Inventory & Monitoring
Pacific Island Network

National Park Service
U.S. Department of the Interior

Pacific Island Network Quarterly

Which of these traditional foods is native to Hawaii ?

pg.2

From left to right:
sweet potato
kalua pork
dried banana
sugercane
coconut
kūlolo (taro, coconut)
breadfruit
dried fish
haupia (coconut, arrowroot)

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National Park Service
U.S. Department of the Interior
Pacific Island Network
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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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NOTE: Unless indicated all photos and articles are NPS.

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Field Schedule

	October	November	December
Landbird monitoring			
Invasive plants	HALE	HALE	HALE
Vegetation communities	HALE		
Water quality	HALE	AMME	KAHO, PUHE, PUHO
Stream animals			
Ground water		AMME	KAHO
Benthic marine	KAHO	KAHO	
Marine fish	KAHO	KAHO	
Vegetation mapping	KALA	HALE, HAVO	
Climate (on-going)	All Parks ----------		

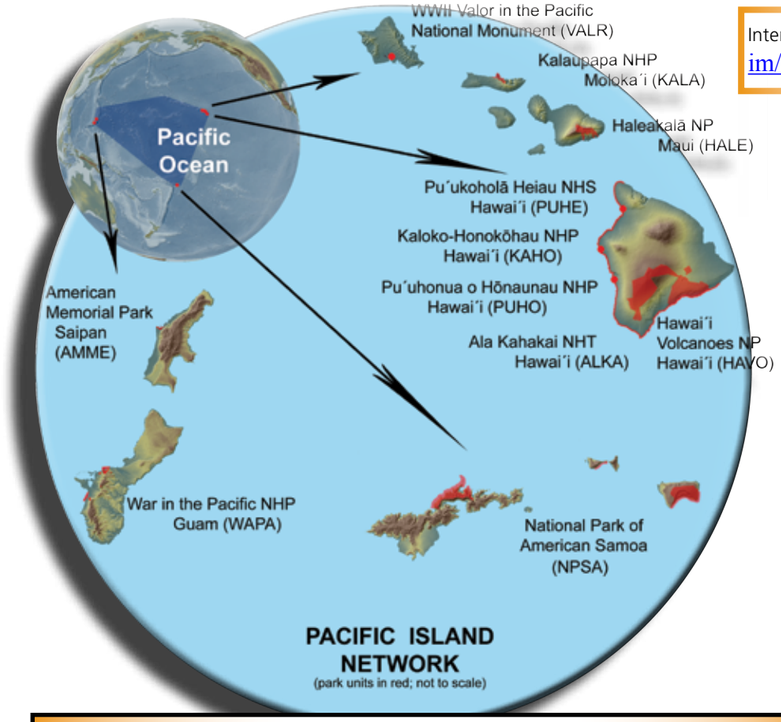
FROM COVER: The fish is the only food pictured here that is native to Hawaii. Taro, coconut, sugarcane, sweet potato, breadfruit, pigs, banana, and arrowroot were brought to Hawaii by people. Although none of these species are native to Hawaii, they play an important part in shaping the landscape and supporting Hawaiian culture. This food illustrates an important distinction for many natural scientists... the difference between calling a plant or animal "native", "non-native", or "invasive". A simple way to consider the issue is:

Traditional Hawaiian food. Photo by J. Wicart

Native species arrived in Hawaii without human intervention via one of the "*3 Ws*" = wind, water, or wings. The Hawaiian hoary bat is a good example.

Non-native species were brought to Hawaii by people. Most of the foods pictured above are in this category.

Invasive species were also brought to Hawaii by people, sometimes unintentionally, and they have detrimental effects on Hawaii's ecosystems by displacing or destroying native species. Strawberry guava fits this description.



Interactive graphic: http://science.nature.nps.gov/im/units/pacn/monitoring/vital_signs.cfm

Noted: Before joining I&M as an aquatic ecologist, David Raikow worked for the Environmental Protection Agency. He and his former team just received a $10,000 Scientific and Technology Acheivement Award for their great work. For more information: http://epa.gov/ncer/staa/annual/2011/2011level1.html

Featured Staff

Sheila McKenna joins the PACN as the marine ecologist. Her career has taken her from Madagascar to New Caledonia to Bermuda, logging over 3,000 dives in that time. Her work contributed to the establishment of several new Marine Protected Areas including the designation of a UNESCO Marine World Heritage Site. She also co-founded a cooperative effort with the Bermuda Government to protect Sargasso Sea, and was a Senior Scientist at Conservation International. She has held research positions with the Bermuda Institute of Ocean Sciences and the Univ. of Guam Marine Lab. Sheila earned her PhD from the Univ. of Maryland.

