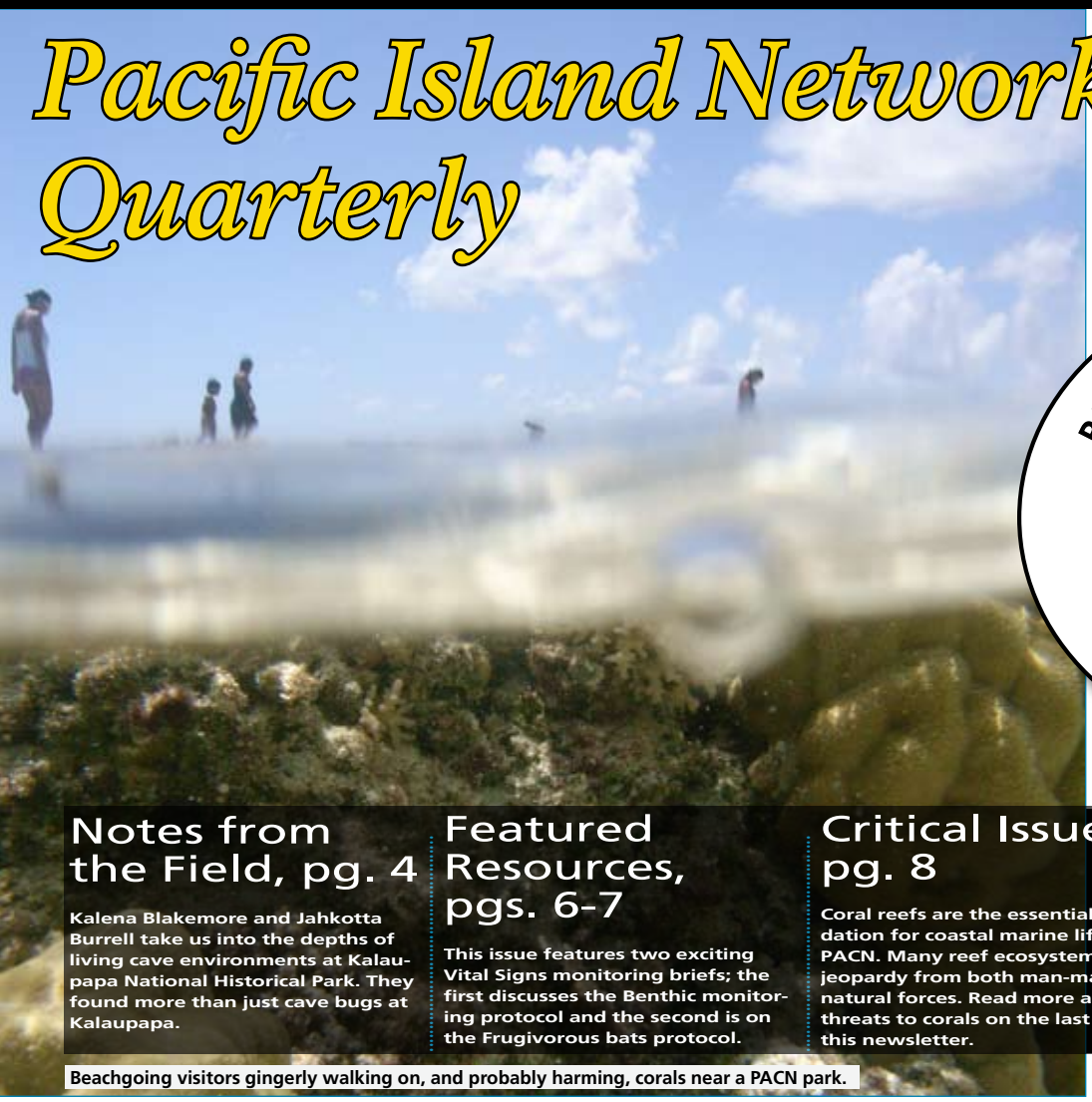
Pacific Island Network Quarterly

Quarterly Newsletter of the
Pacific Island Network
Inventory & Monitoring Program
Oct.- Dec. 2007, Issue no. 10



Notes from the Field, pg. 4

Kalena Blakemore and Jahkotta Burrell take us into the depths of living cave environments at Kalaupapa National Historical Park. They found more than just cave bugs at Kalaupapa.

