



Pacific Island Network Quarterly

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Pacific Island Network
Inventory & Monitoring Program
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An accurate depiction of historical Hawai'i. Or is it?

This viewshed might have been seen by King Kamehameha I near Pu'ukoholā Heiau. However, landscapes are dynamic and many changes have occurred over this landscape since Kamehameha's time.

Can you find four items in this photograph that would not have appeared 200 years ago? (Answers on page 5)

Notes from the Field page 4

Mariska Weijerman shares her stories of working in the unique ecosystems of anchialine pools in West Hawai'i national parks.

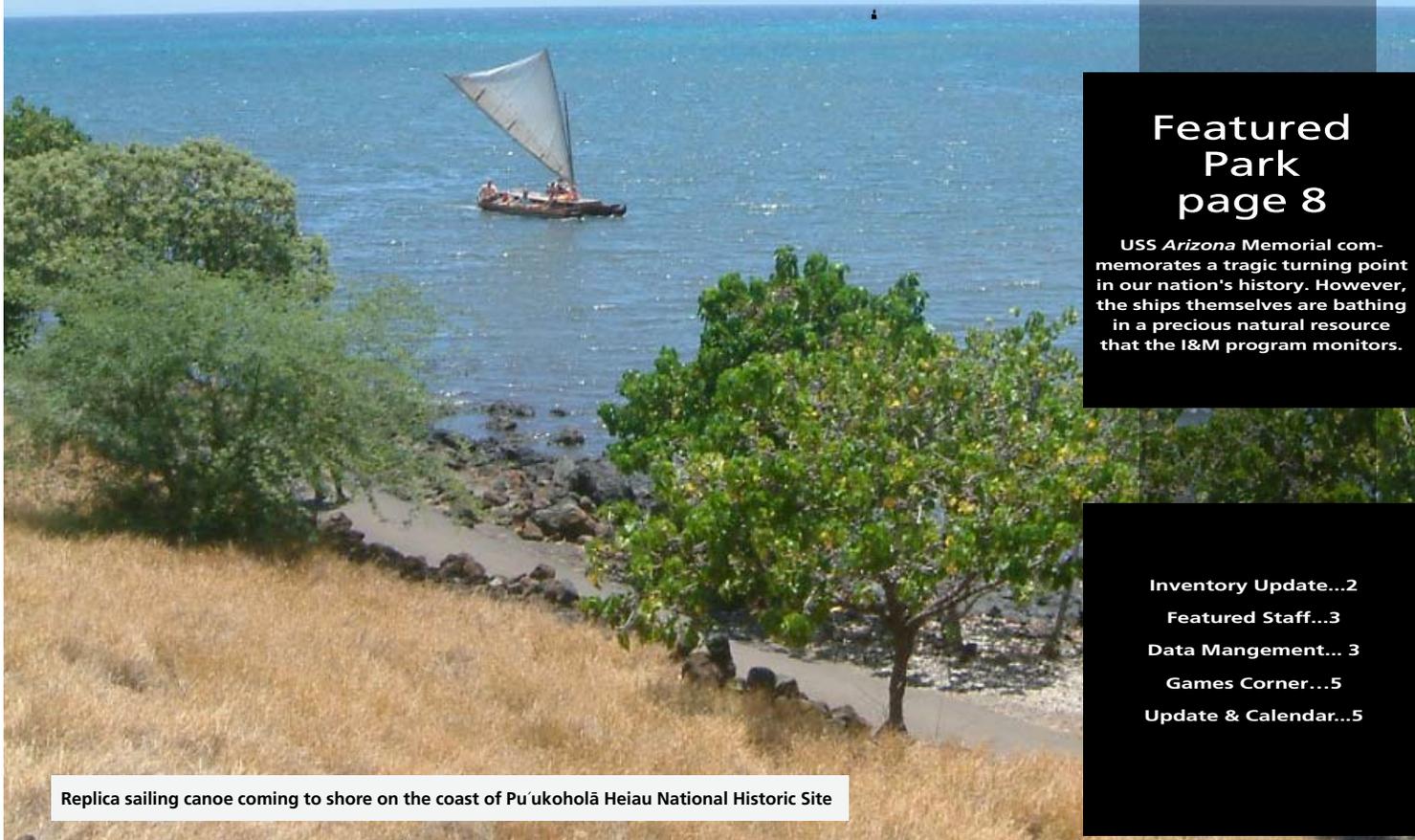
Featured Resources pages 6-7

Natural resources monitoring can be as complex as it is vital to our knowledge of the ecosystems in which we live. This issue features plant communities and the elusive Hawaiian hoary bat.