Scott Kichman, born in upstate NY, served in the US Marines in Panama and the Middle East. In 1994, he received a forestry degree from Haywood College in NC. Then he went to work as a forester for Georgia Pacific in WV, and later worked for the US Forest Service in AK. In 2000, Scott transferred to Great Smoky Mountains NP to do forest health monitoring. Next stop was with the Bureau of Land Management in MT where he was a GIS Specialist. Now he's back with the NPS at Hawai'i Volcanoes NP. Scott is married to Ni Tai and they have a wonderful daughter named Oceanna who is almost 4. He cherishes family life and loves his new job with I&M.

Featured Staff

Colin Phifer joined the I&M vegetation monitoring crew in July. He recently completed his MSc. degree at the University of Hawaii at Hilo where his research focused on pollination and plant reproductive success of kanawao (*Broussaisia arguta*) in forest fragments. Colin hails from the Northwest and previously worked for the Washington State Department of Natural Resources and the US Forest Service on bird and habitat monitoring programs. Colin is excited to be here and is always game for some lunchtime "botanizing and birding."

So long to Asia Addlesburger who diligently worked on our databases, maps, websites, and much more for the past four years. Good luck !

A Tale of Two Vegetation Projects

In 2011, the Inventory & Monitoring Program: (1) completed the first comprehensive vegetation mapping inventory for Kaloko-Honokōhau National Historical Park, and (2) established 15 long-term vegetation monitoring plots within the park's unique coastal strand plant community. Integrating these two vegetation data tools provides the park with a detailed picture of the condition or status of the coastal strand plant community.

The vegetation map displays the distribution of plant types within the park as a snapshot in time. Because these types were created using consistent national standards, park managers can share information on vegetation management techniques for types shared across parks. Some degraded plant associations are shared among the West Hawaii parks (e.g., the dark red polygons on the map below are kiawe coastal dry semi-natural woodlands), and others are unique to this park (e.g., the turquoise polygons are coastal strand sparse vegetation).

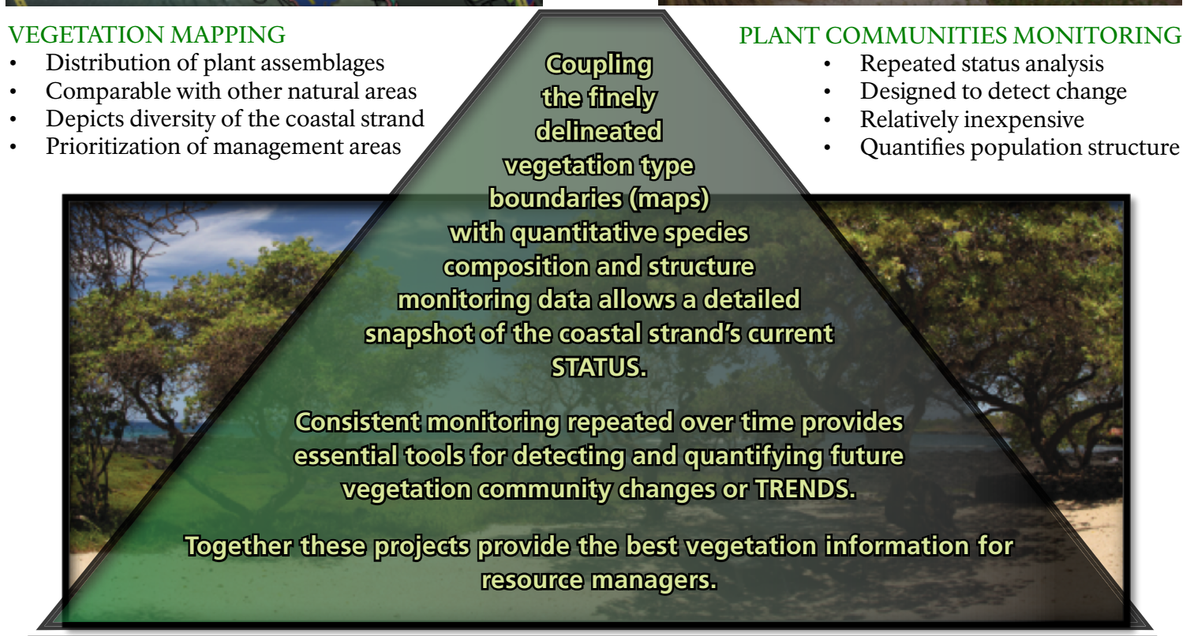
Long-term plant community monitoring provides detailed data on the status of vegetation and is designed to detect changes over time. Specifically, these data identify which plant species are in the coastal strand (species richness), how abundant they are (cover, density), and what size they are (population structure) every five years. In 2011, nearly half of the 31 plants identified were native, including the rare maiapilo (below). The high diversity of plant types in the coastal strand depicted by the vegetation map helps to explain the variety in vegetation among the long-term monitoring plots.

