



NPS Coastal Geology Group

2010 Accomplishments

Winter, 2010



Ocean Beach, Golden Gate National Recreation Area.

The National Park System incorporates 84 coastal park units, including national parks, seashores, lakeshores, recreation areas, monuments, preserves, historic sites, and memorials. These areas encompass nearly 11,000 miles of shoreline and contain iconic American natural and cultural features including beaches, lighthouses, and historic forts.

Increasing pressures and environmental threats such as coastal population growth, pollution, habitat encroachment, and shoreline modifications have negatively impacted coastal areas. To protect and preserve our national coastal heritage the National Park Service (NPS) must have effective coastal zone management policies, a science-based understanding of the resources, and collaborative relationships with other coastal stakeholders.

During 2010 the NPS Coastal Geology team provided parks with technical and policy assistance, developed programmatic guidance, assisted with oil spill response, and worked on climate change adaptation programs. Throughout the year the team collaborated with many partners, including the U.S. Geological Survey (USGS), National Oceanic and Atmospheric Administration (NOAA), U.S. Army Corps of Engineers (USACE), and Western Carolina University.

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Maintaining Island Access

Sleeping Bear Dunes National Lakeshore (SLBE) is located along the shores of Lake Michigan and contains North and South Manitou Islands. The island's docks are critical for visitor access and SLBE has maintained boat access through extensive, costly dredging.



Island ferry, Sleeping Bear Dunes National Lakeshore.

The coastal geology group helped gather information related to repeated shoaling at the docks, including a historical assessment of shoreline activity. Rebecca Beavers visited the park in July 2010 to assess the existing conditions at the docks and meet with park staff. Jodi Eshleman compiled information on the history of dock construction, shoreline change, bathymetry, and atmospheric forcing. Thom Curdts (NPS WRD) generated shoreline change maps to assess historical shoreline activity and Kate Dallas (Geoscientist-in-the-Parks intern) created maps of the bathymetry/topography around the docks from recent lidar data. These data products will help the park understand the shoreline history around the docks and inform alternative dock designs in the future.



South Manitou Island dock, Sleeping Bear Dunes National Lakeshore (NPS photo).

Shoreline Erosion at Culturally Significant Sites

Rapid, sound-side shoreline erosion poses an immediate threat to six culturally significant sites and related infrastructure at Fort Raleigh National Historic Site. Park staff are concerned that existing shoreline hardening may be contributing to the rapid erosion of adjacent, unprotected beaches. The park required technical information for decision-making and requested a report that described the resources at risk and the viable options for short- and long-term shoreline protection/stabilization, while also considering NPS policy and the state's coastal management program.



Eroding bluffs in front of Dough Cemetery, Fort Raleigh National Historic Site.

Linda York (Southeast Regional Office, SERO), Jodi Eshleman, and Mike Cook (Geoscientist-in-the-Parks intern) conducted a site visit in May 2010 to evaluate existing conditions, resources, and infrastructure threatened by shoreline erosion. During their visit they also helped build an oyster shell sill with partners from the community. Jodi and Linda collaborated to write the final report, which discusses the current state of shoreline modification, resources and infrastructure at risk, relevant policy and regulation, possible engineering options for stabilization of priority areas, and recommendations for the future.



Jodi Eshleman and Linda York helping to build an oyster shell sill at Jockey's Ridge.

Shoreline Restoration and Management Plan

The NPS is charged with restoring and protecting the natural processes along the Lake Michigan shoreline in Indiana Dunes National Lakeshore (INDU). Harbors and shoreline stabilization structures (jetties, breakwaters, revetments, and bulkheads) have altered natural sand movement along the shoreline, causing significant accretion in some locations and sand starvation in other areas. To help maintain a more “natural” shoreline and increase the effectiveness of shoreline management, the NPS is developing a long-term Shoreline Restoration and Management Plan.

Jodi Eshleman and Julia Brunner provided extensive support for the Shoreline Management Plan, one of the first of its kind in the NPS. Jodi gathered data for the initial phase of the project and visited the park in March 2010 to review information onsite and meet with partners. She developed an annotated bibliography and created a database of information to help understand whether sufficient information existed to move forward with an EIS. Jodi and Julia worked with the park to draft a Scope of Work to hire a contractor. Jodi worked on the formal review and award process and traveled to the park for the Internal Scoping Meeting in September 2010.