Featured Park page 8

USS *Arizona* Memorial commemorates a tragic turning point in our nation's history. However, the ships themselves are bathing in a precious natural resource that the I&M program monitors.

Inventory Update...2
Featured Staff...3
Data Mangement... 3
Games Corner...5
Update & Calendar...5



Replica sailing canoe coming to shore on the coast of Pu'ukoholā Heiau National Historic Site



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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

Kalaupapa forest birds — Non-native species outnumber natives 4 to 1

The Kalaupapa forest bird inventory report published in the PCSU technical report series is now available online. The report describes the 2005 inventory following eight transects from sea level to 1280 meters in elevation.

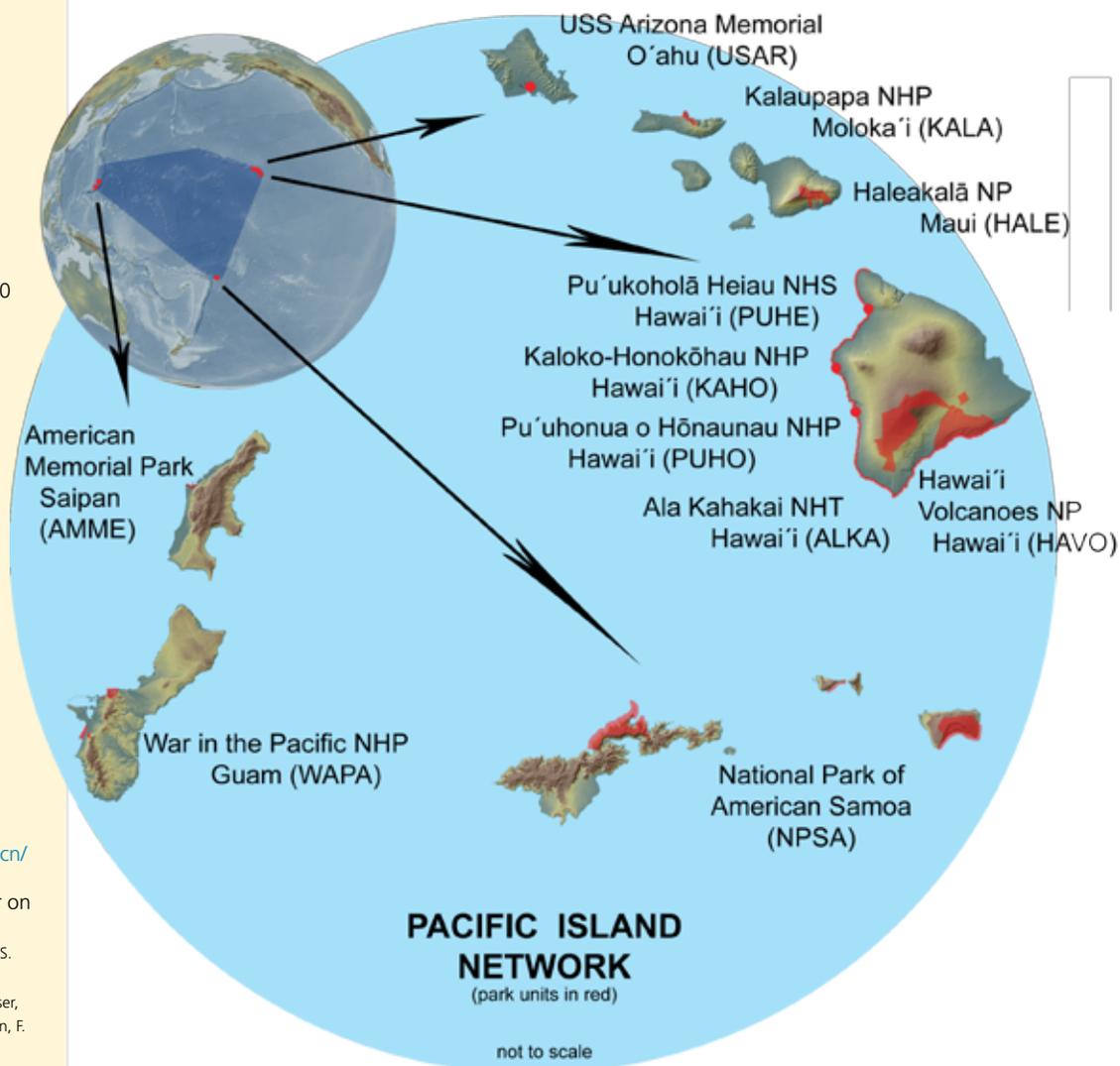
Results indicate that of the nine native species which once inhabited the island, only three remain in the park: 'apapane, 'i'iwi, and Maui 'amakihi. Twelve non-native species were documented during the surveys: barn owl, black francolin, common myna, house finch, Japanese bush-warbler, Japanese white-eye, northern cardinal, nutmeg mannikin, red-billed leiothrix, skylark, spotted dove, and white-rumped shama.