– A. Ainsworth, NPS Botanist

maiapilo

VEGETATION MAPPING
- Distribution of plant assemblages
- Comparable with other natural areas
- Depicts diversity of the coastal strand
- Prioritization of management areas

PLANT COMMUNITIES MONITORING
- Repeated status analysis
- Designed to detect change
- Relatively inexpensive
- Quantifies population structure



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PACN Plays it Safe

The PACN is undergoing a major overhaul of its safety program. Our Safety Plan and monitoring procedures are being rewritten, new Job Hazard Analyses (JHAs) are being created, field crews are receiving better training, and new safety equipment is being employed. More importantly, behavior in the field is changing.

The work we all do in the field carries inherent risks. Yet, risk alone may not be enough to suspend field operations. After all, there is risk when simply crossing the street. Our challenge is to find the right balance between the hazards we face and the job we need to do, and to properly manage the risks they present.

One step is to identify hazards. Each park has a unique set of hazards. In the Pacific we do not, for example, worry about running into bears. And some hazards, like hot lava, are real but occur in such localized areas that it is not usually a concern. Some hazards are particularly important to certain crews, like flash floods when sampling in streams. Other hazards are shared by nearly everyone, like isolation in the back country.

Another step, evaluating risk, is more subjective. One tool we can use to evaluate risk is to assign it a score that incorporates categories including the task's complexity, and the crew's ability to communicate. After tallying the score, the task could be deemed low risk (Green), moderate risk (Amber), or high Risk (Red), hence the name for this exercise; the GAR model.

These considerations are being formalized in new documentation and procedures. Our updated Safety Plan serves as a central reference covering the whole program. Individual vital signs monitoring safety procedures are also being modified and augmented with new JHAs for each park. But documentation means nothing if our behavior in the field is not positively affected.

Some changes are small, like reviewing safety each morning before going into the field. Some changes are more substantial, like the removal of certain field sites deemed unacceptably risky due to the difficulty of evacuating a potentially injured person. Safety is a primary concern for all field leaders and crew. Ultimately, no scientific sample is worth taking if it means an unreasonable risk of injury.

–D. Raikow, NPS Aquatic Ecologist

The Olympics of Coral Conferences

The International Coral Reef Symposium is held every four years just like the Olympics, except that the sporting events are presentations covering all aspects of coral reef research, management, monitoring, cultural interaction, education, and conservation. The 12th symposium took place in Cairns, Australia from July 9 – 13 with over 2000 delegates from 80 countries in attendance. The 12 concurrent sessions covered everything from molecular biology and regional-scale conservation efforts to the cultural, political, and historical dimensions of coral reef management.

The five-day scientific meeting was packed with approximately 1,500 talks and posters. Additionally, 21 organizations showcased cutting edge research techniques, publications, and educational products. The National Park Service's work on coral reefs was highlighted with presentations by Eric Brown of Kalaupapa NHP (KALA), and Mike Gawel of War in the Pacific NHP (WAPA). Eric discussed marine water quality relating to a sewage treatment upgrade in KALA as corals thrive in nutrient poor waters. He also co-authored a study examining how top-down control by predatory fishes and humans influences reefs. Mike spoke on the management of WAPA's coral reefs. Tim Clark of the National Park of American Samoa was also in attendance. Although, I was not an NPS employee at the time of the conference, I presented prior work and co-chaired a session on human impacts to coral reefs with a different organization.

Attendance by staff from other federal agencies working on coral reefs (e.g. USGS, USFW, and NOAA) allowed for real time, cross agency interactions and updates. By the end of the conference, I felt like I'd just finished a coral reef decathlon for Team USA... and the world's reefs will be better for it.

