Pacific Island Network Quarterly

Going Coastal

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Quarterly Newsletter of the Pacific Island Network (PACN) Inventory & Monitoring Program
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The National Park Service (NPS) has implemented natural resource inventory and monitoring on a servicewide basis to ensure all park units possess the resource information needed for effective, science-based management, decision-making, and resource protection.

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Staff Update

Eliseo (Eli) Queja

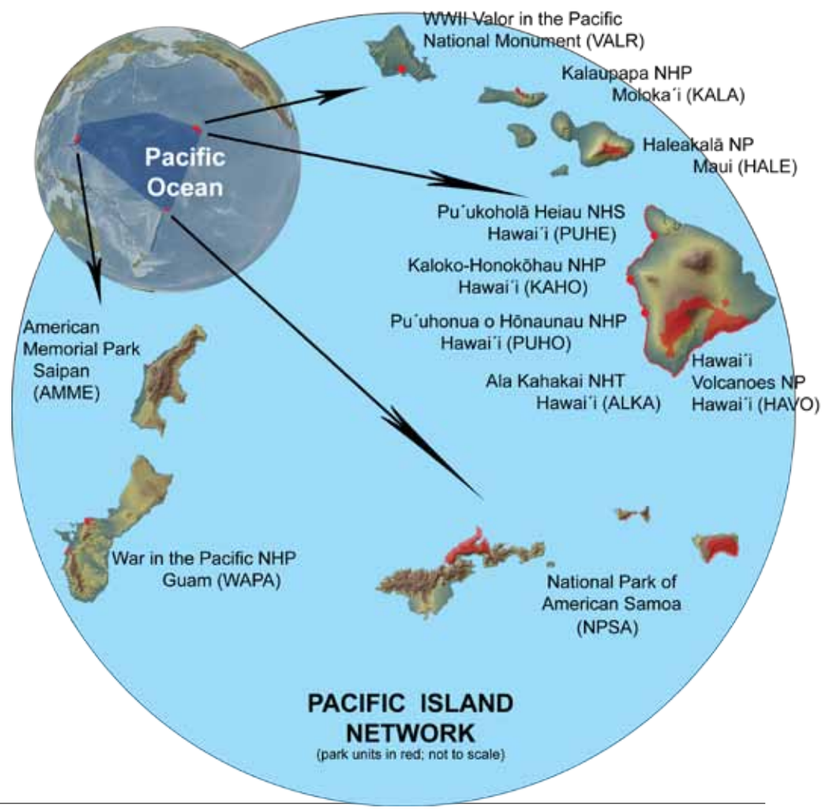
Born and raised in Hilo, Hawaii, Eli became part of the NPS, I&M team as the Administrative Support Technician in May 2010.

He attended the University of Hawaii, Hilo and graduated with a BA in 1982. He also attended the University of Alaska, Fairbanks to pursue his graduate studies in 1999.

Before becoming part of the I&M workforce, Eli served in the US Army from August 1983 to April 2008 as an Army Bandsman. His other duties and responsibilities while in service were Platoon Leader, Unit Administrator, and Supply Supervisor. His service in the army also took him around the world. He served in stations in Norfolk, Virginia; Fort Lewis, Washington; Fort Hood, Texas; Fairbanks, Alaska; Germany; South Korea; Japan; and two tours in Iraq.

Eliseo currently resides in Hilo, and his hobbies are camping and fishing, taking long walks, and playing music. He also is a member of the Hawaii County Band. Eli is happy to be part of the I&M workforce.

Recent volunteers with the program for the autumn and early winter are **Bret Callaway** and **Lauren Greig**. Bret is working on Established Invasive Plant Species pilot study field work at HAVO, and data entry and quality checking for vegetation mapping. Lauren is working on Focal Terrestrial Plant Communities monitoring and Established Invasive Plant Species pilot study field work at HAVO; as well as vegetation mapping field work at KALA and HAVO.



EXTRA!

Really COOL Research in American Samoa

The Climate Foundation has worked for nearly a decade to preserve and restore critical ecosystems threatened by climate change. Coral reefs are one of the most critically endangered ecosystems. Just this year, we have experienced the second global incident of coral bleaching in history, extending from the SW Pacific through Texas and the Caribbean, affecting the full geography of U.S. coral reef sites around the world. Increased sea temperature is a leading factor in these events.