The results from the survey will be used to develop comprehensive monitoring and management plans for avian species in Kalaupapa National Historical Park.

This and other natural resource reports can be found at: <http://www.botany.hawaii.edu/faculty/duffy/techrep.htm>



The white-rumped shama (*Copsychus malabaricus*), seen here with an insect in its beak, is one of the 12 non-native forest bird species now found at KALA.



Data Management

Thumbs-up for ThumbsPlus®, the PACN's photo database tool.

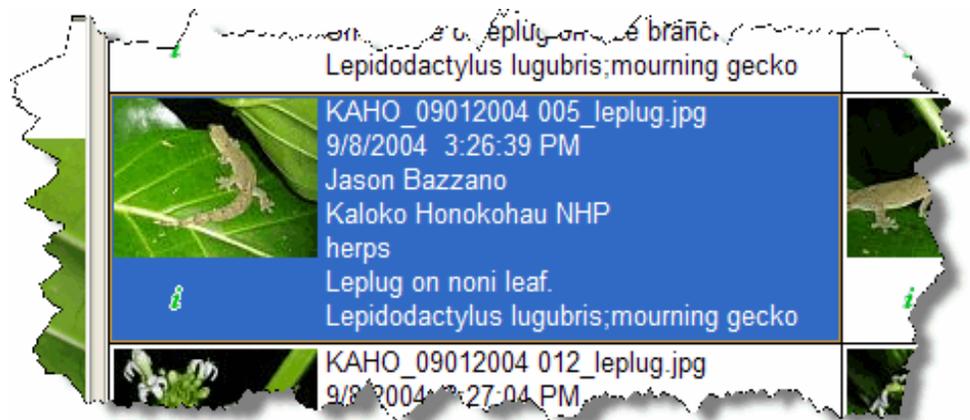


What is that? Who took the photo and where? When was the photo taken and, especially in this case, why?

If this image file has metadata (data about data), then you have the tools to answer these questions. The I&M image database contains more than 10,000 images with ThumbsPlus® software for metadata storage. Some data are automatically stored (e.g., camera make and model, settings) when you upload an image to a database folder. Other metadata need to be added by hand including: title, GPS coordinates, keywords, park code, access constraints,

contact info, and more. Luckily, ThumbsPlus® is a user-friendly program that allows the user to save time by adding identical information to a group of images with little effort.

The thumbnail below from ThumbsPlus® shows metadata categories for displaying the file such as: name, date, time, photographer, location, subject, description, and keywords for each image. These fields can be customized



Featured Staff - PACN Program Manager, Greg Kudray



Greg Kudray joined us earlier this month after five years at the Montana Natural Heritage Program. Greg has an M.S. in Forestry from

Michigan State University and a Ph.D. from Michigan Technological University (MTU) in Ecology. He worked for the Michigan DNR as a park ranger and forester before undertaking his Ph.D. research to develop an ecological classification for the wetland types of Hiawatha National Forest. Later, the Forest funded Greg to complete inventories and mapping, and to establish an inventory database. Greg continued this effort with his own consulting company, eventually creating a field guide to ecosystem types and mapping about 300,000 acres with over 4,000 inventory plots.

Greg was hired in 2003 as the Senior Ecologist with the Montana Natural Heritage Program where he supervised other ecologists and worked on a variety of management-orientated

ecological projects in prairie, riparian, and wetland habitats. Developing wetland and watershed assessment methods and land cover mapping were also focal topics for Greg. He developed regional land cover maps for invasive species modeling and coordinated with the USGS's recent GAP mapping for Montana. Greg established the Montana Wetland and Riparian Mapping Center in 2006 and developed funding partnerships sufficient to map 25% of Montana to USFWS standards.

Greg is excited about building a close working relationship with the parks and continuing the integration of the research aspect of the Pacific Island Coral Reef Program with the I&M Program, which he believes will result in better management recommendations. An early priority is visiting parks, meeting park staff and understanding each park's unique cultural and natural resources. He looks forward to working closely with the Steering Committee and the Board of Directors.

to your preferences and then used for database searches to locate a photo when you need it.

The PACN quarterly newsletter pulls images from this database, but it is also utilized as a resource for posters, brochures, symposia, reports, official websites, protocol development, and as an archive for inventories and scoping visits. With keyword searches in the Thumbs Plus® database, finding the right photo for the right application is a breeze.

