Pacific Island Network
Vital Signs Monitoring Plan

Appendix O: Workshop & Scoping Documents: Part II-Park Scoping Documents

Compiled by Jean Franklin (HPI-CESU)

Pacific Island Network (PACN)

Territory of Guam
War in the Pacific National Historical Park (WAPA)

Commonwealth of the Northern Mariana Islands
American Memorial Park, Saipan (AMME)

Territory of American Samoa
National Park of American Samoa (NPSA)

State of Hawaii
USS Arizona Memorial, Oahu (USAR)
Kalaupapa National Historical Park, Molokai (KALA)
Haleakala National Park, Maui (HALE)
Ala Kahakai National Historic Trail, Hawaii (ALKA)
Puukohola Heiau National Historic Site, Hawaii (PUHE)
Kaloko-Honokohau National Historical Park, Hawaii (KAHO)
Puuhonua o Honaunau National Historical Park, Hawaii (PUHO)
Hawaii Volcanoes National Park, Hawaii (HAVO)

http://science.nature.nps.gov/im/units/pacn/monitoring/plan/

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Pacific Islands Network Vital Signs Monitoring Survey: Results Compilation

This survey is a first step in the Vital Signs monitoring planning process that is outlined in the attached document ("Outline For Vital Signs Monitoring Plan, Pacific Islands Network"). Our purposes are to ask what you consider to be the most significant resource issues in your park and what the primary threats to those resources might be (considering both known and potential threats). The "resources/threats" lists will be further refined and prioritized, allowing for additional opportunities for input and review. To help us assemble background information, we also ask what monitoring is or has been conducted in your park. For all questions, we give a few examples of issues where the vital signs monitoring program might be helpful. Because the objective of this survey is to get as many ideas expressed as possible, we encourage you to treat this as a "brain-storming" exercise and not to spend a great deal of time trying to refine your ideas. Please circulate this to your staff.

WAR IN THE PACIFIC NATIONAL HISTORICAL PARK

1. **What are the park's most significant resources for which information about status and trends is needed?** (E.g., Native koa and ohia forest distribution and health at HAVO, water quality at KAHO, harvested marine fish species at WAPA.)

- Coral Reefs (in general)
- Native Limestone Forests
- Tropical Savanna
- (Other) marine ecosystems

2. **What park resources have regional, or even national significance due to their unique nature, or because they may serve as indicators of regional trends?** (e.g. coral reefs at NPSA, wetland at AMME, endemic forest birds at HALE,)

- Coral Reefs: national significance and may be a indicator of global/regional climate change.
- (Other) marine ecosystem/s

3. **Are there particular resources that the park has special mandates, or commitments to protect either by park legislation, in a general management plan, or in other laws or planning documents?** (e.g. Federally listed species, water rights, viewsheds, etc.)

- Coral Reefs (marine resources) are specifically mentioned in the park GMP and are the focus off funding from the USA Coral Reef Initiative.
- Limestone forests are potentially used by federal or territorial endangered species (snails, birds, bats).
- (Other) marine ecosystem/s

4. **What, in your opinion, are the greatest current threats to significant park resources?** (E.g. trail impacts, subsistence take, illegal harvest, impacts from established alien pests, aircraft noise, etc.)

- Reefs: Sedimentation, Subsistence Fishing and other take, Watershed development/management
- Savanna: Wildfire (arson)
- Limestone Forests: Invasive species, wildfire

5. **What are the greatest potential threats to significant park resources?** (e.g. incipient alien invaders, anticipated air or water quality changes, climate change, landscape-level changes on adjacent lands, etc.).

- Reefs: Invasive species (particularly algae), development of adjacent lands and watersheds
- Savanna: ?, brown tree snake
- Limestone Forests: ?, brown tree snake

6. **Are there significant current or planned community or ecosystem restoration projects in the park for which long-term monitoring information is needed?** (E.g., prescribed fire restoration activities at HAVO and KAHO, fishpond restoration at KAHO.)

- Not really. Down the road may possibly be a plan to restore native savanna lands.

7. **We want information produced by the I&M program to be widely interpreted. What is the best way to make this information available to interpretive staff and the public?** (E.g., establish a web site; conduct periodic written or oral briefings, liaison with Learning Center.)

- A combination of websites and periodic oral and written briefings by the staff of the park. Each park will require a different approach.
- Brochures, glossy publications, and programs for the public will be important. Some savvy in media relations should be consulted to give the program a public relations spin. Involving the public will make raising awareness and funds easier.
- publish grey literature, PCSU publications on web

8. **What natural resource monitoring projects or relevant research have been undertaken in the past or are ongoing now?** Please indicate approximate time spans of the projects and project leaders or principle investigators, if known. (E.g., rare plant and endangered bird monitoring at HAVO; water quality and waterbird monitoring at KAHO, fruitbat monitoring at NPSA, etc.)

- WAPA is about to start to a watershed-level project looking at the effects of wildfire on tropical savanna community structure and erosion rates, and the subsequent downstream effects of this erosion (sedimentation) on WAPA's nearshore reefs. The marine work will be linked with WAPA's marine monitoring program.
- marine transects

9. **Are there other issues you would like considered? For example, interdisciplinary topics, landscape-level changes, or topics about which you think we need more information to help us further identify important monitoring needs?** (E.g., identifying the role of air quality in coral reef health; is ohia forest cover changing above 5,000ft?)

- Nothing immediately comes to mind.