Corals are very sensitive animals. Water temperature increases of 1-2°C above normal can initiate mass bleaching events. Some bleaching events kill large numbers of corals. In 1998 alone they killed 16% of all the world's corals. High temperatures are often followed by outbreaks of coral diseases, which can kill even more corals than bleaching. Pollution, sewage and nutrients often weaken corals, resulting in lower survival rates.

The Climate Foundation has been working to reverse coral bleaching in American Samoa. The U.S. Fish and Wildlife Service and the Pacific Islands Climate Change Cooperative are providing support to The Climate Foundation with a three-year grant for coral reef research, focusing initially on seasonally cooling the reef when sea surface temperatures exceed a maximum. Lowering the average temperature by 0.5°C was enough to reverse bleaching at the airport reef on Tutuila, American Samoa.

It may be possible to use the outfall from seawater air conditioning systems to seasonally cool reefs. It turns out, the effluent from the seawater air conditioning system is lower than 14.5°C, still cool enough to seasonally cool the reef by 1 degree. The cool, deep-ocean water passes through a cold-water pipe without mixing with reef water. Honolulu is currently constructing a 100 megawatt facility for downtown, which can provide considerable cooling for nearby coral reefs. Such innovations can help to preserve a slice of a coral reef ecosystem in the face of increasing environmental and climate pressures.

Seasonally cooling reefs is a massive project. The scale is daunting, yet with the right leverage and with proven innovations such as efficient, district-scale seawater air conditioning, it may be practical to preserve entire reefs. This work can potentially help reefs across the U.S. territories in the Pacific, Atlantic, Caribbean, and the Gulf of Mexico.

—B. Von Herzen,
The Climate Foundation
http://www.climatefoundation.org/globepage

The image on the left was taken several months into a bleaching event. The image on the right was taken in the same spot after a cool water treatment of 24 hours. The color cards help the researcher to calibrate the digital images and measure coral bleaching over a variety of incident light levels.

Monitoring Schedule

January	Vegetation mapping field work at HALE Complete vegetation mapping accuracy assessment field work at WAPA Complete vegetation mapping field data collection at KALA Vegetation mapping field data collection at NPSA and HAVO Complete Focal Terrestrial Plant Communities field quality checks at HAVO Water Quality monitoring at KAHO and HALE Anchialine Pool monitoring at HAVO
February	Vegetation mapping field data collection at HALE Complete vegetation mapping field data collection at NPSA Complete vegetation mapping field data collection at HAVO Water Quality monitoring at PUHO, PUHE, ALKA, KALA, WAPA, and AMME Freshwater Animals monitoring at WAPA Groundwater monitoring at KAHO and AMME
March	Vegetation mapping field data collection at HALE Water Quality monitoring at NPSA Benthic Marine and Marine Fish Monitoring at NPSA

Science Day 2010

The PACN Inventory & Monitoring Program hosted Science Day at the Ala Moana Hotel in Honolulu on December 8th

The second I&M Science Day included a wide variety of talks that focused on cultural and natural resources before wrapping up with a session on science communications.

We welcomed Chris Lehnertz, the new National Park Service Pacific West Regional Director, who provided a great start to our discussion about science in the parks.

Jeff Burgett, Science Manager of the Pacific Islands Climate Change Cooperative, followed with an excellent overview of the challenges climate change will bring to the Pacific islands. His presentation stimulated considerable discussion about how NPS managers can respond to this global issue.

There were several presentations focused on cultural resources including a stunning 3-D high definition look at the USS Arizona underwater. Invasive species issues, both marine and terrestrial, were addressed by scientists from the NPS, the US Forest Service, and the University of Hawaii.
Finally, Shelton Johnson, an interpreter from Yosemite National Park, who has been widely recognized for his work about African American "Buffalo Soldiers", closed our final session on science communications. He rallied the room with a rousing call to think big about bringing our messages to underserved groups and the media.

The Pacific Island Network would like to thank the presenters and all of those able to attend. We hope that the next Science Day will be just as enlightening.