The PACN is currently updating and organizing all the images in its database to improve accessibility. By completing the metadata now, we are ensuring that future PACN staff can use this resource efficiently and to its utmost potential.

So, don't forget your metadata! And, by the way, the top left-photo is of a mu (*Monotaxis grandoculis*), caught by Cory Nash in Ka'u, Big Island, HI. The photo was taken Memorial Day weekend 2008 by L. Armendarez. Why?...well, look at those crazy teeth (good for grinding urchins)!



Notes From the Field

Anchialine pools made early human settlement possible in West Hawai'i. Today, these brackish water pools play a special ecological role for other types of life.

When visitors come over and see the rugged, lava covered coastline, they often perceive black rocks and little more. Many people do not understand why biologists are concerned about converting that 'barren waste land' into resorts with nice lawns and golf courses. However, apart from the intrinsic beauty those mauka to makai lava fields possess, unique aquatic ecosystems hide in the cracks and dips of lava close to shore. In the entire US, only the state of Hawaii has these magnificent brackish water anchialine pools. Moreover, of the worldwide estimated 1000+ pools, the great majority are found on the Kona Coast of Hawai'i. KAHO alone harbors about 160 of them. These pools were a reason that early settlement on the coast was possible as they were a primary source for fresh (albeit brackish) water. So not only are they a unique natural resource, but also a very important cultural resource.

So why not build around those pools? The pools are part of the subterranean water cycle. They are supplied with groundwater from upslope and ocean water with the incoming tide. When this water cycle is impacted by massive water withdrawal for human use, by pollutants and nutrients that enter the groundwater, or by interrupting the groundwater flow — the habitat availability for numerous unique and rare species decreases or disappears.

I have just started assembling the I&M Anchia-



Mariska Weijerman (front) and Sallie Beavers record GPS data at Kaloko-Honokōhau National Historical Park.



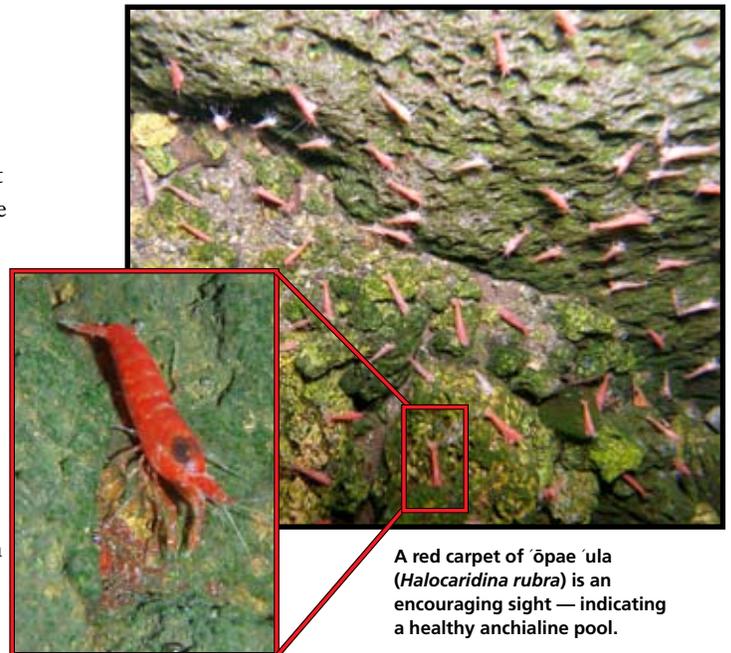
Native algae, *Ulva reticulata*, flourishes in an anchialine pool in Kaloko-Honokōhau National Historical Park. This food algae, sometimes called "sea lettuce", is easily recognized by thin, long, fettuccini-like blades with swiss cheese like holes.

line pool animals protocol. Every so often it is time to get re-acquainted with the material I'm writing about and make a field visit. Bringing lots of water (and extra salt after a near fainting spell), I accompany Natural Resources Technician Lisa Marrack, or PACN Aquatic Technician Lindsey Kramer when she does water quality sampling. Some pools display a red carpet of the characteristic 'ōpae 'ula (*Halocaridina rubra*) or red shrimp. Hiding in the dark corners of the pools loom their predators, a slightly larger red shrimp, the candidate endangered *Metabetaeus lohena*. There are six rare shrimp species documented in Hawaiian pools, four of which are candidates for listing as Endangered Species by the US Fish and Wildlife

Service. Of these, only the *Metabetaeus* have been recorded in PACN parks. I hope that one day I'll be able to add more sightings of these rare unique animals to the tally.