10. **Identify any opportunities for monitoring partnerships with other agencies, neighboring landowners, universities, etc. that will allow the parks to leverage personnel and funding available for monitoring.** (We want to describe any widely-accepted monitoring efforts used by other agencies in the general region. We are particularly interested in monitoring that provides the network with opportunities to compare data, put the network's data in context, and assist in interpretation of data collected in parks).

- Under the auspices of the Guam EPA, and the Bureau of Coastal Zone Management, the territory of Guam is interested in initiating a marine monitoring program. They have yet to do so.
- The Guam Division of Forestry currently monitors several terrestrial plots across the island. Plots are in forest and savanna. This program is new.

AMERICAN MEMORIAL PARK

1. **What are the park's most significant resources for which information about status and trends is needed?** (E.g., Native koa and ohia forest distribution and health at HAVO, water quality at KAHO, harvested marine fish species at WAPA.)

- Coral Reefs (in general)

- Wetlands/Mangroves (particularly an inland mangrove wetland -- the only one of it's kind in the Mariana Islands)
- Endangered bird species

2. **What park resources have regional, or even national significance due to their unique nature, or because they may serve as indicators of regional trends?** (e.g. coral reefs at NPSA, wetland at AMME, endemic forest birds at HALE,)

- Coral Reefs: national significance and may be an indicator of global/regional climate change.
- Wetlands: nationally protected and home to some endangered bird species

3. **Are there particular resources that the park has special mandates, or commitments to protect either by park legislation, in a general management plan, or in other laws or planning documents?** (e.g. Federally listed species, water rights, viewsheds, etc.)

- Coral Reefs (marine resources) are specifically outlined under several EO.
- Wetlands contain endangered species (I don't recall the bird species but it is a warbler)

4. **What, in your opinion, are the greatest current threats to significant park resources?** (E.g. trail impacts, subsistence take, illegal harvest, impacts from established alien pests, aircraft noise, etc.)

- Reefs: Watershed development/management, tourism, boating marina
- Wetlands: encroaching development, illegal dumping, water quality

5. **What are the greatest potential threats to significant park resources?** (e.g. incipient alien invaders, anticipated air or water quality changes, climate change, landscape-level changes on adjacent lands, etc.).

- Reefs: Invasive species (particularly algae), development of adjacent lands and watersheds, water quality from a nearby garbage dump, overfishing.
- Wetlands: Chemical contaminants from previous illegal dumping, adjacent development, water quality (groundwater) contamination

6. **Are there significant current or planned community or ecosystem restoration projects in the park for which long-term monitoring information is needed?** (E.g., prescribed fire restoration activities at HAVO and KAHO, fishpond restoration at KAHO.)

- No. This park has no dedicated NR personnel. I act in this regard to some extent and Chuck Sayon (AMME Supt.) does what he can but has a very full plate.

7. **We want information produced by the I&M program to be widely interpreted. What is the best way to make this information available to interpretive staff and the public?** (E.g., establish a web site; conduct periodic written or oral briefings, liaison with Learning Center.)

- A combination of websites and periodic oral and written briefings by the staff of the park. Each park will require a different approach. Brochures, glossy publications, and programs for the public will be important. Some savvy in media relations should be consulted to give the program a public relations spin. Involving the public will make raising awareness and funds easier.

8. **What natural resource monitoring projects or relevant research have been undertaken in the past or are ongoing now?** Please indicate approximate time spans of the projects and project leaders or principle investigators, if known. (E.g., rare plant and endangered bird monitoring at HAVO; water quality and waterbird monitoring at KAHO, fruitbat monitoring at NPSA, etc.)

- A wetlands survey was conducted last FY; we are awaiting the final report. This included a predator study for the endangered warbler, GIS mapping, and inventory of plant species.

- Local CNMI agencies currently have a marine monitoring program with sites in the water adjacent to the park. The park currently has no jurisdiction over the marine resources.

9. **Are there other issues you would like considered? For example, interdisciplinary topics, landscape-level changes, or topics about which you think we need more information to help us further identify important monitoring needs?** (E.g., identifying the role of air quality in coral reef health; is ohia forest cover changing above 5,000ft?)

- Nothing immediately comes to mind.

10. **Identify any opportunities for monitoring partnerships with other agencies, neighboring landowners, universities, etc. that will allow the parks to leverage personnel and funding available for monitoring.** (We want to describe any widely-accepted monitoring efforts used by other agencies in the general region. We are particularly interested in monitoring that provides the network with opportunities to compare data, put the network's data in context, and assist in interpretation of data collected in parks).

- CNMI has an marine monitoring program in place. This involves 3 local agencies collecting benthic habitat data and fisheries data.

Please return by Wednesday, May 8 to Darcy Hu; phone 808-985-6092; fax 808 985-6029;

PO Box 52, Hawaii National Park, HI 96718-0052; or via email.

Name: Dwayne Minton Phone (in case we need clarification): 671-472-7240

NATIONAL PARK OF AMERICAN SAMOA

1. What are the park's most significant resources for which information about status and trends is needed? (E.g., Native koa and ohia forest distribution and health at HAVO, water quality at KAHO, harvested marine fish species at WAPA.)