Featured Resources, pgs. 6-7

This issue features two exciting Vital Signs monitoring briefs; the first discusses the Benthic monitoring protocol and the second is on the Frugivorous bats protocol.

Critical Issue, pg. 8

Coral reefs are the essential foundation for coastal marine life in the PACN. Many reef ecosystems are in jeopardy from both man-made and natural forces. Read more about threats to corals on the last page of this newsletter.

Beachgoing visitors gingerly walking on, and probably harming, corals near a PACN park.

Aloha - Talofa - Greetings
Tirow - Hafa adai

The Pacific Island Network (PACN) Inventory and Monitoring program would once again like to wish all of our associates, readers, and friends a happy holiday season and best wishes for the new year. 2007 has been an exciting, albeit challenging, year for us as we have seen fellow staff come and go, made programmatic adjustments, and engaged in exciting science. We look forward to working with many of you in 2008 as we begin to implement some of the Vital Signs monitoring protocols. You may see us in your PACN parks in the near future. If you do, be sure to stop by, say "hello", and we'll have a chat about our shared natural resources.

Cheers,
The PACN

Hawaiian snow... just in time for the holidays.

Mauna Loa, an active volcano partially located in Hawai'i Volcanoes National Park (HAVO), stands proudly shrouded in a December snowfall. HAVO is a rare gem of the National Park Service as it embodies 50% of the world's climatic zones in a single national park.

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The National Park Service 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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***NOTE:** Unless indicated all photos and articles are NPS.
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Inventory Update

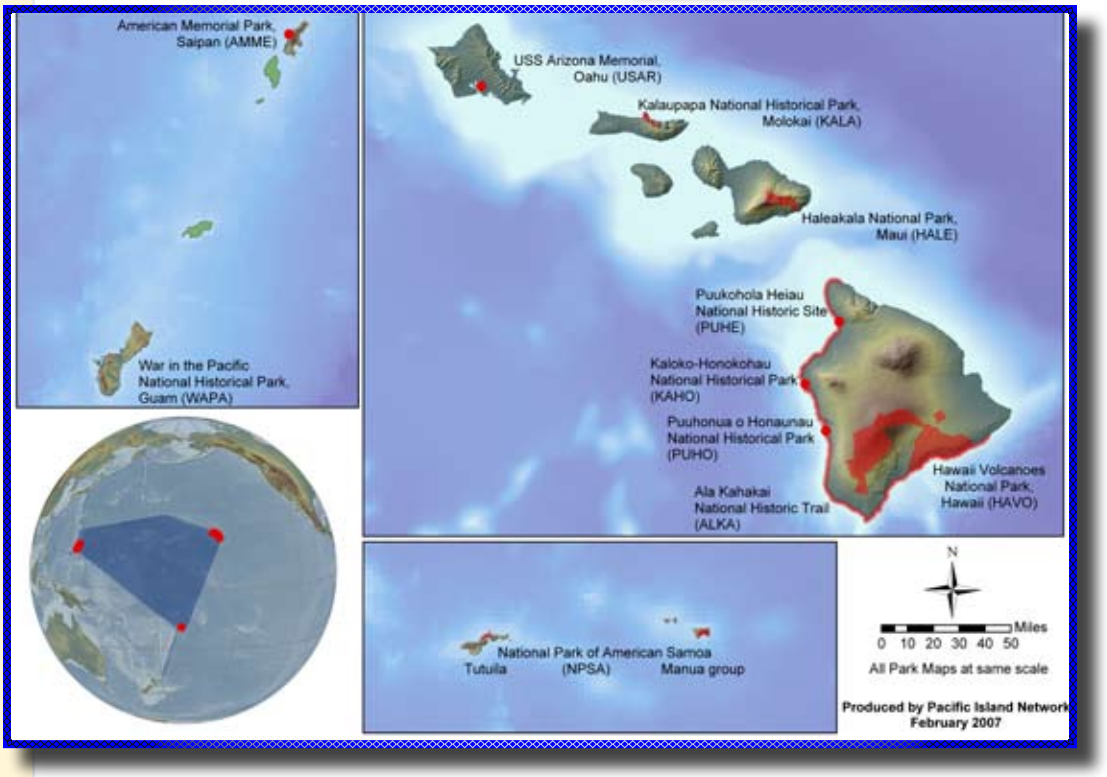
Progress Report for Geologic Inventories