Snails can also be found in the pools, most common is the native pipiwai (*Theodoxus cariosus*). Crustaceans, fish (native and alien), crabs, worms, and insects inhabit the pools as well. A rare endemic pool insect to keep an eye out for

is the orange-black damselfly (*Megalagrion xanthomelas*). This species has only been recorded in or near six pools in PACN parks. It completes its lifecycle in these pools, and therefore depends on them for survival.



A red carpet of 'ōpae 'ula (*Halocaridina rubra*) is an encouraging sight — indicating a healthy anchialine pool.

Anchialine pools vary in size, surrounding vegetation, substrate, visible animal life, and historical use. As they are so unique in the world, I believe that it is a privilege to visit, study, and care for them.

Next time you visit the Hawaiian coastline, respectfully explore and marvel at this unique ecosystem.

— M. Weijerman, Marine Resources CESU Cooperator

Outreach and Staffing Update

Outreach

The PACN science communications staff have completed the first draft of the PACN Science Communications Plan. This plan will outline the future of science communications and outreach in the PACN. It may aid other networks in the development of similar plans as the various national I&M networks begin to establish goals and standards for science communications. Comments on the draft plan are welcomed. Please contact C. Nash (see page 2) for a copy.

I&M Spatial Data Specialist Viet Doan led an introductory GIS workshop at HAVO for local high school students on May 7.

I&M participated in the Pu'uhonua o Hōnauau NHP cultural festival on the last weekend in June. This year, I&M focused on four Vital Sign monitoring themes (anchialine pools animals, invasive plants, groundwater dynamics, and fish harvest).

Staffing Update

NPS: The Pacific Island Network is very pleased to announce the arrival of our new Program Manager, Dr. Greg Kudray. Greg joined our team from Montana where he most recently worked with the Natural Heritage Program. He brings a wealth of experience to the post and we look forward to working together. See *Featured Staff* on page 3 to learn more about Greg.

I&M welcomes Database Specialist, Asia Addlesberger. She will begin work with our data

team in early August.

CESU: Chris Todd is a graduate student at the University of Hawaii at Hilo. He joins I&M for a summer research assistantship which will focus on collecting Hawaiian hoary bat field data as the program fine tunes the insectivorous bats monitoring protocol.

Another UH Hilo student, Heather Gleason, is on a ten week intensive summer internship with I&M. She is assisting the science communications team with developing several outreach products, including festival displays, I&M educational posters for parks staff, and more.

Finally, I&M bids a fond farewell to Risé Hart, whose many years of devoted service to NPSA and the PACN will not be forgotten. We wish her well in her next adventure in Arizona.

Games Corner

The Inventory and Monitoring Program's landscape dynamics monitoring protocol will track landscape changes over time. Can you identify four items that would not have appeared in Pu'ukoholā Heiau National Historic Site's landscape during the reign of King Kamehameha I?



ANSWERS:

1. Kiawe (*Prosopis pallida*) originated in South America, and is now commonly found in dry coastal climates in Hawaii. It was first introduced to Hawaii at a churchyard in Honolulu by a French priest in 1828.

2. Buffel grass (*Cenchrus ciliaris*). Originating in Africa this grass was first recorded in Hawaii in 1935. This species is known to displace the native pili grass which was historically dominant at Pu'ukoholā.

3. Paved section of a path which is part of the greater Ala Kahakai National Historic Trail system.

4. Modern buoy (congratulations if you got this one. It's hard to see).

BONUS QUESTIONS:

Q: Can you identify any other items in this photograph that would not have been part of this landscape 200 years ago?

Q: Can you find plants or items that may have been part of this landscape 200 years ago?

Calendar • April - June, 2008

April 1-4 = Data management staff attended a data conference in Colorado

April = Science communications staff attended web training in Honolulu, and science communications training at Univ of Maryland

May 7 = I&M led GIS workshop for high school students at HAVO

June 2 = I&M presented program to visiting college students at HAVO

June 12 = PACN Board of Directors meeting in Honolulu

June 16 = PACN anchialine pools protocol presented at AAAS workshop in Waimea, Big Island

June 28-29 = PACN conducted natural resources and Vital Signs display at the PUHO Cultural Festival



Insectivorous Bat Monitoring



The 'ōpe'ape'a may be monitored in six PACN parks.