1) High Priority

a) Terrestrial resources
   i) rainforest ecosystem health (partnership opportunities)
      (1) fruit bats
      (2) rainforest birds
      (3) coconut crabs
      (4) native insects
      (5) land snails
      (6) general forest health
   ii) rare species
      (1) Tahitian petrels (abundance, effects of predation)
      (2) plants (distribution, abundance)

b) Marine resources
   i) coral reef ecosystems
   ii) harvested fish
   iii) sea turtles ("rapidly approaching extinction" according to US Recovery Team)
   iv) marine and freshwater water quality

2) Moderate Priority

a) ethnobotanically important plants (effects of use and disuse over time, study already initiated)
b) rare species: sheath tailed bat (status, use of park resources)
c) other species of interest
d) seabirds

2. What park resources have regional, or even national significance due to their unique nature, or because they may serve as indicators of regional trends? (e.g. coral reefs at NPSA, wetland at AMME, endemic forest birds at HALE,)

- paleotropical flora and fauna as a whole, plus special significance of: lowland rainforests (very limited distribution), fruit bats (limited distribution)
- Tahitian petrels and other seabirds on Mt. Lata
- Indo-Pacific coral reefs
- South Pacific sea turtle stocks
- General park biodiversity
- streams
- invasive aliens

3. Are there particular resources that the park has special mandates, or commitments to protect either by park legislation, in a general management plan, or in other laws or planning documents? (e.g. Federally listed species, water rights, viewsheds, etc.)

- coral reefs
- fruit bats
- tropical rainforests
- T & E species (sea turtles, humpback whales)

4. What, in your opinion, are the greatest current threats to significant park resources? (E.g. trail impacts, subsistence take, illegal harvest, impacts from established alien pests, aircraft noise, etc.)

<u>High Priority:</u>

- invasive plants and animals (feral pigs, rats, ants, disease, plants, etc.)
- expanding agriculture into primary forest in the park
- sand-mining on turtle nesting beaches
- fishing pressure
- illegal fishing
- harvest of local turtles in foreign waters, and mortality as bycatch in offshore fisheries
- coconut crab subsistence harvest
- other loss of biodiversity

5. What are the greatest potential threats to significant park resources? (e.g. incipient alien invaders, anticipated air or water quality changes, climate change, landscape-level changes on adjacent lands, etc.).

1) <u>High priority</u>
   a) invasive species nearby, but not here yet (e.g., brown tree snake, *Miconia* etc.)
   b) climate change (droughts, etc that affect distribution and abundance of species)
   c) coral bleaching, mortality and disease due to warming sea surface temperatures
   d) natural causes (e.g., hurricanes- baseline monitoring data is essential for understanding impacts of natural disturbances and potentially <u>unnatural</u> responses due to human induced influences such as invasive species)
   e) human population growth (e.g., loss of habitat buffer or reservoirs, degradation of air quality, water quality etc.)
   f) crown-of-thorns starfish invasion

2) <u>Moderate priority</u>
   a) development of incompatible tourist facilities adjacent to park lands

3) <u>Not prioritized</u>
   a) further loss of biodiversity due to other than above-listed causes
   b) marine harvest
   c) subsistence farming

6. Are there significant current or planned community or ecosystem restoration projects in the park for which long-term monitoring information is needed? (E.g., prescribed fire restoration activities at HAVO and KAHO, fishpond restoration at KAHO.)

- reforestation projects (invasive species, fallow agriculture plots)
- invasive species control (e.g., Clidemia and thrips in Manua, feral pigs, rat control on Mt. Lata)
- native ecosystem restoration
- fences*, snares*
- forest birds
- other pig, goat, rat monitoring

7. We want information produced by the I&M program to be widely interpreted. What is the best way to make this information available to interpretive staff and the public? (E.g., establish a web site; conduct periodic written or oral briefings, liaison with Learning Center.)

- The development of public-friendly summaries of I&M activities would be great. They could be posted to an I&M website that would be linked to our park websites, or they could be pages added to the park websites individually, or they could simply be distributed electronically. We wouldn't want to see a tremendous amount of resources spent on a complex website.
- learning center
- publish grey lit, PCSU publications on web
- researchers write popular articles

8. What natural resource monitoring projects or relevant research have been undertaken in the past or are ongoing now? Please indicate approximate time spans of the projects and project leaders or principle investigators, if known. (E.g., rare plant and endangered bird monitoring at HAVO; water quality and waterbird monitoring at KAHO, fruitbat monitoring at NPSA, etc.)

- many miscellaneous coral & reef fish reports for territory, some within NPSA
- fishery survey in Ofu and Olosega islands by NPSA: 1 year, in progress.
- Seabird study on Mt. Lata: 3 years, in final year. Setbacks due to staffing issues. PCSU.
- DMWR bird and fruit bat surveys: ongoing territory-wide with some stations located within the park, conducted by the local government Dept. of Marine and Wildlife Resources. (are there other fruit bat surveys that have occurred in past?—ask Bryan.)
- Whistler's vegetation plots, permanent plots established for park floristic survey, 1994.
- Travis Heggie: revisited some of Whistler's plots, data are forthcoming.
- NTBG ethnobotanical survey (plots, oral interviews): 2-3 year project in its second year.
- Feral pig control efforts: ongoing snaring and activity transect data collection, in-house.
- Laufuti Stream Bioassessment by NPSA.
- Stream Bioassessment, funded but not started yet, 1 year, PCSU.
- Disturbed lands delineation (agroforestry within the park), funded, planned for this summer, NPSA/PCSU.

9. Are there other issues you would like considered? For example, interdisciplinary topics, landscape-level changes, or topics about which you think we need more information to help us further identify important monitoring needs? (E.g., identifying the role of air quality in coral reef health; is ohia forest cover changing above 5,000ft?)