The NPS Geologic Resource Evaluation (GRE) program is an ongoing inventory that provides parks with digital geologic maps, geologic evaluation reports, and a geologic bibliography.

The geologic map for the National Park of American Samoa has been available for a few years. In 2007, GRE added maps for the following national parks in Hawaii: Kalaupapa National Historical Park, Haleakalā National Park, Ala Kahakai National Historic Trail, Pu'ukoholā Heiau National Historic Site, Kaloko-Honokōhau National Historical Park, Pu'uhonua o Hōnaunau National Historical Park, and Hawai'i Volcanoes National Park.

Completion of digital maps for War in the Pacific National Historical Park (Guam), and American Memorial Park (Saipan) is planned for 2008. In addition, GRE is planning on completing the geologic evaluation report for the National Park of American Samoa. These reports accompany the maps and are specifically intended to be relevant and useful for park resource managers.

Digital geologic maps for the national parks are available to the public online through the NPS Data Store at http://science.nature.nps.gov/nrdata/



Map of the 11 Pacific Island Network park units

Data Management — GIS Day 2007 in Hawaii

On Wednesday, November 14, 2007, the world celebrated the 9th annual GIS Day. Held as part of National Geographic Society's Geography Awareness Week and Geography Action! initiative, GIS Day is an international grassroots event to promote geographic literacy in schools, communities, and organizations. Traditionally, every year on GIS Day GIS users open their doors to the general public and host a variety of events that allow people to see and experience GIS firsthand. This year, with the theme "Discovering the World Through GIS", nearly 800 events were scheduled in 83 countries around the world and all 50 U.S. states participated. Events included corporate open houses, hands-on workshops, mapping technology expos, and GIS conferences on many school/college campuses.

To join in the celebration, I&M hosted a map and poster gallery at Hawai'i Volcanoes National Park. An information table was set up to display literature and handouts, along with ArcGIS and ArcScene project demos on laptop computers. Park visitors enjoyed free maps and learned more about how GIS is used to manage park resources.

Park visitors, teachers, scientists, and park staff stopped by on November 14 for the GIS Day Interactive display at Hawai'i Volcanoes National Park Kilauea visitor center. This display was the only one registered in Hawaii and, therefore, made Hawaii the 50th state to participate.

Big thanks to Jim Gale (Chief of Interpretation), Kupono McDaniel (Park Ranger), and Tom Hoots (Chief of Maintenance) for their assistance in making GIS Day 2007 a fun and successful event at HAVO. Special thanks to Jessica Dougherty (PUHO Archeologist) and Paul Berkowitz (USGS-RCUH GIS Tech) for running the GIS demos and answering questions at the information table.

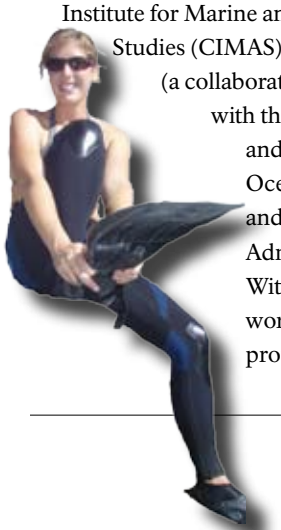
For more information about GIS Day, log on to www.gisday.com or contact Viet Doan at viet_doan@contractor.nps.gov.