Pacific Islands Climate Change Cooperative

Also known as **PICCC**, this is a conservation alliance to assist those who manage native species, island ecosystems, and key cultural resources in adapting their management to climate change for the benefit of the people of the Pacific islands. The PICCC is governed by a committee of Federal, State, private, indigenous, and non-governmental conservation organizations and academic institutions acting in partnership to fulfill the cooperative's mission, vision, and goals.

PICCC projects to date include:

Climate Modeling for the Hawaiian Archipelago —Focuses on numerical climate change projection experiments through development and application of a regional atmospheric modeling system with high resolution at a scale that is ecologically relevant to natural resources management.

Climate Downscaling —Builds on existing experience with statistical downscaling methods to derive comprehensive estimates of the future rainfall changes over the Hawaiian Islands for the mid and late 21st century to provide optimized estimates for key climate targets that may have the highest risk potential for endangered species in Hawaii's ecosystem.

Climate and Ecosystem Monitoring —Ensures continued operation and maintenance of the HaleNet climate and ecosystem monitoring network which provides critical high-quality data for calibration and validation of downscaled climate models for Maui.

Bioclimate Projections —Uses first generation statistical climate downscaling to project changes in the distributions of native Hawaiian plants based on projected future temperature and precipitation.

Mapping Sea-level Rise —Provides a spatial and temporal model of sea-level rise on sites of high management significance on the coastal plains of O'ahu and Maui in order to define potential ecological and cultural impacts and support management responses.

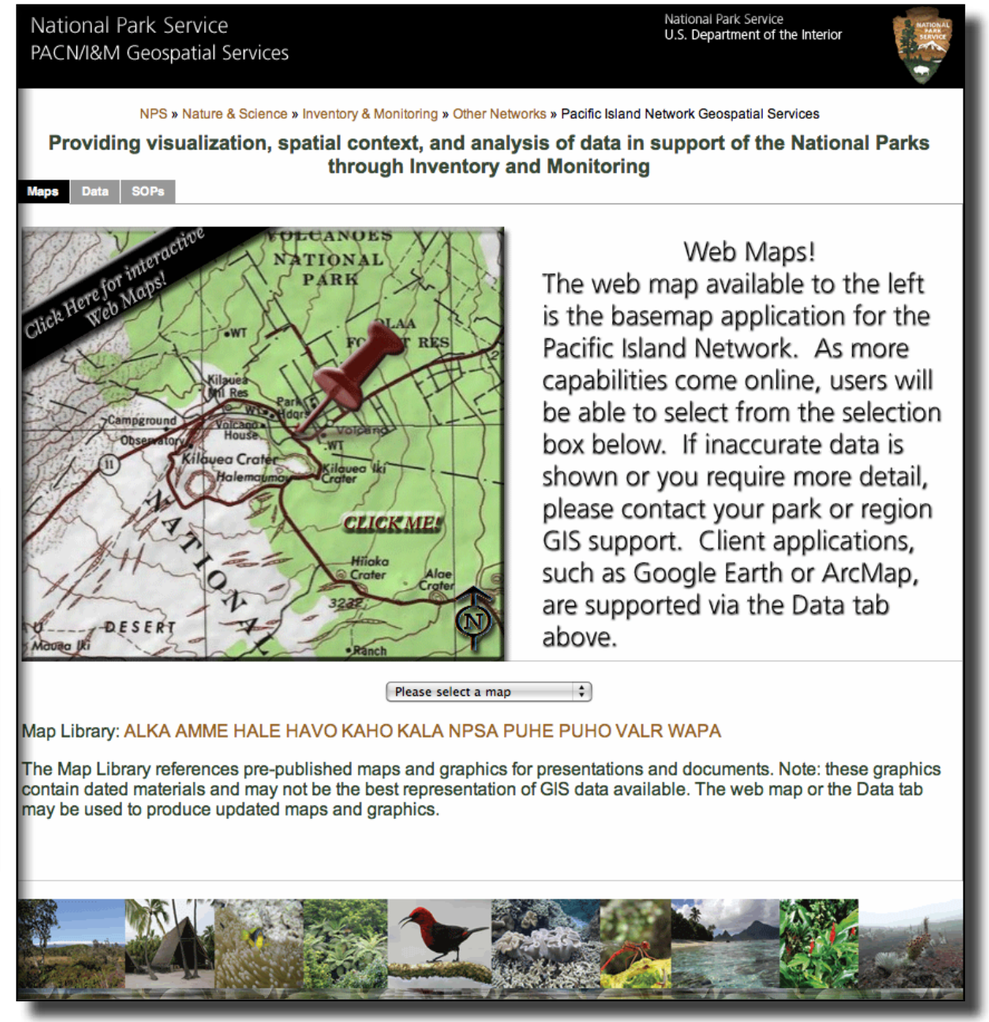
Reversing Coral Reef Impacts —Explores methods to reverse localized coral bleaching and tests methods of locally increasing pH on the reef to counter ocean acidification.