–S. A. McKenna, NPS Marine Ecologist

12th International Coral Reef Symposium.
Photo from "Outcomes Report" at www.icrs2012.com/

Haleakalā NP - Landbirds Update

Haleakalā National Park (HALE) is famous for stunning sunrises over the immense volcanic basin, the rare and picturesque silversword, and for the dramatic waterfalls and pools of ‘Ohe‘o gulch.

Amazingly, there is still a place in HALE that is seldom seen. That place is Kīpahulu Valley, a legendary forest that harbors Maui’s rare and unique Hawaiian honeycreepers. The valley is a natural fortress; walled in by dense rainforest, sheer cliffs, and huge waterfalls. It rains nearly every day.

The Inventory & Monitoring landbird team conducted a survey to provide data for monitoring long-term trends in bird distribution, density, and abundance in Kīpahulu Valley. The team conducted point-count surveys at 162 stations on 11 transects in a 3,120 hectare area. Every bird seen and heard during the 8-minute counts was recorded within both native rainforest and non-native lowland forest.

Some of the honeycreepers in the valley are notoriously cryptic. For instance, the endangered Maui nukupu‘u and Maui ‘ākepa have been observed less than 10 times in the last 100 years.

A total of **2,830** individual birds of **6 native** and **6 non-native** species were recorded during the survey. The ‘apapane was the most abundant and widely distributed species documented. The team detected 849 individuals at 93% of the stations. Generalist foragers, ‘apapane thrive in ‘ōhi‘a rainforests where they can feed on nectar and search for small insects.

Maui ‘amakihi and ‘i‘iwi were similarly abundant and widespread in Kīpahulu Valley. ‘Amakihi have fared well on most of the Hawaiian Islands because of their generalist diet and resistance to the deadly avian malaria parasite. In contrast, ‘i‘iwi are very vulnerable to the disease and generally only occur in elevations above 4,500 feet where mosquitoes are cold temperature intolerant. Curiously, ‘i‘iwi were detected at elevations as low as 3,200 feet in Kīpahulu Valley; well below the known ranges on Kaua‘i and Hawai‘i Islands (‘i‘iwi are extinct on Moloka‘i and O‘ahu). What could account for this specie's occurrence at low elevations? One speculation is that the strong and cool trade winds that blast the valley suppress populations of mosquitoes that transmit the parasite.

The Maui ‘alauahio, or Maui creeper, is relatively common in Kīpahulu Valley. The team detected 142 individuals at 35% of the stations sampled. ‘Alauahio are conspicuous because they forage in small groups and actively “chip” to each other. They are also curious and often approach observers in the field. ‘Alauahio occupy a unique niche in native rainforests. Their short and straight bills are perfect for searching for insects under leaves and in the bark of trees and shrubs. They are often seen “creeping” along branches and trunks in search of food.

In contrast to the small and cute disposition of the ‘alauahio, the ‘ākohekohe, or crested honeycreeper, has a haunting presence. They are the largest of the honeycreepers and their feathers are predominantly black, with speckles of orange and yellow. Adults have a large mohawk-like crest on their heads. They look and act like the chiefs of the forest as they aggressively defend food and nesting resources. The team only detected 20 individuals in HALE, which appears to be a significant reduction from previous surveys. Habitat degradation, introduced predators, and the prevalence of avian malaria has drastically reduced the range of this endangered species. Previous estimates for ‘ākohekohe hover near 3,800 individuals on all of Maui. The estimate may need to be adjusted to mark an unfortunate decline of this spectacular honeycreeper.

The endangered kiwikiu, or Maui parrotbill, is undoubtedly one of the most striking and unusual honeycreepers on Maui. This species uses its large hooked bill to tear, rip, dig, and crush the bark and branches of native trees and shrubs in search of insects and their larvae. Island wide estimates hover near 500 individuals, making it one of the rarest species in Hawai‘i. Only 8 individuals were detected in the 2012 survey which was unfortunate, but not surprising. Recovery of this species is slow due to its low reproductive rate. Adults lay only one egg per year and juveniles stay with their parents for up to 8 months. Kiwikiu also require relatively large home ranges to search for prey. These birds can suffer if even a small portion of their range is severed or degraded, which emphasizes the importance of habitat protection for this species.

Therewas a strong representation of non-native forest birds in even the most pristine native forests. The Japanese white-eye, Japanese bush-warbler, and the red-billed leiothrix accounted for nearly half of all non-native bird detections. They are also broadly distributed throughout weedy low elevation forests where they can disperse seeds such as the invasive Koster’s curse. Native birds are conspicuously absent from low elevation weedy forests, likely due to avian malaria and because most native birds adhere to strict foraging, nesting, and behavioral requirements only offered by native habitats.