Featured Staff

Lindsey Kramer

Lindsey began as an aquatic and marine biotechnician with the Pacific Island Network program in August 2007. She received a B.A. in biology from Oberlin College in 2002, and an M.S. in marine science from the Dauphin Island Sea Lab, Alabama in 2005. Her thesis work focused on the effects of establishing marine reserves on inshore coral patch reef communities.

In 2005, she began work with the Cooperative Institute for Marine and Atmospheric Studies (CIMAS) in Miami, Florida (a collaborative institute with the Univ. of Miami and the National Oceanographic and Atmospheric Administration). With CIMAS, she worked on numerous projects focusing on the status and restoration of the recently federally threatened coral species, *Acropora palmata*. She participated in long-term monitoring projects for this species in Biscayne Bay, the Florida Keys, Navassa Island and Curacao, and helped establish what will hopefully become a public monitoring database for the Caribbean region.



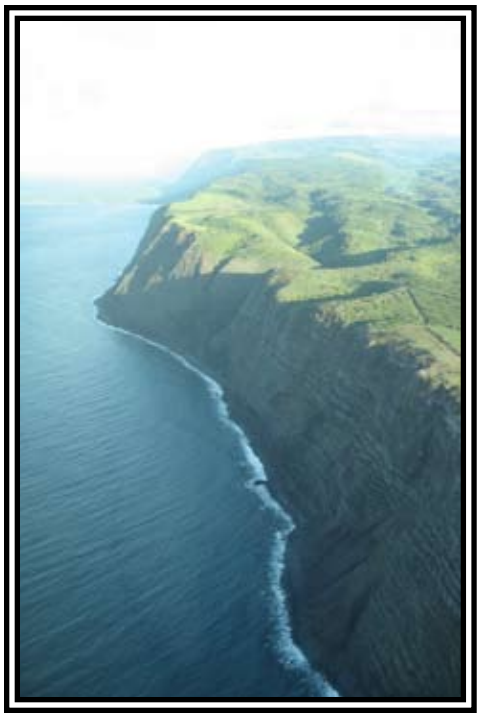
Now having moved to the other side of the nation, she has begun working in the Pacific with the National Park Service Inventory and Monitoring program. Lindsey is involved with several Vital Sign monitoring protocols including freshwater and marine water quality, freshwater animal communities, benthic marine communities, marine fish, groundwater, and anchialine pool communities.

Donna Ashenmacher

Donna joined the Inventory and Monitoring staff in May of this year as the Administrative Technician. She previously worked with the Hawai'i Volcanoes National Park in administration both in the Resource Management and Maintenance Divisions. When not at work Donna enjoys gardening, reading, and traveling.

Notes From the Field - Spelunking at KALA

The sculpted green sea cliffs that hug the Kalaupapa Peninsula were our first glimpse of what was to be our Kalaupapa National Historical Park (KALA) adventure. Located on the northern tip of Molokaʻi, the peninsula consists of a basaltic shield of revived volcanism originating from the Kauhakō Crater. Erupting 300,000 years ago, this crater is responsible for creating the peninsula; the youngest portion of this 265 square mile island. However, the geological forces that created this peninsula have long since gone, leaving behind a view that can only be described as breath-taking. Even as we



Nature's elements have carved amazing features in the landscape, including caves and this majestic 2000 foot tall pali (cliff) off the north coast of Moloka'i.

bounced between the tortuous fingers of turbulence, gripping the thick black seatbelts of our tiny Cessna, we couldn't help but be mesmerized by the view provided by the petite window of our "bush plane." The sharp green bosoms of Hālawa, Pāpalaua, Wailau, and Pelekunu seemed to beckon us to this special place. A place which was chosen as a Hansen's disease colony in the mid-19th century because of its isolated nature.

Speckled with quaint houses (Kalaupapa is still home to Hansen's disease patients), coconut palms, and a barrage of beach cats, we felt as if we had taken a step back in time with our first few steps off of the plane. "Welcome to Kalaupapa," our NPS Cultural Resources Management contact, Jennifer Cerny, greeted us with the kind of aloha that makes you feel like you are returning home. After familiarizing us with our living quarters (we stayed in the Bay View Dorms, a wonderful historic building with a fantastic view), we set out to complete our task of inventorying Kalaupapa National Historical Park caves.