Article content from PICCC website: http://hawaiiconservation.org/piccc.asp

Lost without a Map? Not Anymore.

The NPS Inventory and Monitoring Program (I&M) has developed mapping tools that can be used by NPS employees. Capabilities include: an online interactive smart-map, data-subscription services (for ArcGIS and Google Earth), a map library for parks, and a repository for standard operating procedures and educational material relative to geospatial science and services.

What does this mean for NPS employees? **An easy way to create professional-looking maps and graphics to help communicate a sense of place; as well as increased visibility of the science and management activities taking place in the parks.**



Map homepage for the Pacifc island Network and your gateway to powerful mapping technology.

All of this without installing and learning complex software. Just open your web-browser to http://pacn.maps.nps.gov (NPS computers only) and explore the homepage for this increasingly rich map content. Although this program was funded by I&M, it has been designed with the intent to integrate knowledge from all NPS personnel for interpretation, analysis, and management. This service will continue to evolve with technology and, most importantly, as more users begin to coordinate data and requirements with GIS (Geographic Information Systems) personnel.

With the implementation of this web-based service, parks have increased access to maps with the capacity for real-time layer updates, data-feeds (such as earthquake or tsunami information), map creation and printing, and reporting (coming soon). The commercial technology behind this service includes: Microsoft SQL Server as the relational database, ESRI's ArcGIS Server to provide core web GIS capability, and Geocortex Essentials (Latitude Geographics) as a presentation and management tier.
So get mapping!

—B. McMillan, NPS GIS Specialist

Along the Edge of the Earth

A coastal inventory of Hawaii's national parks.

What do we do if the coastlines of Hawaii's national parks are exposed to an impact like an oil spill? What sort of information is needed to inform management actions? Staff at many national parks have been recently confronted with these types of questions. Often we have had little basic information about coastal resources other than the longstanding knowledge of Hawaiians as reflected in the many descriptive names for coastal areas. National parks in Hawaii have coasts with diverse natural and cultural resources, many of which occur on and around the intertidal zone. This zone is special because it is submerged twice daily by high tides, and alternately exposed to air during low tides.

Why take an inventory?

Coasts contain or provide many resources including traditional food gathering, fish ponds, temples, and other cultural sites. The coasts are also home to numerous plants and animals, some native or endemic (occuring only within a given area). An inventory of the resources on the coasts provides a point of reference from which to assess future changes in resources.

Coasts face many natural and anthropogenic (human-caused) threats, some more dramatic than others. The Deepwater Horizon oil spill in the Gulf of Mexico impacted 550 miles of coast including many national park and USFWS refuge coasts http://www.fws.gov/home/dhoilspill/. More than 600 National Park Service employees from 120 parks and 15 offices worked on the Gulf spill between April 20-Oct. 20, 2010. Over 918 tons of oiled debris was removed from Gulf Islands National Seashore alone http://www.nps.gov/aboutus/oil-spill-response.htm.

Hawaii's national parks coasts are in many ways more vulnerable than parks elsewhere due to remoteness, rough sea conditions at certain times of year, high vessel traffic, and limited response capabilities.