- climate change impacts (and we need weather stations in all 3 park units)
- coral bleaching
- nearshore water current patterns (that affect egg and larval dispersal, etc)
- subsistence farms and take

10. Identify any opportunities for monitoring partnerships with other agencies, neighboring landowners, universities, etc. that will allow the parks to leverage personnel and funding available for monitoring. (We want to describe any widely-accepted monitoring efforts used by other agencies in the general region. We are particularly interested in monitoring that provides the network with opportunities to compare data, put the network's data in context, and assist in interpretation of data collected in parks).

- Local Dept. Marine and Wildlife Resources: bird/bat monitoring
- A. Samoa Selected Invasive Species Taskforce (ASSIST): cooperative invasive species work
- Coral Reef Advisory Group (CRAG): cooperation on many marine issues
- Univ. Hawaii: 3-year PhD study of corals in Ofu lagoon
- DOC (territory-wide GIS database of benthic marine habitats)
- USDA: Forest Health Inventory Plots may be established in the park
- NOAA (coral reef initiative), etc.
- more could probably be added with a bit more thought on this

Contributors: PC, SS, CC, BH

KALAUPAPA NATIONAL HISTORICAL PARK

1. **What are the park's most significant resources for which information about status and trends is needed?**
- Upper elevation forest/native forest boundary mapping
- all bird abundance and distribution throughout park, including native forest bird trends with more regularity.
- Coral reefs including abundant reef and pelagic fish populations
- Monk seal habitat including the only current pupping beach in the Main Hawaiian Islands (MHI)
- rocky shorelines supporting perhaps the most dense opihi populations in the MHI.
- Coastal strand community
- endangered plants
- procellarids

2. **What park resources have regional, or even national significance due to their unique nature, or because they may serve as indicators of regional trends?**
- Offshore islets (relictual life)
- cliff resources
- marine ecosystems, including coral reefs
- stream

3. **Are there particular resources that the park has special mandates, or commitments to protect either by park legislation, in a general management plan, or in other laws or planning documents?**
- Federally listed species, including Monk Seals, Green Sea Turtles, Humpback Whales
- historical places and view sheds
- Coral reefs and other marine ecosystems

4. **What, in your opinion, are the greatest current threats to significant park resources?**

- Overuse or improper visitation to offshore islands,
- continued degradation of higher elevation forest due to feral animals.
- Degradation of coral reefs by leaching of untreated sewerage from cess pits.
- Other invasive aliens (plants, ungulates, rats, disease, mosquitoes, ants)
- loss of biodiversity

5. **What are the greatest potential threats to significant park resources?**
- Altered disturbance regimes and concomitant succession by alien vegetation
- Leaching of untreated sewerage into coastal waters
- new invasive aliens (brown tree snake, Melastomes, grasses)
- further loss of biodiversity

6. **Are there significant current or planned community or ecosystem restoration projects in the park for which long-term monitoring information is needed?**
- Restoration of lowland, coastal *Pritchardia* forest

- restoration of lowland dry/mesic forest
- restoration of coastal strand vegetation
- ungulate removal from a section of Puu Alii plateau
- use of fences*, snares* in other areas
- koa and ohia forests
- invasive grasses
- forest birds
- pigs, goats, and deer

7. **We want information produced by the I&M program to be widely interpreted. What is the best way to make this information available to interpretive staff and the public?**
- Incorporate interpretation staff into monitoring programs as technicians
- I&M on web
- learning center
- publish grey lit, PCSU publications on web
- researchers write popular articles

8. **What natural resource monitoring projects or relevant research have been undertaken in the past or are ongoing now?**
- Guy Hughes, PI 1)Restoration of lowland, coastal *Pritchardia* forest,
- 2)restoration of lowland dry/mesic forest,
- 3)restoration of coastal strand vegetation,
- 4)ungulate removal from a section of Puu Alii plateau,
- Kathy Hancock PI 1) Coral reef monitoring,
- 2) Resident Monk Seal beach and shoreline use,
- 3) Hancock/Hughes Population structure and dynamics of marine limpets (opihi)
- goats, pigs, deer (need more info on these—Bryan?)
- crater plants (need more info on these—Bryan?)

9. **Are there other issues you would like considered? For example, interdisciplinary topics, landscape-level changes, or topics about which you think we need more information to help us further identify important monitoring needs?**
- I believe that our parks, particularly KALA and Molokai, should be monitoring systems cooperatively at the island scale. The framework for this type of initiative is in place through work with the federal Enterprise Community (EC) designation and implementation, and USDA NRCS Watershed Restoration Action Strategy for the south shore of Molokai. Models and support for projects working at scales larger than parks are needed.

10. **Identify any opportunities for monitoring partnerships with other agencies, neighboring landowners, universities, etc. that will allow the parks to leverage personnel and funding available for monitoring.**
- South Molokai Reef Studies (USGS, USFWS, Hawaii DLNR, NOAA, University of Hawaii and University of California Santa Cruz).
- Molokai Community Watershed Coalition
- Bishop Museum All Taxa effort
- Molokai Invasive Species Committee
- GAP

Please return by Wednesday, May 8 to Darcy Hu; phone 808-985-6092; fax 808 985-6029;

PO Box 52, Hawaii National Park, HI 96718-0052; or via email.

Name: G Hughes 567-6802 x41 Phone (in case we need clarification): .