Spelunkers J. Burrell and K. Blakemore

In order to fulfill I&M and KALA's needs, 17 caves were selected for inventory purposes. A pre-established protocol developed by Hawai'i Volcanoes National Park (HAVO) was followed during the inventory process.

Here we are peeping out from the depths of a Kalaupapa cave entrance.

The cave inventory consisted of identifying and documenting resources. Resource types included:

- **Biological resources – Cave adapted flora and fauna**
- **Geological resources – Stalagmites, mineral deposits, etc.**
- **Paleontological resources – Fossils, charcoal, etc.**
- **Archeological resources – Historic and prehistoric structures and artifacts**

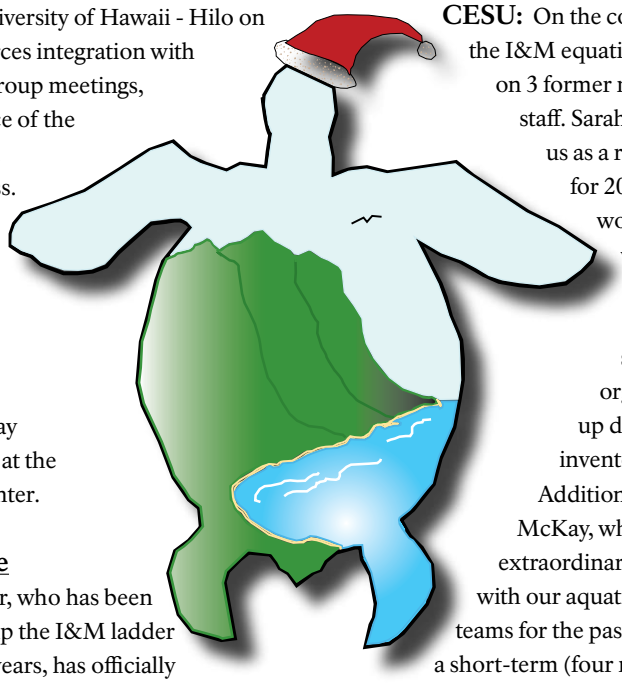
Our field work involved mapping, photographing, and taking inventory of resources in each cave. During our two weeks of cave inventory work in November and December 2007, we identified several fauna species. One in particular, the *Oliarus kalaupapae* (pictured at bottom), was an exciting discovery because it is only found in Kalaupapa caves. Other species observed included: *Argiope appensa*, *Holocnemus pluchei*, *Salticidae* spiders, and *Periplaneta americana*. Data collected during the inventory will assist the National Park Service, Bishop Museum, and other scientists with future cave research. In January, we will continue to inventory cave life in other Hawaii national parks.

— J. Burrell and K. Blakemore

Many generations of adaptation to cave environments have aided this plant hopper, *Oliarus kalaupapae,* in its dark cave life.

Outreach and Staffing Update

Outreach I&M staff and science communicators Tim Carruthers and Jane Hawkey from the University of Maryland Center for Environmental Science, Integration and Application Network are continuing their effort to create conceptual models with and for the West Hawai'i parks. The project is slated to be finished by the end of January. Also, an I&M cooperator conducted a lecture to graduate students at the University of Hawaii - Hilo on the cultural resources integration with Vital Signs focus group meetings, and the importance of the results to the I&M monitoring process. Finally, I&Mers Viet Doan and Paul Berkowitz, along with Jessica Dougherty from PUHO conducted a successful GIS day interactive display at the HAVO visitor's center.



Staffing Update

NPS: Kelly Kozar, who has been working her way up the I&M ladder for the past three years, has officially become I&M's new Data Manager. Congratulations, Kelly.

Graduate student Chris Todd has begun conducting field trials for the Insectivorous bat protocol team. For the next several months, Chris will be setting up bat monitoring equipment and collecting data for protocol development.

