrier tidal marsh are being restored, which will enhance and support a long stretch of barrier beach along the Delaware Bay. Efforts will carve out miles of marsh drainage channels through October, then pump in 1.1 million cubic yards of sand along 7,000 linear feet of shoreline and fill the deep cuts formed during Hurricane Sandy and other storms. The dunes and restored beach area will be planted with beach grasses and shrubs to hold the sand in place. <https://www.doi.gov/hurricanesandy/more-resilient-prime-hook-national-wildlife-refuge>

National Park Service:

Studying resilience in urban coastal ecosystems: the Science and Resilience Institute at Jamaica Bay, NY

Ten research projects, each conducted by partners of the Science and Resilience Institute at Jamaica Bay and planned for completion in fall 2016, are focused on enhanc-

ing our understanding of coastal habitat response and resilience to sea-level rise and storms. Scientists are developing advanced numerical models capable of projecting the response of Jamaica Bay to sea-level rise and storm surge, as well as understanding how coastal adaptation or restoration practices (e.g., marsh elevation enhancement) will influence coastal flooding, storm waves, and water quality. <https://www.doi.gov/hurricanesandy/studying-resilience-urban-coastal-ecosystems-science-and-resilience-institute-jamaica>

U.S. Geological Survey:

USGS SWaTH science supports USFWS wetland management through improved understanding of storm impacts

The USGS constructed and implemented the Surge-Wave and Tide Hydrodynamic (SWaTH) network along the Atlantic Coast from North Carolina to Maine to provide storm-tide and wave data that will enhance public awareness, improve coastal-flooding predictions, and inform emergency responders. To collect storm-tide and wave data in

Sandy Recovery continued from page 25

critical wetland environments, the USGS partnered with USFWS to install and pilot a series of “ready when needed” SWaTH data collection platforms at two national wildlife refuges in Delaware -- Bombay Hook National Wildlife Refuge and Prime Hook National Wildlife Refuges. At the onset of the an approaching storm, these sensors measure the impact of waves and water across the wetland, as well as erosion and accumulation of wetland sediments. <https://www.doi.gov/hurricanesandy/usgs-swath-science-supports-usfws-wetland-management>

Bureau of Ocean Energy Management:

BOEM agreements with Rhode Island, Massachusetts, and Maine yield new data on offshore sand resources and coastal geology.

BOEM signed cooperative agreements with Rhode Island, Massachusetts, and Maine in 2014 committing to coastal recovery and



Scientists with BOEM, the state of Rhode Island and Univ. of Massachusetts work to collect sediment samples at Inkwell Beach on Martha's Vineyard, MA. Photo credit: Jon Woodruff, UMass-Amherst



Installation of stainless support rod for USGS SWaTH sensor in Bombay Hook National Wildlife Refuge near Smyrna, DE Photo credit: Chris Nealan, USGS

resilient coastal systems. Although New England states have not requested sand from federal waters, they are evaluating its potential use as material from upland sources becomes more expensive and its transport generates neighborhood air quality and road impact issues. The co-ops shared some common elements—to evaluate offshore sand and/or gravel resources and associated benthic habitat in federal waters, and to update maps and databases of offshore sand or gravel which might be needed in the future.

More information: <https://www.doi.gov/hurricanesandy/boem-agreements-ri-ma-me>

National Fish and Wildlife Foundation:

New Jersey: Delaware Bay Beach Restoration

In June 2014 the National Fish and Wildlife Foundation (NFWF) awarded \$4.75 million to the American Littoral Society to restore six Delaware Bayshore wetland and beach sites in New Jer-

sey's Cape May and Cumberland Counties. Overall, the project will restore 5.7 miles of beach, create 20 jobs, improve community resiliency and improve public beach access and their associated tourism economies. The American Littoral Society will also pilot a process to sustainably maintain navigation channels that are important to commercial and recreational fishermen, while also providing source materials for marsh restoration. Ecologically, the wetland and beach restoration efforts will benefit horseshoe crab spawning grounds and the shorebirds that depend on the horseshoe crab eggs. <https://www.doi.gov/hurricanesandy/nfwf-als-delaware-bay-beach-restoration>



Hoseshoe crab at NPS Gateway National Recreation Area, NY. Photo credit: Sarah Gulick, NPS

Measuring Resilience:

Assessing results of DOI Hurricane Sandy projects is critical for developing best practices, determining gaps in knowledge, sustaining or enhancing improvements in coastal resilience created by project activity, and communicating the effective use of tax dollars to the American people. To that end, DOI has initiated a resilience assessment process that will establish criteria for determining project success and metrics to quantify changes in resilience resulting from project actions at multiple scales.