Threats or impacts to coasts are often cumulative and interact to compound a serious problem especially in the context of global climate change. This is especially true as coasts undergo increasing sea levels, water temperatures, and acidity. Some coastal resources will be lost or submerged and the coastline will move further inland. Threats other than oil spills and climate change include: overfishing/resource extraction, vessel groundings, trampling/physical damage, pollution, soil runoff and sedimentation, and other land use effects.

How do we prepare for coasts at risk?

A key element of effective response preparedness is science-based information on resource condition. A recent coastal inventory project provided a baseline of coastal resources in Hawaii national parks. Information on coastal geology, biology, human uses, and physical drivers (e.g., wind, waves, tides) was collected using basic 18th century methods; supplemented by modern technology, including digital cameras and GPS.

Scientists walked or flew (Hawai'i Volcanoes NP) over all park coasts. The coasts were divided into segments based on major geological and biological features like substrate type (bedrock, boulder, cobble, sand, etc.), mineralogy (e.g., volcanic basalt, carbonate, or limestone), slope, coast orientation, or areas covered by a predominant species.

Data collected from each park was entered into a GIS database which allows park managers and others to easily search through results of the inventory. For example, if you want to know how much sandy beach is in a particular park and where it occurs, or find out where certain coastal features or species occur, you can quickly locate this information in the database. Associated graphs, tables, photos, and maps will help you on your quest.

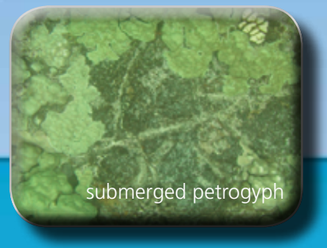
Now that we have hundreds of photographs, detailed maps, and resource data, we will always know what the 53 total miles of coastline in Hawaii's national parks were like at the time of the survey. In the event of a gradual change (e.g., climate change) or a castastophic disaster (e.g., oil spill) we will have baseline knowledge of our finite and precious coastal resources.

— L. Basch, NPS Marine Ecologist

— G. Kudray, NPS PACN Program Manager

Steep volcanic cliffs and headlands are the most common type of coast in Hawaii parks followed by: low-slope basalt intertidal benches with tide pools; boulder; cobble; pebble; carbonate white, mixed white and black sand, and volcanic black sand beaches.

Park coasts preserve unique cultural resources and landscapes such as prehistoric and historic house and burial sites, trails, tidepools, temples, petroglyphs, and fish ponds.



Biodiversity, vertical distribution, and abundance of coastal organisms is generally higher on coasts exposed to strong wave action.

Fortunately, only a few invasive species were found on park coasts (two algae, a mangrove, and a barnacle). They currently pose a relatively low threat to park coastal habitats, but this may change quickly.

Some parks have considerable coastal species richness including: land plants, marine algae, marine invertebrates, marine fishes, birds, sea turtles, and marine mammals. Total coastal species seen in park: Hawai'i Volcanoes National Park (103), Kaloko-Honokōhau National Historical Park (109), Kalaupapa N.H.P. (116), and Pu'uhonua o Hōnaunau N.H.P. (96).

Park coasts provide critical habitat for two sea turtles (green and hawksbill), the endangered Hawaiian monk seal, birds, corals, sharks, and many other rare, threatened, or endangered plants and animals.

Park coasts preserve some of the finest tidepool habitats, species assemblages, and resources in the Hawaiian archipelago.

Where the Wild Plants Are

PACIFIC ISLAND VEGETATION MAPPING CHALLENGES CONQUERED THROUGH COOPERATION

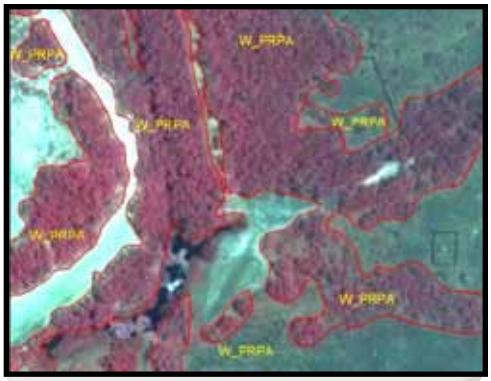
Pacific island national parks present unique vegetation and land use mapping challenges due to geographic isolation, high endemism, sensitive cultural landscapes, and lack of vegetation classifications and legacy data. Accurate, vegetation base maps are necessary to inform natural and cultural resource management within parks. In 2007, the Pacific Island Network Inventory and Monitoring Program, in collaboration with the NPS National Vegetation Inventory Program, developed an innovative strategy to address mapping needs relying on park cooperation, regional vegetation experts, vegetation classification specialists, and two mapping contractors.