Penny Latham, PWR Regional Coordinator and acting PACN Program Manager, has moved back to her office in Seattle. She plans to return to HAVO for a short stay in February.

CESU: On the cooperator side of the I&M equation, I&M hired on 3 former members of our staff. Sarah Nash will join us as a regular employee for 2008. She will be working closely with our data management and inventory staff to help organize and clean up databases and inventory reports. Additionally, Danielle McKay, who has been an extraordinary volunteer with our aquatic and marine teams for the past year, has taken a short-term (four month) position as an RCUH cooperator working on the Water quality protocol. Finally, I&M has once again called upon the expert statistical services of David Schneider to help guide statistical methods and analysis of data sets for several protocols.

Calendar • Oct. - Dec., 2007

September 27-29= I&M participates in a natural resources display with HALE staff at the Maui County fair.
October 4-5= Science communicators from the University of Maryland work directly with West Hawaii parks.
October 9= Draft AARWP submitted to Regional Coordinator.
October 17= Lecture on I&M to graduate students at UH Hilo.
November 14= I&M led GIS Day celebration at HAVO.
November 22= Thanksgiving
December 3-7= Staff attended contracts training in New Mexico.
December 14= Draft science communications plan submitted to Regional Coordinator.
December 24-25= Holiday.

Games Corner

Which climatic zones are represented in Hawai'i Island PACN parks?

The Big Island of Hawaii lays claim to at least 10 of the 12-14 (under debate) climatic zones in the world. Of those 10 climatic zones, 9 are located in Hawai'i Island national park units. Can you identify the park unit by the grouping of climatic zones of which it is comprised ?

Climatic Zones*

1. **Steppe**
   Savanna
2. **Rainforest**
   Continuously Wet & Warm
   Mediterranean Summer Cool
   Mediterranean Summer Warm
   Periglacial
   Tropical Summer Dry
3. **Desert**
   Steppe
4. **Rainforest**
   Savanna
   Tropical Summer Dry
   Steppe
   Desert
5. **Rainforest**
   Savanna

Hawai'i Island National Park Units

A. **Ala Kahakai NHT**
B. **Pu'uhonua o Hōnauau NHP**
C. **Hawai'i Volcanoes NP**
D. **Pu'ukoholā Heiau NHS**
E. **Kaloko-Honokōhau NHP**

*Sanderson, M. et al. *Prevailing Trade Winds: Weather and Climate in Hawai'i.* Univ. of Hawaii Press, Honolulu 1993

ANSWERS:

1= E, 2= C, 3= D, 4= A, 5= B

Bonus Question

Q: Which is the only climatic zone found on Hawai'i Island, but not in a PACN park unit?

A: Tropical Monsoon (found on Hāmākua coast)

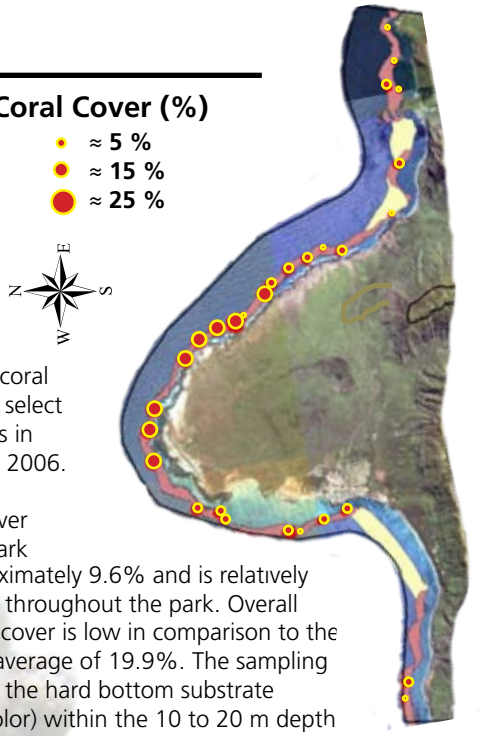
Benthic Marine Monitoring

Network Parks Where Resource Is Monitored

- Kaloko-Honokōhau National Historical Park (KAHO)
- War in the Pacific National Historical Park (WAPA)
- Kalaupapa National Historical Park (KALA)
- National Park of American Samoa (NPSA)