Julia helped refine the problems, scope, and timeline of the plan and budgeted and wrote the successful justification for pre-award funds. She also helped draft the Memorandum of Agreement and briefing statement to accompany the Notice of Intent for the EIS. The assistance provided by the coastal geology team has been instrumental in developing the INDU Shoreline Management Plan, which will ultimately help to restore and protect the park’s shoreline and improve visitors’ experience.



Top Left: Park staff and partners at Indiana Dunes National Lakeshore (INDU).

Top Right: Lake Michigan shore, INDU (NPS photo).

Bottom: Burns Ditch breakwall, INDU (NPS staff photo).

Restoration of West Ship Island

West Ship Island, a barrier island in Gulf Islands National Seashore (GUIS) in Mississippi, has experienced severe erosion over time. In 1969 storm surge from Hurricane Camille breached the former island and created two separate islands, East Ship and West Ship Island. Recently, Hurricane Katrina severely damaged West Ship Island. The U.S. Army Corps of Engineers has proposed a beach restoration project along West Ship Island to maintain the sustainability of the island, and incidentally increase protection to historic Fort Massachusetts (circa 1866). The project is part of the larger Mississippi Coastal Improvements Program (MsCIP), a component of which calls for restoring the sediment budget and transport system in the park.

Rebecca Beavers and Jodi Eshleman participated in monthly inter-agency calls and NPS working group conference calls, and reviewed the draft Environmental Assessment. Jodi also reviewed scopes of work for geophysical mapping and compiled information related to the compatibility of Gulfport channel sediment.

Rebecca, Jodi, and Julia Brunner also worked with the South East Regional Office to help GUIS with recommendations for sand removal and road overwash resulting from Tropical Storm Ida, which impacted the park in early November 2009. Rebecca also coordinated lidar flights over the Atlantic Coast for several NPS units (Cape Hatteras NS, Assateague Island NS, Gateway NRA, and Fire Island NS) to help assess the impacts from the storm.



Top: Kemp's ridley sea turtle (NPS photo).

Bottom: Fort Massachusetts on West Ship Island, Gulf Islands National Seashore (NPS photo).

Storm Damage Response



Erosion along Ocean Beach, Golden Gate National Recreation Area.

One of the world's largest urban national parks, Golden Gate National Recreation Area has over 60 miles of coastline. Ocean Beach, a 4 mile long sandy beach at the mouth of the Golden Gate inlet, contains an erosional section that threatens a major highway and safe use of the beach.

Rebecca Beavers, Jodi Eshleman and Julia Brunner provided support for the Ocean Beach emergency stabilization project through participation in conference calls and reviews of alternatives, draft reports, and meeting presentations. Jodi visited the park in February 2010 to meet with partners and make recommendations for monitoring and management of the project area. Julia Brunner assisted with policy and permitting issues arising from the City of San Francisco's controversial declaration of a state of emergency resulting from storm erosion. The coastal geology team also provided support for projects at Stinson Beach, Fort Funston, Crissy Marsh, and Alcatraz. Jodi helped the park to draft a scope of work to complete geologic and geotechnical reconnaissance on Alcatraz Island. This contract was awarded and the work will help to guide future management decisions and help to focus resources in areas where remediation may be most successful.

Sediment Management

Julia Brunner and Jodi Eshleman provided ongoing support to Cape Lookout National Seashore related to the Wilmington USACE District's project to complete a Dredged Material Management Plan for the Morehead City Harbor Navigation Channel. They helped to draft correspondence describing the NPS policy related to sediment disposal, wilderness designation, and the history of impacts realized within the national seashore as a result of the navigation channel. They will continue to provide support to the park, as NPS is a cooperating agency on the EIS, which includes an alternative for sediment disposal on Shackleford Banks to mitigate for the loss of sediment through dredge disposal offshore.



Cape Lookout lighthouse, Cape Lookout National Seashore (NPS photo).

Jodi, Julia, Rebecca Beavers, and Linda York (SERO) reviewed the State of North Carolina's draft report about the performance of terminal groins (sand-trapping structures perpendicular to a shoreline) along the Atlantic coast, and worked with the NPS Southeast Regional Office and the two parks to prepare an NPS letter commenting on the report. The state will use the report to assess whether more terminal groins should be allowed within North Carolina, so NPS involvement and input about impacts on parklands from existing structures is crucial.