Mapping methods differed between small and large parks. For five smaller parks in the Pacific Island Network, manual image interpretation and intensive field work were efficient. In the four larger parks, field work was combined with large landscape-scale techniques. Field work for all parks was conducted jointly by park and I&M staff. Once completed, draft maps were presented to park staff for review which included an explanation about the methods and vegetation type classification. Involving park staff throughout the process increased the park buy-in and usefulness of the mapping products to park management.

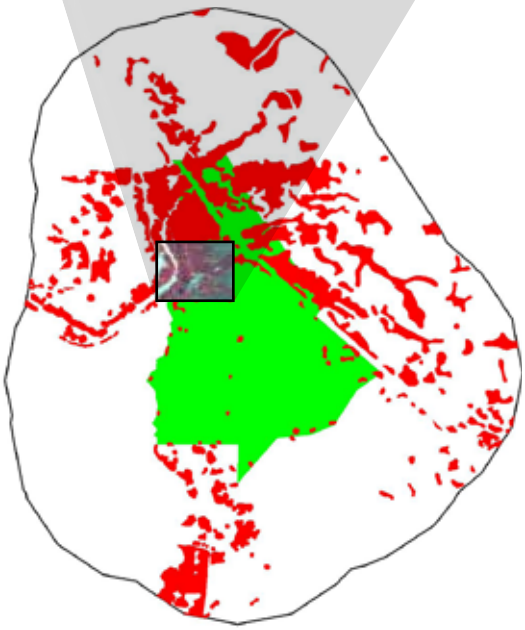
Vegetation Mapping Aids Park Management:

Pu‘ukoholā Heiau National Historic Site (PUHE) encompasses approximately 80 acres on the western coast of the island of Hawai‘i. The park was established to preserve and protect important ancient Hawaiian heiau (temples) and other historical and cultural features. PUHE is situated on a lava field and supports 104 vascular plant species including examples of coastal strand and wetland native plants that are actively managed. Most of the upland vegetation has been extremely altered over the years and invasive species and vegetation types dominate. Invasive plant species are considered a threat for some cultural resources. The two most abundant invasive plant species within the park are buffelgrass (*Pennisetum ciliare*) a bunchgrass, and kiawe (*Prosopis pallida*) shrubs and trees. Buffelgrass has the capacity to quickly cover and obscure cultural rock features. The buffelgrass plant community occurs on over 50% of the landscape. The kiawe community is also widespread. The roots of kiawe trees threaten cultural resources by damaging the integrity of rock walls and house structures. Both communities are fire-prone and are attractive to feral goats.

Biotechnician Corie Yanger sampling vegetation within the abundant kiawe community.



Photographic signature of kiawe in a section of PUHE. The red boundary lines correspond with the kiawe communities in the image below.



PUHE boundary depicted in green with the kiawe communities in red.

Plant community boundaries were delineated by identifying photographic signatures for each type (middle map) and generating polygons (lower map). Community boundaries allow park staff to prioritize sites for management and provides a starting point to document further invasive species encroachment. This project represents the best efforts put forth by a multi-disciplinary team including: GIS contractor Dan Cogan (Cogan Technology, Inc.), classification ecologist Keith Schulz (NatureServe), and many NPS resources staff.

Accurate and current vegetation maps aid park managers in the prioritization of resource protection by identifying sites or habitats likely to contain key resources (e.g., rare plants, wildlife habitat, or petroglyphs) and/or key threats (e.g., wildland fire potential or likely vector areas for invasive species).

The vegetation mapping inventory is a snapshot in time, and a baseline where current plant communities are described and mapped. By comparing these data with future products, park managers will be able to quantify vegetation changes in and around parks.

— A. Ainsworth, NPS Botanist
— D. Cogan, GIS Specialist/Contractor