HALEAKALA NATIONAL PARK

1. **What are the park's most significant resources for which information about status and trends is needed?** (E.g., Native koa and ohia forest distribution and health at HAVO, water quality at KAHO, harvested marine fish species at WAPA.)

- Near pristine recovering alpine aeolian cinderland, subalpine shrub and grassland, montane bogs, cloud and rain forest, leeward shrublands, mesic and dry forests and associated ecotones distributed in close proximity along a sharp climatological gradient.
- TES Forest and Seabirds, distribution & health
- TES, Rare and Locally Endemic Plant Species, distribution & health
- Endangered Bats, distribution & health
- Rich Endemic and Rare (and any listed) Arthropod Fauna
- Invertebrate species, esp. those related to TES forest birds
- Highly impacted systems which may contain rare/TES species
- land snails (are these all listed?)
- Pollinators
- Subalpine lakes and associated biota
- Perennial and intermittent streams, water quality, associated biota and riparian habitat
- Faunal and floral, native and Polynesian introduced species health, richness, distribution and abundance
- Climatological gradients
- Air Quality
- View sheds
- Geological processes
- Forest birds
- cave ecosystems
- Alien species distribution and % increase

2. **What park resources have regional, or even national significance due to their unique nature, or because they may serve as indicators of regional trends?** (e.g. coral reefs at NPSA, wetland at AMME, endemic forest birds at HALE,)

- Near pristine recovering alpine aeolian cinderland, subalpine shrub and grassland, montane bogs, cloud and rain forest, leeward shrublands, mesic and dry forests and associated ecotones distributed in close proximity along a sharp climatological gradient.
- TES Forest and Seabirds
- TES, Rare and Locally Endemic Plant Species
- Rich Endemic and Rare invertebrates
- Subalpine lakes and associated biota
- Perennial and intermittent streams, water quality, associated biota and riparian habitat
- Faunal and floral, native and Polynesian introduced species health, richness, distribution and abundance
- Climatological gradients
- Air Quality
- Geological processes
- Pollinators
- native biodiversity
- invasive alien control techniques & philosophy

3. **Are there particular resources that the park has special mandates, or commitments to protect either by park legislation, in a general management plan, or in other laws or planning documents?** (e.g. Federally listed species, water rights, viewsheds, etc.)
- Federally Listed Plants and Animals

- Class 1 Air shed
- Biosphere Reserve
- Designated Wilderness
- Kipahulu Research Natural Area (Closed entry Scientific Reserve)
- Historic Districts
- native birds
- native ecosystems

4. **What, in your opinion, are the greatest current threats to significant park resources?** (E.g. trail impacts, subsistence take, illegal harvest, impacts from established alien pests, aircraft noise, etc.)

- Uncontrolled or insufficient (funding for) control of the spread of established Alien Plants and Animals in the Park (including plants, ungulates, rats, disease, mosquitoes, ants)
- Inadequate exclusionary fencing.
- Introductions and New Invasions of Alien Plants and Animals (including plants, ungulates, disease, mosquitoes, ants)
- Predation and trampling by alien mammals; invertebrate and potentially reptilian predators on native animals and plants
- Impacts of Avian diseases on Endemic Avifauna
- Loss of Key species such as prey species, host species, plant dispersers and pollinators
- Fire (reversing ongoing recovery of native plant communities)
- Visitor Impacts in sensitive or wilderness areas (e.g., trampling in aolian life zone)
- loss of biodiversity

5. **What are the greatest potential threats to significant park resources?** (e.g. incipient alien invaders, anticipated air or water quality changes, climate change, landscape-level changes on adjacent lands, etc.)

- Uncontrolled or insufficient control of the spread of established Alien Plants and Animals in the Park
- New Invasions of Alien Plants and Animals (brown tree snake, Melastomes, grasses)
- Depredations of alien mammal, invert and potentially reptilian predators on native species
- New impacts of avian diseases on endemic avifauna
- New loss of key species such as host plants, plant dispersers and pollinators
- Fire reversing ongoing recovery of native plant communities
- Unknown (potential) visitor impacts in aquatic, sensitive or wilderness areas
- Developing Park Infrastructure
- Trespass Cattle
- Changes in existing or proposed horseback tour operations
- Lack of supportive legislation to eliminate/control pests before they enter the park.
- Increasing park visitation.
- further loss of biodiversity

6. **Are there significant current or planned community or ecosystem restoration projects in the park for which long-term monitoring information is needed?** (E.g., prescribed fire restoration activities at HAVO and KAHO, fishpond restoration at KAHO.)

- Short and long term ecological changes as the result of management actions such as feral animal and alien plant removal. (fences*, snares*, pigs, goats, rats, both pre-removal and post) *'inspections' rather than scientific, statistically modelled monitoring
- Research burns to determine the possible role of prescribed fire as a tool in restoring plant communities
- Endangered and rare plant stabilization projects.
- Conversion of alien to native fuels projects
- forest birds
- potential translocation or repatriation of endangered avifauna and other native species
- prescribed fire
- native ecosystem restoration, including koa and ohia forests and restoration of systems invaded by alien grasses
- Scenic restoration – viewshed & cultural demonstration area revegetation plan.

7. **We want information produced by the I&M program to be widely interpreted. What is the best way to make this information available to interpretive staff and the public?** (E.g., establish a web site; conduct periodic written or oral briefings, liaison with Learning Center.)