Coastal Engineering Inventory

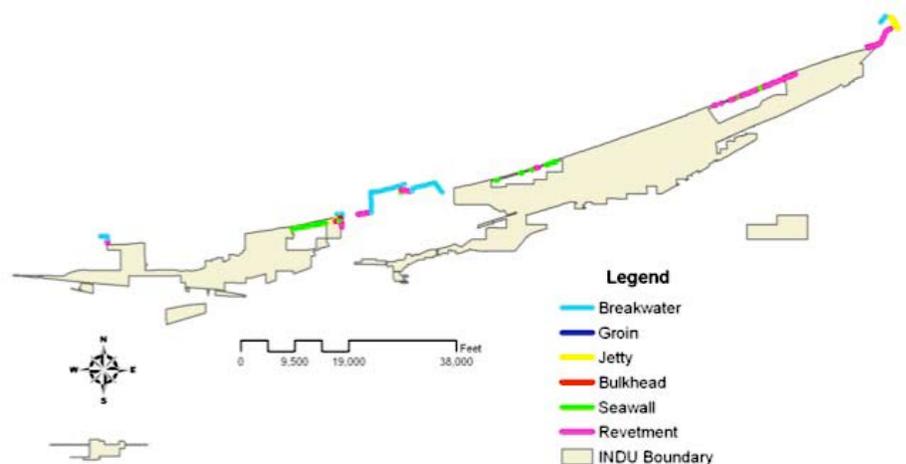
In cooperation with the Program for the Study of Developed Shorelines at Western Carolina University, Jodi Eshleman and Rebecca Beavers completed a reconnaissance-level investigation, analysis and inventory of coastal engineering projects for ten coastal national park units: Apostle Islands NL, Boston Harbor Islands NRA, Cape Lookout NS, Channel Islands NP, Fire Island NS, Fort Pulaski NM, Indiana Dunes NL, Jean Lafitte NHP, Lewis & Clark NP and Timucuan Ecological and Historic Preserve. The primary items that were inventoried included coastal structures, dredge and fill projects, and beach nourishment/dune construction projects.

The Coastal Engineering Inventory will help the NPS define the extent of human-altered coastal areas in the National Park System. This, in turn, will help the NPS understand its resources, establish baselines, develop desired future conditions, balance the protection of historic resources and infrastructure with the preservation of natural systems, and improve post-storm response. All of these actions will improve the ability of the NPS to manage coastal park units in accordance with NPS policies.



Groin in Fire Island National Seashore.

The report was published in the Natural Resource Technical Report Series in September 2010 and is accompanied by a Geographic Information Systems database of coastal engineering projects. The report is available at <http://nriinfo/Reference.mvc/Profile?code=2165163>.



Erosion control structures in and adjacent to Indiana Dunes National Seashore.

Oil Spill Response

Since the drill rig Deepwater Horizon exploded and sank into the Gulf of Mexico on April 20, 2010, the NPS has been part of the federal response. Rebecca Beavers was deployed for two weeks to the Houma Unified Command in Louisiana. Rebecca developed a multi-million dollar project statement for sediment restoration at GUIIS, participated in numerous conference calls for the Natural Resource Damage Assessment case, provided comments on many documents, worked with shoreline clean-up, and helped with Resource Advisor Training.



Overflight assessing boom conditions at Gulf Islands National Seashore (NPS photo).

Julia Brunner worked with the Lands Resources Division in Fort Collins and Atlanta and with Thom Curdts (NPS WRD) to ensure that the most updated and accurate boundary maps of Jean Lafitte NHP, Padre Island NS, Gulf Island NS, De Soto NM, Everglades NP, Dry Tortugas NP, Big Cypress National Preserve, and Biscayne NP were provided to the incident management team.

Climate Change Adaptation

Climate variability and change are already affecting coastal parks through rising sea levels, lowering Great Lakes water levels, changing storm patterns, increasing ocean acidity and melting permafrost. These processes and other coastal hazards are threatening parks' cultural and natural resources, infrastructure, and public recreational opportunities. To address these concerns the NPS is working with scientists and other partners to develop landscape- and ecosystem-scale adaptation strategies that protect coastal resources and promote their long-term resilience and sustainability.

In 2010 Rebecca Beavers spent extensive time working with the Climate Change Response Program staff. Rebecca served as the Climate Change Adaption Coordinator from May to June, coordinated with Facilities for coastal vulnerability studies, commented on legislation, and, in cooperation with NOAA, established the Coastal Adaptation Coordinator position. This position is highly interdisciplinary and will assist with the development of adaption strategies, acquire and disseminate science applications information, and work closely with other agencies and partners to support effective management actions and resource protection in the face of a changing climate. The NPS welcomed Dr. Maria Honeycutt to this post in September 2010.



The historic fish pond at Kaloko-Honokohau National Park is being threatened by rising sea levels (NPS photo).