See Sandy Recovery page 27

Sandy Recovery continued from page 26

This report, the first phase of the assessment effort, was developed for DOI by a metrics expert group (MEG) of physical and ecological scientists and socio-economic experts who recommended performance metrics for measuring changes in resilience resulting from the DOI-sponsored projects. The report identifies natural and artificial coastal features most affected by Hurricane Sandy along the Northeast coast -- such as marshes, beaches, estuaries -- and recommended metrics that would indicate resilience change in those features. The list of performance metrics is extensive, given the diversity of coastal features and objectives, so a subset of recommended core metrics is also provided.

The MEG report recommends also establishing operational frameworks of data collection and synthesis that link information across projects for describing regional scale changes in resilience, and across ecological and socio-economic conditions to inform local to regional management decisions.

Learn about the metrics report:

<https://www.doi.gov/hurricanesandy/news/hurricane-sandy-project-metrics-report>

DOI Hurricane Sandy recovery:

<https://www.doi.gov/hurricanesandy>

Map of DOI Response to Hurricane Sand: <http://fws.maps.arcgis.com/apps/MapSeries/index.html?appid=17a3ad1b05884d369c0b24fbc57b6b9>

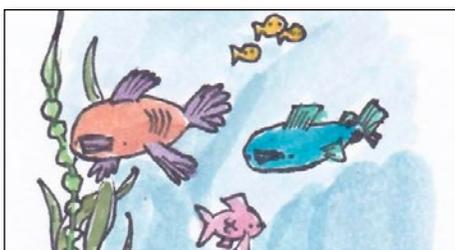


Illustration credit: Cole Goco

Raising NPS Profile in Marine Education Community

Preparing for the 2016 National Park Service Centennial

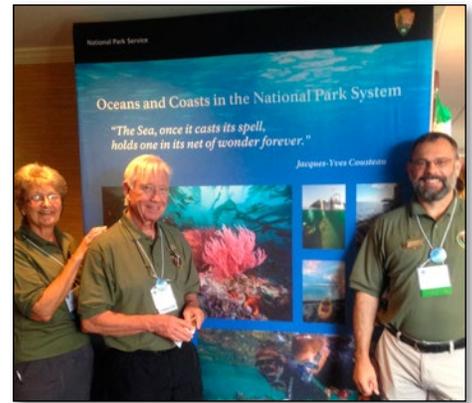
By Cliff McCreedy and Gary Bremen, NPS

The NPS Centennial and DOI's role in ocean stewardship were on prominent display at the National Marine Educators Association (NMEA) Conference in June in Newport, Rhode Island, where NPS staff and volunteers reached out to 350 teachers, professors, and informal educators who attended the event.

The NPS Ocean and Coastal Resources Branch provided a large map of the Park System where visitors could find their ocean, coastal or Great Lakes parks. They highlighted the NPS-wide Underwater Junior Ranger Activities Guide and demonstrated hands-on activities relating to sea turtles, dolphins, sharks, and climate change. Biscayne National Park staff and volunteers held an educational session on how to easily use replicable ideas from Biscayne NP's award-winning Family Fun Fest program. Those who completed all five demonstrated activities earned a specially-designed button featuring a park image and the Centennial logo.

Rhode Island's U.S. Senators, Sheldon Whitehouse and Jack Reed, attended the conference opening, and spoke knowledgeably and passionately about oceans, education and climate change.

The Park Service celebrates its 100th birthday in 2016. The National Park Service is entrusted with managing 86 ocean coastal and Great Lakes parks across 22



Biscayne National Park volunteers (left to right) Carolyn and Paul Osmon and Roger Boone made the NPS exhibit one of the most popular exhibits at the 2015 National Marine Educators Association conference by helping people "Find Your Park" and demonstrating activities for marine science educators at every level. Photo credit: NPS

states and four territories. With over 11,000 miles of coast and 2.5 million acres of ocean and Great Lakes waters, these ocean and coastal parks provide tremendous recreational benefits and biological and cultural values to the nation.