- Inter, intranet and LAN postings of findings, maps, photos and items of interest, perhaps most easily achieved through an updated series of progress or summary reports submitted by discipline and edited into a comprehensive format. Web and more public postings would need to be sanitized or generalized so as not to disclose sensitive information. LAN postings would allow park staffs to retrieve and query the data for their particular need.
- Easy-to-read, "catchy" annual brochures/reports on significant findings, including photos
- Press Releases of Dramatic/Interesting Findings
- Oral and visual public information briefings given in lay-terms by dynamic individuals
- Conduct periodic written or oral briefings
- Short public service announcements on television and radio
- A break out session at the HI Conservation Conference
- researchers writing popular articles
- publish grey literature, CSU publications on web
- Consistent recording of data among parks in the network will not only facilitate transferring this info out to interpreters and the public, but will allow for comparisons that will provide the broad frame of reference as to the condition of our resources and issues across the network.
- Learning center

8. **What natural resource monitoring projects or relevant research have been undertaken in the past or are ongoing now?** Please indicate approximate time spans of the projects and project leaders or principle investigators, if known. (E.g., rare plant and endangered bird monitoring at HAVO; water quality and waterbird monitoring at KAHO, fruitbat monitoring at NPSA, etc.)

Pasted here is a quick off the top list that I sent out to stimulate discussion and hopefully get additions back in June of 2000. I received no replies. We have some very rich datasets from past monitoring efforts that we need to take advantage of. I will tune this up again send it for another round.

Probable Unpublished Data Sets and Possible Contacts/Collaborators
(pre & post Huli Pohaku etal)

HALEAKALA

1. Yoshinaga Veg Plots & Exclosures: Medeiros, Loope, Nani Anderson
2. Kaupo, Crater, Hana Rain Forest & Front Country exclosures: Loope, Medeiros
3. USFWS Forest Bird Survey: Jacobi
   a) forest & upland birds
   b) veg plots & incidentals
   c) ungulate activity
4. Kipahulu Interdisciplinary Study 1983-84
   a) forest bird counts: Banko, Stone
   b) rat trap on 500m transects: etal
   c) botanical plots:*** Anderson, L. Pratt, Higashino, Medeiros
   d) weed transects:*** Anderson, L. Pratt, Higashino, Medeiros
   e) inverts: Howarth, Gon, Stone
5. Kipahulu Pig Research 1985-88
   a) ungulate activity: ***Anderson, Stone
   b) veg plots: ***Anderson, stone
   c) weed transects:*** Anderson, Stone

Although some of the above projects were published in one form or another, the raw data from the projects has potential to provide invaluable baseline data especially if the data were normalized and geo-referenced!

***Anderson indicates possibility of digital data at HALE

goats, deer, crater plants (these from Bryan Harry)

- Ground-nesting endangered birds in crater district (Nene and Uau) population monitoring (trends, dynamics, threats, etc.)
- Forest bird populations in recovering rain-forest areas monitoring
- Effects of the removal of feral animals on endangered seabird populations
- Introduced alien mammal monitoring and removal
- Vespula and argentine ant monitoring
- USGS Water Resources stream gaging at Oheo
- University of Hawaii climate data (Giambelluca)
- Changes in high elevation and aquatic ecosystems based on global climate changes
- Distribution of cheatgrass
- Seismograph data
- Long-term monitoring of summit-area silverswords
- Volcano hazards monitoring

9. **Are there other issues you would like considered? For example, interdisciplinary topics, landscape-level changes, or topics about which you think we need more information to help us further identify important monitoring needs?** (E.g., identifying the role of air quality in coral reef health; is ohia forest cover changing above 5,000ft?)

- Detecting landscape level changes and interdisciplinary integration are essential for successful implementation of monitoring networks. A way to incorporate this integration is to specifically query subject matter experts, lets say the bird folks, what vegetation parameters are most important for understanding a bird issue, conversely ask the plant folks what bird info is most important for understanding the plant issue… itemize these needs and then pull the 2 or more groups together to hash out the details. The approach we used in Kona was good but we had too many participants and agendas for the allotted time. These items from # 1. would require this approach:
- Near pristine recovering alpine aeolian cinderland, subalpine shrub and grassland, montane bogs, cloud and rain forest, leeward shrublands, mesic and dry forests and associated ecotones distributed in close proximity along a sharp climatological gradient.
- Subalpine lakes and associated biota
- Perennial and intermittent streams, water quality, associated biota and riparian habitat
- Faunal and floral, native and Polynesian introduced species health, richness, distribution and abundance
- Incorporating cultural resources and Hawaiian culture with natural resource issues. For example, the role of native species in prehistoric, historic and modern Hawaiian culture
- Visitor carrying capacity

10. **Identify any opportunities for monitoring partnerships with other agencies, neighboring landowners, universities, etc. that will allow the parks to leverage personnel and funding available for monitoring.** (We want to describe any widely-accepted monitoring efforts used by other agencies in the general region. We are particularly interested in monitoring that provides the network with opportunities to compare data, put the network's data in context, and assist in interpretation of data collected in parks).