Jurisdiction Handbook

The Ocean Park Jurisdiction Handbook was designed to respond to NPS managers' long-standing request for clarification of their jurisdiction and authorities. Julia Brunner worked with GRD's contract attorney to solicit initial input from several attorneys in the Solicitor's Office and finished a draft of the handbook in December 2009. She also organized a review meeting of nine attorneys at the National Conservation Training Center in April 2010, revised the handbook, and sent it out again for NPS review. The handbook will help ocean and coastal parks interact more effectively with state and federal agencies, protect park resources, and enhance visitor enjoyment.



Johns Hopkins Glacier, Glacier Bay National Park (NPS photo). Glacier Bay National Park serves as an example of the complexity of submerged lands, with some submerged lands owned by the federal government and some owned by the State of Alaska.

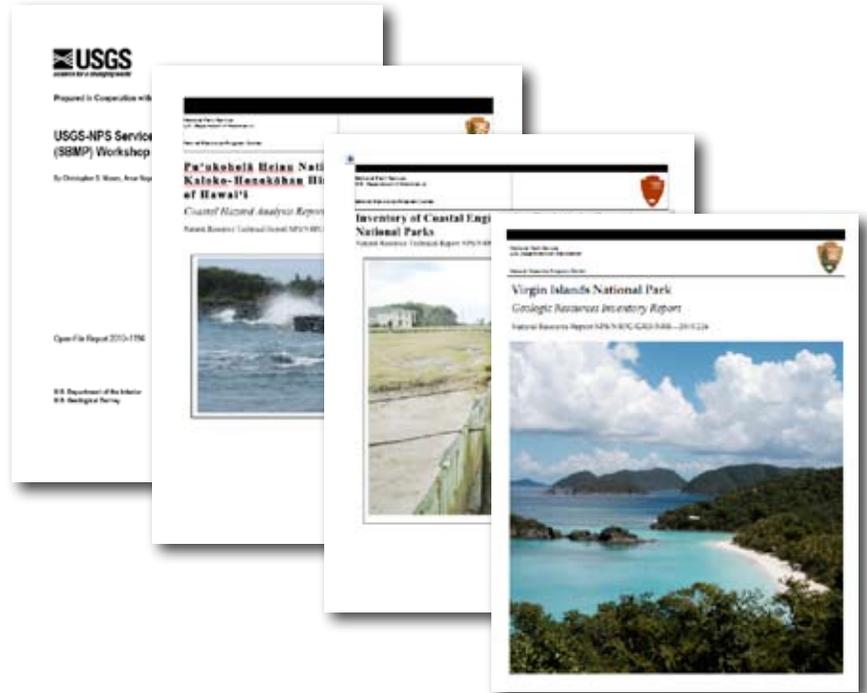
Publications

The USGS-NPS Servicewide Benthic Mapping Program Workshop Report summarizes the agenda, discussion and findings from a workshop convened in 2008 to discuss and plan a benthic mapping program in ocean and Great Lakes parks. The report was published as a USGS Open File Report in September 2010. The report is available at <http://pubs.usgs.gov/of/2010/1194/>

Coastal hazards threaten the preservation of several natural and cultural landmarks on the Island of Hawaii. The **Pu'ukoholā Heiau National Historic Site and Kaloko - Honokōhau National Historical Park Coastal Hazard Analysis Report** assesses the risk of coastal erosion, waves from large swell, sea-level rise, and tsunamis to the parks. The report was funded by the NPS Recreation Fee Program and was published in October of 2010. The report is available at <http://www.soest.hawaii.edu/coasts/nps/>

The **Inventory of Coastal Engineering Projects in Coastal National Parks** report presents and analyzes coastal engineering projects in 10 park units. The report was funded by the NPS Recreation Fee Program and was published in September 2010. The report is available at <http://nriinfo/Reference.mvc/Profile?code=2165163>

In FY 2010 **Geologic Resource Inventories (GRIs)** were completed for Acadia National Park, Padre Island National Seashore, Hawaii Volcanoes National Park, Kalaupapa National Historic Park, and Virgin Islands National Park. GRIs aim to increase the understanding of the geologic processes at work in parks and provide sound geologic information for use in park decision making. GRIs and links to geologic map data are available at http://www.nature.nps.gov/geology/inventory/gre_publications.cfm



Webinars

The Coastal Geology group coordinated two presentations and webinars by Dr. Stan Riggs (East Carolina University) at the NRPC Academy Place Office in December 2009. Dr. Riggs spoke about Cape Lookout NS, Cape Hatteras NS, and a vision for future management of the national seashores.