Kīpahulu Valley and portions of northeastern Haleakalā Volcano are the best examples of pristine native rainforest on east Maui. It is perplexing why several species of Hawaiian honeycreepers are so incredibly rare even in these forests. The devastating effects of avian disease and habitat degradation in low elevation forests are apparent, but why are some native species scarce even in undisturbed areas? The extinction of the po‘ouli (the last individual died in captivity in 2004) provides a grim reminder of the fragility of Hawaiian ecosystems, where a species may rely on very specific resources such as endemic invertebrates. Even subtle changes can sometimes have dramatic impacts on forest bird communities. Without regular monitoring, detrimental processes and population declines may escape notice.

Nonetheless, many natural wonders appear to be safe in the fortress of Kīpahulu Valley. Species like the enigmatic Maui ‘ākepa and Maui nukupu‘u escaped our notice this time. Whether they are one of the valley’s hidden treasures, or lost to time, has yet to be determined.

—S. Judge, Wildlife Biologist
Hawaii-Pacific Islands
Cooperative Ecosystem Studies Unit

BIRDS DETECTED

‘Ākohekohe (*Palmeria dolei*)	20
‘I‘iwi (*Vestiaria coccinea*)	399
Maui ‘alauahio (*Paroreomyza montana*)	142
‘Apapane (*Himatione sanguinea*)	849
Maui ‘amakihi (*Hemignathus virens wilsoni*)	334
Kiwikiu (*Pseudonestor xanthophrys*)	8
Melodious laughing thrush (*Garrulax canorus*)	17
Northern cardinal (*Cardinalis cardinalis*)	3
Red-billed leiothrix (*Leiothrix lutea*)	346
House finch (*Carpodacus mexicanus*)	1
Japanese bush-warbler (*Cettia diphone*)	354
Japanese white-eye (Zosterops japonicus)	357

‘Ākohekohe, ‘alauahio, and kiwikiu photos by J. Jeffrey

Teen Scientists Investigate Water on Saipan

...and change the way a wetland is managed

In the spring of this year, the natural resources staff at American Memorial Park (AMME), on the island of Saipan, heard about a previously undiscovered sewer line break being repaired just a few dozen yards from the park's boundary within the city of Garapan. The leak was quickly fixed, but this raised questions about exactly what was draining into the park's artificial wetland and stream from the city's storm drains.

Seven teenagers from AMME's Youth Conservation Corps (YCC) investigated the situation. For two months over the summer, they measured bacteria levels in the wetland and stream. They tested the water at several of the Inventory & Monitoring Program's (I&M) regular water quality monitoring sites. In addition, they tested a site shared with the Commonwealth of the Northern Mariana Islands Division of Environmental Quality (DEQ) in its recreational water monitoring program. They also tested the park's drinking water. Because they used the same type of tests used by DEQ, the U.S. Environmental Protection Agency, and many other organizations responsible for testing beaches and recreational waters, their results could be directly compared to local and national standards.

Most of these YCC teens started with no training in scientific procedures, yet all learned quickly. A National Park Service Biological Technician trained both the teens and AMME rangers to collect, prepare, and analyze samples. AMME rangers supervised the YCC team throughout the project, and made sure they worked safely and carefully.

The young scientists tested three to four sites twice a week, measuring levels of *E. coli* and total *coliform* bacteria on Mondays, and *Enterococcus* bacteria on Wednesdays. They were responsible for sample collection and preparation, monitoring the incubation of samples, and reading and collating the results. Not only did they follow strict protocols for the safe and sterile collection and handling of these samples, they conducted precise dilutions and kept extensive field notes. Their preliminary data showed little or no contamination of samples, and supported the proposition that citizen science can provide reliable data for management decisions.

The resulting data* will be AMME's first long-term look at bacteria concentrations in the stormwater flowing into and through the park, and out to the adjacent Smiling Cove Marina. With this information, NPS scientists and managers have changed the way they manage the wetland, helping improve safety and making long-term management plans with local public works and environmental officials.

The National Park Service provided the testing supplies and equipment to start this project and a similar one on Guam, giving the parks a powerful new tool for outreach, research, and management. The success of this project is a great reminder of the importance of involving the public in our work, and of the power of combining opportunities for outreach with meaningful projects that benefit both the participants and the parks.

–J. Mills, NPS
Biological Technician

AMME's Youth Conservation Corps takes on the challenge of conducting serious water quality science.

**Final analysis of project data is still being processed.*