- NARS has put considerable effort into monitoring. I understand there is general frustration with the amount of bang for the Buck in that effort and it may be redesigned in a highly watered down version with databases handled by Heritage contract. We should be in dialogue with them about partnering. HALE staff have participated in TNC monitoring over the past 6 years or so. The Island invasive Species Committees monitoring of distributions and control efforts should be a fine partner. HALE and MISC are collecting and managing this data in concert.
- Statewide forest bird surveys (DLNR, others?)
- Molokai Community Watershed Coalition,

- Bishop Museum (including All Taxa effort)
- GAP
- Pacific Cooperative Studies Unit
- Current DOFAW / HALE partnership for monitoring seabirds, Nene and forest birds.
- Adjacent ranches and Hawaiian Homelands (Kaupo ranch, Haleakala Ranch, Ulupalaku Ranch, Kahikinui/LIFE)
- Miscellaneous graduate students
- National Fish and Wildlife Foundation (currently funding Nene monitoring)
- National Parks and Conservation Association
- American Hiking Society
- US Fish and Wildlife Service
- Student Conservation Association
- Youth Conservation Corp
- Maui Forest Bird Recovery Project
- USGS-BRD
- Natural Resource Soil Council
- High schools and local undergraduates
- Miscellaneous Native Hawaiian organizations (including hula halau, political groups, etc.)

PUUKOHOLA HEIAU NATIONAL HISTORIC SITE

1. **What are the park's most significant resources for which information about status and trends is needed?** (E.g., Native koa and ohia forest distribution and health at HAVO, water quality at KAHO, harvested marine fish species at WAPA.)
- Ophioglossum (pololei fern): additional info about federal status, recommendations for management
- Pili grass: restoration projects, Pili restoration/plantings (Curt Daehler study) in road corridor; possible extension to other areas.
- Native plants (uhaloa, ilima, etc.): recommendations for restoration, reintroduction methods, water or no water . . .etc.; how to monitor growth; historical accounts of vegetation there to aid in restoration efforts
- landscape

2. **What park resources have regional, or even national significance due to their unique nature, or because they may serve as indicators of regional trends?** (e.g. coral reefs at NPSA, wetland at AMME, endemic forest birds at HALE,)
- Marine resources (turtle, fish, etc.): finding sources of fish mortality; how to reduce sedimentation in the bay
- Pili: e.g. Determining best restoration techniques for broad scale plantings

3. **Are there particular resources that the park has special mandates, or commitments to protect either by park legislation, in a general management plan, or in other laws or planning documents?** (e.g. Federally listed species, water rights, viewsheds, etc.)

- Primarily cultural sites (2 heiau and John Young Homestead)
- Marine animals (turtles)
- Ohai ula (Sesbania tomentosa) – endangered plants that kupuna asserts was at Spencer park a long time ago.

4. **What, in your opinion, are the greatest current threats to significant park resources?** (E.g. trail impacts, subsistence take, illegal harvest, impacts from established alien pests, aircraft noise, etc.)
- Kiawe (growing into beaches) – also public health concern
- Puncture vine – also public health concern (grows fast)
- Merremia aegiptica – growing on walls and ground
- Fire
- Erosion
- Pickleweed – successfully removed

- Fountain grass – on-going removal
- Also: Koa haole, Chinese banyan, date palm (and recommendations in Linda Pratt's report)
- NPS development

5. **What are the greatest potential threats to significant park resources?** (e.g. incipient alien invaders, anticipated air or water quality changes, climate change, landscape-level changes on adjacent lands, etc.).
- Development of liquid fuel storage facility adjacent to Park at Kawaihae Harbor (in Harbor Plan)
- Recreational harbor already built (about 400 yds from the Park): Concerns: fuel spill, increased visitation, access, marine related threats.
- Dirt biking (along coral flats and stream, etc.)
- Other activities that could threaten viewscapes

6. **Are there significant current or planned community or ecosystem restoration projects in the park for which long-term monitoring information is needed?** (E.g., prescribed fire restoration activities at HAVO and KAHO, fishpond restoration at KAHO.)
- Pili grass restoration
- Wetland area – maintenance of connection to ocean

7. **We want information produced by the I&M program to be widely interpreted. What is the best way to make this information available to interpretive staff and the public?** (E.g., establish a web site; conduct periodic written or oral briefings, liaison with Learning Center.)
- Learning Center
- Interactive media center on site (via computer online); link info collected by Clif Smith and others.
- Enhance relationship with key community partners
    1. Hawaiian Charter School that has adopted the Park as part of their classroom, offer educational opportunities)
    2. Mauna Kea Soils and Conservation District
    3. Royal Court Assembly
- I&m on web
- Publish grey literature
- PCSU publications on web

8. **What natural resource monitoring projects or relevant research have been undertaken in the past or are ongoing now?** Please indicate approximate time spans of the projects and project leaders or principle investigators, if known. (E.g., rare plant and endangered bird monitoring at HAVO; water quality and waterbird monitoring at KAHO, fruitbat monitoring at NPSA, etc.)
- Pololei monitoring (monitoring the plants or where they come up after a rain, clearing weeds, etc.)
- Shark monitoring in the bay
- Pili grass monitoring
- Native plant monitoring in watered areas.

9. **Are there other issues you would like considered? For example, interdisciplinary topics, landscape-level changes, or topics about which you think we need more information to help us further identify important monitoring needs?** (E.g., identifying the role of air quality in coral reef health; is ohia forest cover changing above 5,000ft?)

- Need to establish monitoring protocols for effects of sediment in the bay.

10. **Identify any opportunities for monitoring partnerships with other agencies, neighboring landowners, universities, etc. that will allow the parks to leverage personnel and funding available for monitoring.** (We want to describe any widely-accepted monitoring efforts used by other agencies in the general region. We are particularly interested in monitoring that provides the network with opportunities to compare data, put the network's data in context, and assist in interpretation of data collected in parks).