The Coastal Geology group hosted a webinar in February 2010 entitled 'September 2009 Tsunami Impacts at National Park of American Samoa and Surrounding Areas.' Mike Reynolds (National Park of American Samoa Superintendent), Steve Flory (a member of the event's NPS incident management team) and Dr. Bruce Jaffe (USGS) spoke about their experiences in American Samoa after the tsunami. The webinar is available at <http://www1.nrintra.nps.gov/wrd/marine/webinars.cfm>.

These webinars are available at <http://www.nature.nps.gov/geology/coastal/news.cfm>

Presentations

Rebecca Beavers, Jodi Eshleman, and Julia Brunner gave presentations at the NPS Aquatic Professionals Meeting in February 2010. They spoke about barrier island restoration at GUIs, modeling severe storms in southern California, and the Jurisdiction Handbook, respectively.



Pago Pago Harbor, American Samoa before the 2009 tsunami (NPS photo).

On the Horizon

Coastal Sediment Restoration Guidance

The NPS Coastal Geology group is creating a Coastal Sediment Restoration Guidance manual to be used by NPS staff to better plan and manage coastal sediment restoration projects. The manual will provide tools for resource managers to interface with partners that are completing technical design for sediment restoration projects and present a unified approach to coastal sediment management.

Climate Change Adaptation

As part of her Coastal Climate Adaptation detail from NOAA, Maria Honeycutt will be working with staff across NPS directorates to develop several products concerning sea-level rise and lake-level change. These will include additional scientific information about the critical physical processes and impacts, as well as a compilation of existing datasets and tools that can be used to assess vulnerability and identify adaptation actions.

Benthic Mapping Program

A Servicewide Benthic Mapping Program for National Parks was published in December 2010 and provides recommended protocols for a servicewide benthic mapping program. See the report at <http://pubs.usgs.gov/of/2010/1264/>

Historical Shoreline Change

The USGS is conducting a nationwide assessment of shoreline change rates and trends for open-ocean coasts. This project represents the first effort to calculate rates of shoreline change on a national scale using consistent methods. The newest report, *The National Assessment of Shoreline Change: Historical Shoreline Change along the New England and Mid-Atlantic Coasts*, was published late in 2010 and is online at <http://pubs.usgs.gov/of/2010/1118/>

Geologic Resource Inventories

Geologic Resource Inventories are planned for Puukohola Heiau National Historic Site, Pu'uhonua o Honaunau National Historical Park, Kaloko-Honokohau National Historical Park, Buck Island Reef National Monument, Cape Hatteras National Seashore, and War in the Pacific National Historical Park in FY 2011.

George Wright Society Conference

Rebecca Beavers, Jodi Eshleman, and Julia Brunner will participate in the 2011 George Wright Society Conference on Parks, Protected Areas & Cultural Sites in New Orleans, Louisiana. The conference encourages dialogue and information exchange related to protected area conservation and includes participants from state, federal, and private agencies.



National Park Service
U.S. Department of the Interior
Coastal Geology Contacts

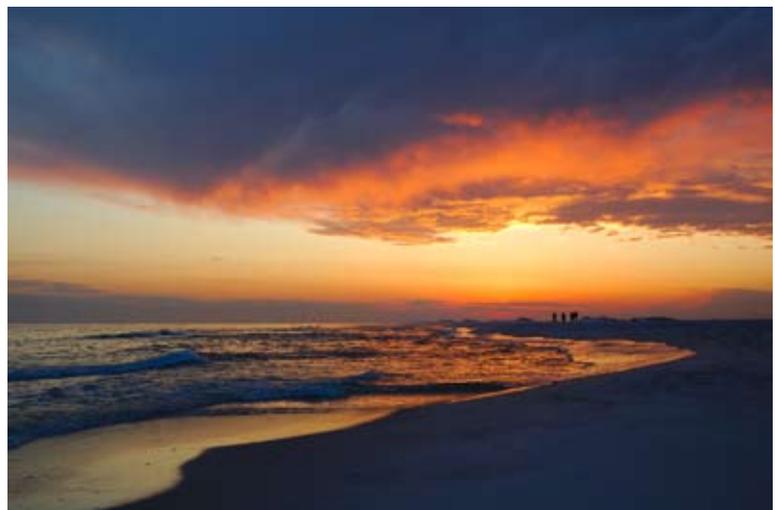
NPS Coastal Geology website:
www.nature.nps.gov/geology/coastal

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Sunset at Fort Pickens, Gulf Island National Seashore (NPS photo).