Importance: Corals Build Marine Reef Ecosystems

Coral reefs are diverse, complex, and important components of shallow fringing and barrier reef ecosystems in Pacific Island Network (PACN) parks. Coral reef ecosystems are centers of biodiversity due to the habitat complexity they provide to different organisms. The reef provides substrate and microhabitats in which sessile and motile organisms live and feed. The architectural complexity is shaped by a combination of many factors, including: nutrient availability, salinity, light, substrate type, temperature, and exposure to wave action. Reef building corals are sensitive to environmental degradation. Therefore, they are good indicators of overall health for nearshore marine ecosystems.



Percent coral cover at select locations in KALA in 2006. Average coral cover in the park is approximately 9.6% and is relatively uniform throughout the park. Overall percent cover is low in comparison to the Hawaii average of 19.9%. The sampling frame is the hard bottom substrate (coral color) within the 10 to 20 m depth contour. The black outline shows the marine boundary and underwater areas shaded in yellow are sandy habitats.

Long-Term Monitoring

The National Park Service (NPS) initiated the marine benthic monitoring program by surveying coral reefs in KALA in 2006, and began surveying reef communities at NPSA and KAHO in 2007. Ecologist led field teams navigate by boat to 30 randomly selected sites within each park using a GPS system. Once over a site, the dive team descends to the reef below to photograph the benthic community, measure the topographical complexity, and examine coral settlement. The images are processed to derive percent cover for various substrate types and determine the frequency of disease and/or bleaching. This program will allow the NPS to detect significant trends in the benthic community in response to changing climate, coastline development, and management activities.

Monitoring Objectives

- Determine long-term trends in percent cover of sessile marine macroinvertebrate (corals, sponges, etc.) and algal assemblages on hard substratum, between 10 and 20 meters depth.
- Examine trends in benthic topography (rugosity).
- Determine trends in settlement rate of hard corals to artificial surfaces.
- Investigate long-term trends in the incidence of coral disease and bleaching.

Management Applications

- Identify unique benthic assemblages and areas of high biodiversity within the parks.
- Document long-term trends in benthic community cover and structure for climate change assessments.
- Examine coral settlement patterns to determine larval source and sink areas around the parks.
- Provide early warning system for disease and bleaching events as well as the detection of invasive species.

A pictorial taste of the PACN's diverse and complex coral reef ecosystems.

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Frugivorous Bats Monitoring

Network Parks Where Resource Is Monitored

- National Park of American Samoa: Tutuila and Ta'u Islands (NPSA)

Importance: Ecologically and Culturally Significant Species

Some species of frugivorous bats, also known as flying foxes, are indigenous to oceanic islands in the South Pacific. On geographically isolated islands with low biodiversity, fruit bats may be ecologically important in maintaining tropical forest ecosystems through pollination and seed dispersal. In American Samoa, fruit bats or pe'a hold a key position as likely ecological indicators of forest ecosystem health and environmental change. Fruit bats have historically been subjected to commercial hunting, habitat loss, and climatic disturbances leading to population declines. Hunting still occurs in American Samoa (despite a ban in 1991) as the indigenous Fa'asamoa culture regards fruit bats as traditional food. The pe'a is depicted in Samoan folklore and symbolized in cultural art forms as a stylized letter 'W'. This symbol can be found on tapa cloth, pottery, and in tattoos.

White-naped fruit bat colony at NPSA. This species is called pe'a fanua, or "fruit bat of settled lands", by Samoan's due to this bat's propensity to fly into human settlements and eat agricultural fruits.

Long-Term Monitoring

Two fruit bat species reside in American Samoa: the Samoan fruit bat (*Pteropus samoensis*), listed by USFWS (2005) as a Species of Concern, and the more common white-naped fruit bat (*P. tonganus*). Preliminary surveys suggest that Samoan fruit bats occur in greater numbers in the Tutuila park unit than elsewhere on the island. Monitoring for both species will be conducted primarily in this park unit, although roost sites in the Ta'u park unit will also be included. Long-term monitoring of these species in NPSA is critical to documenting population changes and identifying environmental stressors that affect populations and habitat.