Network Parks Where Potentially Monitored

- ▼ Pu'uhonua o Hōnaunau National Historical Park (PUHO)
- ▼ Hawai'i Volcanoes National Park (HAVO)
- ▼ Kalaupapa National Historical Park (KALA)
- ▼ Kaloko-Honokōhau National Historical Park (KAHO)
- ▼ Haleakalā National Park (HALE) — secondary priority
- ▼ Pu'ukoholā Heiau National Historic Site (PUHE) — secondary priority

Importance: Hawaii's Only Native Terrestrial Mammal

The Hawaiian hoary bat (*Lasiurus cinereus semotus*), known in Hawaiian as 'ōpe'ape'a, is the only native terrestrial mammal in Hawaii. It was listed as an endangered species in 1970 and is protected by law. Insectivorous bats are known to have economic and agricultural importance as predators of insect pests. Due to high metabolic rates and consumption of a diversity of insects, bats play an important ecological role by keeping insect populations in balance. 'Ōpe'ape'a population estimates have ranged from hundreds to thousands of individuals, but these numbers are based on anecdotal and incomplete data. It does appear, however, that the range and numbers of these bats have decreased significantly, as they were historically present on all main Hawaiian islands. It is thought that the islands of Hawai'i and Kaua'i now have the largest bat numbers, while sightings on other islands are uncommon. Current information regarding the natural history and population status of this species is scarce.



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Long-Term Monitoring

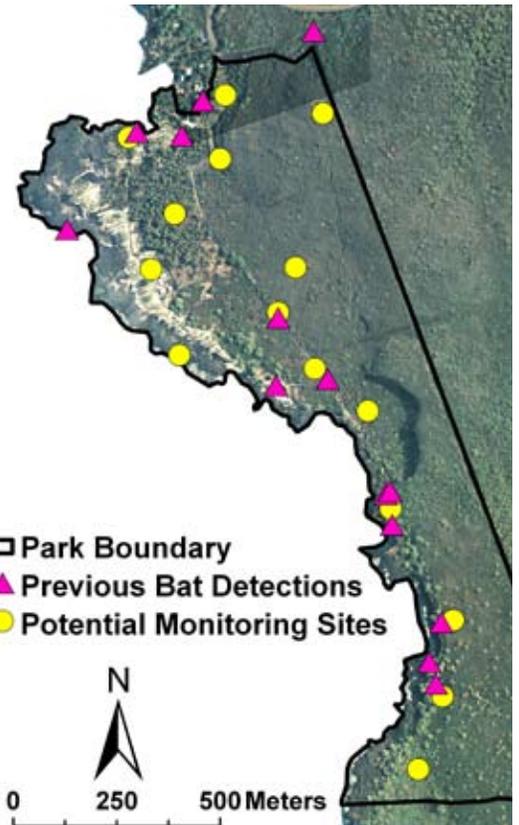
The PACN is developing a monitoring protocol using acoustic bat detectors to survey selected sites in six PACN parks. Bat echolocation calls are observed with AnaBat II detectors and recorded with a ZCAIM, a device which stores data onto a compact flash memory card for later downloading onto a PC. This system is well suited for the implementation of passive, long-term monitoring as it can be left remotely in the field for weeks at a time. Activity patterns will serve as a surrogate for relative abundance, allowing for inferences to be made regarding changes in bat occurrence over time (i.e., monthly, seasonally, annually, and spatially).

Monitoring Objectives

- ▼ Determine status and trends of Hawaiian hoary bat occupancy in selected areas of HAVO, PUHO, KAHO, and KALA
- ▼ Determine Hawaiian hoary bat presence and use of selected areas in HALE and PUHE

Management Applications

- ▼ Improve understanding of Hawaiian hoary bat use of selected park areas by supplementing existing information on seasonality and elevational movements
- ▼ Aid park resource management staff in developing feasible goals and strategies for management of high occupancy/use areas



Hawaiian hoary bats have been detected all along the PUHO coastline. Based on these observations, certain sites are selected for long-term monitoring.



Terrestrial Plant Communities Monitoring

Network Parks Where Resource Is Monitored

- * Hawai'i Volcanoes National Park (HAVO)
- * Haleakalā National Park (HALE)
- * Kalaupapa National Historical Park (KALA)
- * National Park of American Samoa (NPSA)
- * War in the Pacific National Historical Park (WAPA)
- * American Memorial Park (AMME)
- * Kaloko-Honokōhau National Historical Park (KAHO)

Importance: Endemic, Endangered, and Ethnobotanic

Each terrestrial plant community is significant in its own way. For example, in the parks of Hawaii and American Samoa, geographic isolation has led to extraordinary rates of endemism (e.g., 90% of Hawaii's native flowering plants are endemic species). Additionally, Hawaii's wet forests contain numerous endangered species as well as plants used for traditional practices (such as maile, *Alyxia oliviformis*, used for lei making), while its subalpine shrublands contain unique and spectacular plants such as the Haleakalā silver-sword (*Argyroxiphium sandwicense*). The wet forests of American Samoa contain plants of ethnobotanical value and provide food for two rare fruit bats (*Pteropus samoensis* and *P. tonganus*). Similarly, AMME's mangrove (*Bruguiera gymnorrhiza*) forest provides critical habitat for two endangered bird species and a rare tree snail. Within WAPA on the northern half of Guam, the limestone forest represents a highly diverse assemblage of native trees, shrubs, and ferns, many of which are found only in the Mariana Islands.