The NPS Natural Resource Stewardship and Science Directorate and Biscayne National Park hope to expand this joint effort for the NPS Centennial year at the 2016 NMEA Conference in Orlando, FL.

Stay tuned for NPS Centennial events and activities across the ocean and coastal parks, as part of the **Find Your Park** Centennial campaign, as well as virtual experiences via social media and the web.



Illustration credit: Cole Goco

Sea Lampreys - Unique Ancient Fish

The Surfing Bison



Watch the video: <https://www.youtube.com/watch?v=dkwfdVAoSXk>

Pacific: <http://www.fws.gov/pacific/Fisheries/sphabcon/lamprey/index.cfm>

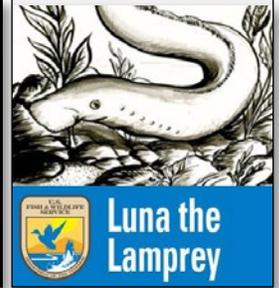
Great Lakes: <http://www.fws.gov/midwest/fisheries/sea-lamprey.html>,
http://www.umesc.usgs.gov/invasive_species/sea_lamprey.html

Twitter: Follow @LunatheLamprey

Facebook: 'Like' Luna the Lamprey: <https://www.facebook.com/PacificLamprey>

By Cheryl Fossani, DOI

All species of lamprey belong to a primitive group of fishes that are eel-like in shape. Unlike true fishes, they do not have jaws and paired fins but have round sucker-like mouths, no scales, and breathing holes instead of gills. Lamprey species are often identified by their teeth structure.



From left to right: The Pacific Lamprey (*Entosphenus tridentata*). Photo credit: USFWS

A close up view of the sea lamprey's mouth, a rasping oral disc structure. Photo credit: USFWS

Luna the Lamprey is part of the USFWS Pacific Lamprey Conservation initiative to raise public awareness and understanding about these unique fish. Image credit: USFWS

Native sea lamprey species are found along the Pacific and North Atlantic coasts. Sea lampreys found along the Pacific and Atlantic coasts are very similar both in their life cycle and behavior. As adults in the marine environment, sea lampreys are parasitic fish that feed on a variety of species, including salmon, flatfish, rockfish, and pollock, and are an important food source for many birds, fish, and mammals along the coast. Lampreys feed by rasping a hole in the side of their prey. They detach once they are done feeding, commonly their host survives.

After spending one to three years in the marine environment, adult lampreys stop feeding and migrate to freshwater streams and rivers to spawn. After spawning, the adult lampreys die, while their larval offspring, known as ammocoetes, drift downstream and burrow into fine sediments where they live as filter feeders until they are large enough to migrate to the ocean where they mature. They play a key ecological role in transporting nutrients between marine and freshwater ecosystems and can act as a buffer by reducing predation on migrating salmon.

Pacific Lamprey (*Entosphenus tridentata*) populations are in trouble. Once historically widespread along the West Coast of the United States, populations have declined in abundance and become restricted in distribution throughout California, Oregon, Washington, and Idaho. Threats include dams, stream degradation, and poor water quality. Lampreys serve vital cultural and sustenance purposes for Native American tribes and preserving the traditional annual harvest is of great importance to the tribes.

Invasive Sea Lampreys in the Great Lakes--A Management Challenge

Unlike the lampreys found along the Pacific and Atlantic coasts, non-native sea lampreys found in the Great Lakes have devastated large numbers of fish species, including lake trout, lake whitefish, and ciscoes. The sea lamprey was first discovered in Lake Ontario in 1835, Lake Erie in 1921, Lake Huron in 1932, Lake Michigan in 1936, and Lake Superior in 1946. Reproducing populations were found in all of these upper lakes by 1947.

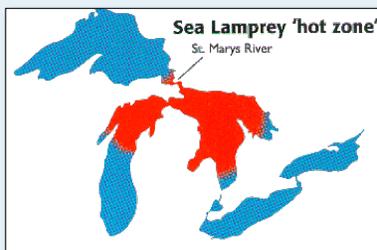


Image credit: USGS



Members from local tribes gather annually at Willamette Falls, OR to harvest the treasured Pacific lamprey species both a significant part of tribal culture as well as an important food source. Photo credit: Meghan Kearney, USFWS

The present "hot zone" is the St. Marys River. The USFWS and the USGS are working with partners in the Great Lakes region to control and manage the impacts caused by this non-native species on Great Lakes fisheries and ecosystems.