Monitoring Objective

- Determine current status and long-term trends in relative abundance and distribution of fruit bats in NPSA.

Management Applications

- Provide information and decision support about bat populations to park management.
- Identify negative trends in population abundance and distribution, and assess needs for enhanced species protection.
- Improve understanding of fruit bat ecology in the park.

The Samoan fruit bat is known as pe'a vao, or "fruit bat of the forest", as it depends on mature primary forest for foraging and roosting. The pe'a vao tends to roost alone or in small groups whereas the pe'a fanua roosts in colonies.

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Resource website: http://science.nature.nps.gov/im/units/pacn/monitoring/vs_frugivorous_bats.cfm

Coral decline in the Pacific Islands

Top left: Pieces of dead coral reef scattered on a beach remind us of a habitat lost.
Right: Live corals provide vital fish habitat.

Description: Coral reefs are the ocean's equivalent to terrestrial rainforests. By providing a protective habitat, they offer sanctuary to arguably the most diverse plant and animal communities of any marine system. Fish and invertebrates thrive on coral reefs, particularly areas with high coral diversity, because of the abundant and varied food sources, the variety of niches to inhabit, and the opportunities to reproduce. Coral reefs act as a natural coastal buffer by protecting the shore from erosion and storm effects, and they provide humans with areas to collect fish, invertebrates, and seaweeds for food. Shallow areas for swimming, sandy beaches, and great snorkeling areas are all a result of healthy coral reef communities, and often support Pacific island economies.

Corals are relatively simple colonial invertebrate organisms, yet they are able to create complex coral reef structures. Symbiotic algae, called *zooxanthellae*, live within coral tissue and provide nutrients and oxygen to their host. They are critical to the survival and growth of most reef-building coral species. Corals sequester dissolved calcium carbonate from seawater with their fleshy tentacles, then use this material to construct a protective stony skeleton. Long-term accumulations of this material can result in massive individual coral colonies, and ultimately result in the creation of sometimes kilometer-scale coral reefs.

Threats: Globally, coral communities face many natural and man-made threats, and populations have declined dramatically in the past 30 years. Threats to Pacific island reefs include: global climate change, benthic invertebrate disease, over-exploitation which can lead to altered food webs, destructive fishing practices (blasting and chemical poisoning), and physical damage associated with human visitation (see photo at left). Also, coastal development projects in the Pacific islands are often associated with increased sedimentation, water pollution, and algal blooms on surrounding reefs.

Scientists are scrambling to predict the effects of global climate change on coral reefs. Predictions include: coral reef 'drowning' as a result of sea-level rise and the inability of corals to survive at the appropriate depth, increased incidence of coral bleaching (*zooxanthellae* expulsion from coral tissue) and disease due to heightened sea surface temperatures, physical destruction of coral reefs following more frequent storm events, and elevated seawater acidity resulting in the inability of corals to accrete limestone.

Although many coral reef habitats of the Pacific islands are considered 'pristine' and healthy, such as in the Northwest Hawaiian Islands, human-induced environmental changes threaten all reefs, no matter how remote. Healthy coral reefs remain resilient to acute disturbances, such as infrequent storms, but with chronic disturbances, such as steadily rising seawater temperatures, corals are less capable of full recovery. Without protective or carefully proactive management, coral reefs run the risk of continued decline.

Management: Fortunately, Pacific island national parks and federal marine reserves offer protection to regional coral reef ecosystems. Adaptive management techniques such as fish harvest limits, regulated visitor use, public educational and stewardship programs, as well as careful inventory and monitoring studies help to ensure the ongoing survivorship of coral reefs.

—D. McKay and L. Kramer

Left: Walking on coral reefs crushes and kills the slow growing organisms. This photo was taken near a PACN park. **Above:** A tiny Christmas tree worm (*Spirobranchus giganteus*) makes its home on a coral.