Long-Term Monitoring

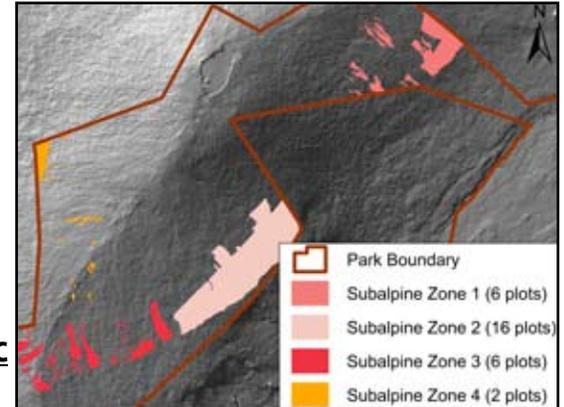
Prior to now, much of the plant communities monitoring in PACN parks has focused on short-term changes due to specific events such as fencing, ungulate removal, or fire. This monitoring protocol takes a long-term, systematic approach to monitoring five plant communities (wet forest, subalpine shrubland, coastal strand, mangrove forest, and limestone forest) from seven parks. In each of these plant communities scientists will establish a series of randomly located plots that will be surveyed every five years for community composition and structure (i.e., species cover and density by layer). This protocol will allow scientists and resource managers to detect significant trends in these plant communities.

Monitoring Objective

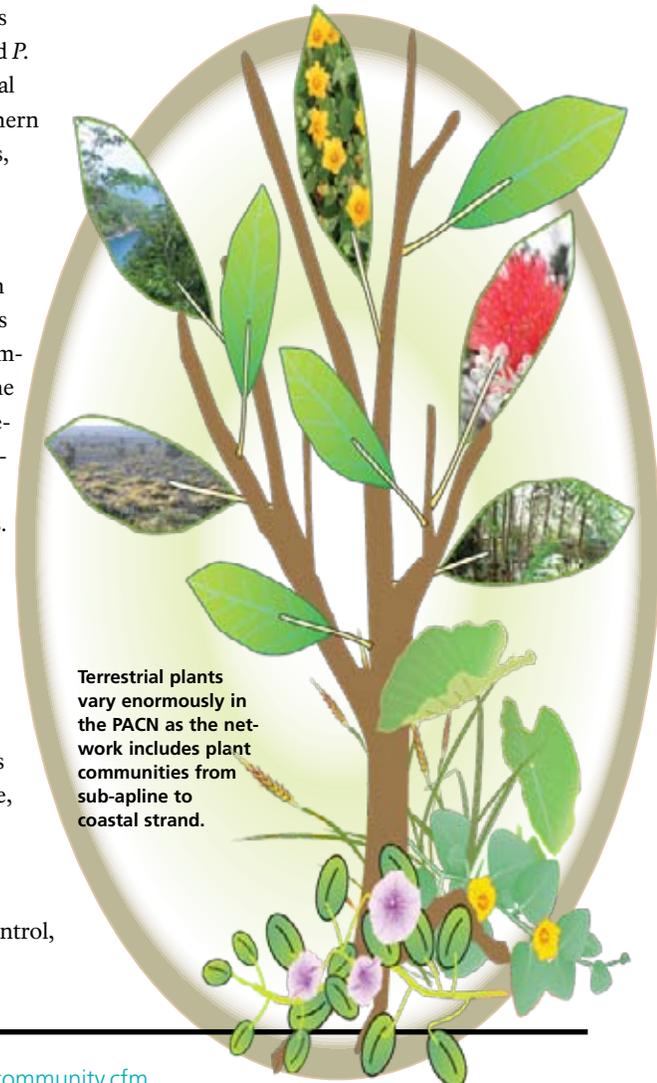
- * Determine the status and trends at 5-year intervals of composition and structure in five terrestrial plant communities

Management Applications

- * Determine health and management needs of five terrestrial plant communities
- * Monitor shifts in community composition and structure due to climate change, catastrophic events (e.g., fires or hurricanes) and other influences
- * Identify rapid increases in invasive species distribution and abundance
- * Identify native species diebacks due to disease, competition, or other factors
- * Evaluate the effectiveness of management actions such as fencing, ungulate control, or pesticide applications



Detailed map of the 4 subalpine shrubland zones at HAVO. The number of sampling plots in each zone (as listed in the legend) is proportional to the area of each zone.



Terrestrial plants vary enormously in the PACN as the network includes plant communities from sub-alpine to coastal strand.

Network website: <http://science.nature.nps.gov/im/units/pacn/>

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



USS Arizona Memorial (USAR)

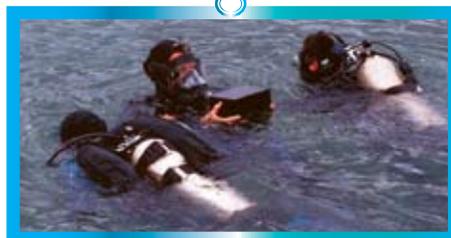
The most terrible, beautiful, and memorable events in life are often results of collision. Two objects meeting firmly in one location, sometimes in harmony, sometimes in brutal tragedy. Love, birth, and war are all products of two bodies coming together. These moments define us as individuals and a society—the story of Pearl Harbor is no different.

As Japan and the United States stared across the Pacific at one another, two world powers, two cultures, and two agendas poised to collide. Their collision would take lives, destroy families, engulf the world in war, and shape history. 2,454 people died on December 7, 1941, but why here, why Pearl Harbor?

Natural Resources: Hawaii sits atop a hot-spot, a phenomenon where surging magma from deep within the earth shoots up into the Pacific Ocean, building a series of islands. This collision of superheated magma and cold seawater created prime real estate for Polynesians and world powers alike. 2,500 miles from North America and 3,500 miles from Asia, Hawaii is the most remote landmass in the world. It was this remoteness that made Hawaii so attractive. Pearl Harbor's expansive, protected waters made it one of the best harbors in the Pacific. This safe harbor linked Asia and North America. Whoever controlled it could control the Pacific. The hotspot placed Hawaii in the middle of nowhere, yet suddenly, in the middle of a world war.

Cultural Resources: The enormous fireball that engulfed the *USS Arizona* on December 7, 1941, signaled the official collision of the United States and Japan. Nearly 900 men who died on the *Arizona* still lay entombed within its hull, beneath the *USS Arizona* Memorial, beneath the feet of 1,600 visitors each day. This memorial, and all of Pearl Harbor remains important to those who survived.

Every day, at least one survivor spends their morning at the *USS Arizona* Memorial Visitor Center. Survivors like Everett and Miyoko Hyland, Sterling Cale, Al Rodrigues, and Bob Kinzler tell stories, answer questions, and help



USAR website: <http://www.nps.gov/usar/>

the world appreciate Pearl Harbor. Coming face to face with a survivor is unforgettable.

Inventory and Monitoring: The *Arizona* has a new adversary—the sea. For nearly seventy years, saltwater has eaten at the *Arizona* while coral encrusts the wreck, weighing down the fragile structure. According to researcher Tim Foecke, the hull of the *Arizona* “eventually will undergo some sort of catastrophic collapse.” The historical significance of the ship and potential environmental damage prompted studying and monitoring.

The water quality and climate of Pearl Harbor will also be monitored. Both of these natural resources Vital Signs will serve as indicators to assess the condition of the memorial's natural treasures—including the health of the water which envelops the great ship's hull

Current Issues in Management: In an effort to connect today's visitors to the people of the Pearl Harbor attack, the National Park Service is building a new \$52 million visitor center opening on December 7, 2010. Its exhibits aim to tell the Pearl Harbor story through the eyes of the people. Reading quotations from men like Captain R.H. English, “The torpedo struck with a violent explosion on the starboard side” and using interactive oral history kiosks, visitors can appreciate what of the men and women of Pearl Harbor experienced.

This past December 7th the *USS Arizona* Memorial acquired the *USS Oklahoma* Memorial on Ford Island. The *Oklahoma* experienced the second largest loss of life in the bombing of O'ahu. The *Arizona* Memorial works closely with its partners in history at Pearl Harbor; the *USS Bowfin*, the *USS Missouri* and the Pacific Aviation Museum, as well as other sites in the Pacific Theater. As we look to the future, we recognize that through sharing stories and working together with private and public partners, we honor the memories of those that served.

— Will Yavorsky, USAR

Photos from top: *USS Arizona* Memorial, Everett Hyland with guests, aerial view of memorial, explosion of *USS Arizona* in 1941, NPS divers in Pearl Harbor