- Hawaiian Charter School

- Mauna Kea Soils and Conservation District
- Royal Court Assembly (important caretakers, source of volunteers)

KALOKO-HONOKOHAU NATIONAL HISTORICAL PARK

1. **What are the park's most significant resources for which information about status and trends is needed?**

- Water quality of ponds, pools, nearshore waters, groundwater
- Population and life history information of marine turtles
- Population and life history information of endemic waterbirds
- Inventory of anchialine pool species
- Coral reef: Algae, Coral species and cover, Fish, Target fish in fisheries
- Population size and location of native plant species
- Pond systems (biotic component)

2. **What park resources have regional, or even national significance due to their unique nature, or because they may serve as indicators of regional trends?**
    1) Threatened and Endangered Marine Turtles
        i. Hawksbill sea turtles (critically endangered) regularly seen in the park at dive sites. May someday use the area for nesting. Protection of their reef habitat is critical
        ii. Hawaiian green turtles (threatened). Large resident population primarily consisting of juvenile turtles extensively uses the park for forage (nearshore) and resting/sleeping (in established "holes" on reef). This population is currently free of the green turtle fibropapallomatosis disease that is severely affecting other green turtles in the state of Hawaii. Worst-case scenario, these turtles could be the only stock that remains to replenish the state population if the disease causes large mortality in affected turtles.
    2) Two fishponds provide significant wetland habitat for endangered endemic waterbirds (stilts, coots)
    3) Anchialine pools. The park contains about 10% of the State's anchialine pool resources. These pools contain endemic and rare species, including the candidate species the Orangeblack Damselfly.
    4) Coral reef provides important (perhaps critical) habitat to marine turtles, west Hawaii contains most of the pristine reef habitat in the state. KAHO contains the most significant reef of all Hawaii parks (followed by PUHO).
    5) As invasive plants are removed from the park and native plants expand or are reintroduced, the park may become a nursery for critical native plants needed for reintroduction in other dry coastal areas. Some critical species include Bidens sp and Capparis sp.

3. **Are there particular resources that the park has special mandates, or commitments to protect either by park legislation, in a general management plan, or in other laws or planning documents?**
    1) T&E species
    2) Migratory bird act
    3) Reefs--Coral Reef Initiative
    4) Fishpond and anchialine pools in GMP

4. **What, in your opinion, are the greatest current threats to significant park resources?**
    1) Human Related Impacts (Threat Range: High Medium Low)
        i. Coastal/Mauka Development of Conservation Lands surrounding the park (High)
            1. Groundwater contamination from industrial uses, spills, herbicides, pesticides leading to contamination of park waters.
            2. Nutrient loading of ponds, anchialine pools, and nearshore waters from upslope cesspools and septic tanks. Phosphates from wash water originating in the harbor.
        ii. High use impact at some SCUBA diving sites. (Medium-Low)

iii. Alien marine species – algae, invertebrates. Potential infection site from harbor, hulls and anchor chains (Medium)
iv. Alien fish in anchialine pools (High/Medium)
v. Aquarium fish collecting (Medium). The State of Hawaii Department of Aquatic Resources has prohibited collecting in the park since 2000 but there is virtually no enforcement.
vi. Potential sedimentation of coral reef from pond restoration activities, harbor activities, (Medium)
vii. Impacts to T&E species (nesting waterbirds, basking marine turtles) from dogs allowed in the park, even on leashes. (High)
viii. Visitor impacts to natural resources (Medium to High)

2) Natural Impacts
i. Alien predators of endangered water birds (mongoose, feral cats, dogs) (High)
ii. Alien vegetation (High)
iii. Erosion of sandy shoreline
iv. Other invasive aliens (plants, ungulates, rats, disease, mosquitoes, ants)
v. loss of biodiversity

5. What are the greatest potential threats to significant park resources?

- Air Quality (level of threat unknown)
- Climate Change – coral reef, rising sea levels affecting erosion rates
- Additional mauka and adjacent development
- Privatization and expansion of Honokohau Harbor
- Increased visitation due to new visitor contact station
- new invasive aliens (brown tree snake, Melastomes, grasses)
- further loss of biodiversity
- alien fishes

6. **Are there significant current or planned community or ecosystem restoration projects in the park for which long-term monitoring information is needed?**
1) Restoration of Aimakapa pond habitat for waterbirds
2) Restoration of Kaloko pond wall (effects of opening makahas to ocean)
3) Potential restoration of some anchialine pools (milo vegetation removal, alien sp removal)

7. We want information produced by the I&M program to be widely interpreted. What is the best way to make this information available to interpretive staff and the public.
1) Web sites
2) Briefing of staff
3) Participation days for interp staff on projects
4) Signs, brochures and exhibits in the park for the visiting public
5) Newspaper updates for local public
6) learning center
7) publish grey lit, PCSU publs on web
8) researchers write popular articles

8. **What natural resource monitoring projects or relevant research have been undertaken in the past or are ongoing now?**
1) Marine turtle health and habitat study
2) Waterbird nesting study
3) Alien vegetation removal
4) Water quality of Aimakapa pond
5) Contaminants of Kaloko and Aimakapa ponds

9. **Are there other issues you would like considered? For example, interdisciplinary topics, landscape-level changes, or topics about which you think we need more information to help us further identify important monitoring needs?**
    1) Interface between natural and cultural resources
    2) Paleo-ecology studies- especially evidence of the pre-Hawaiian, changes during Hawaiian settlement and pre/post-European environments
    3) Subsidence and sea-level rise studies

10. **Identify any opportunities for monitoring partnerships with other agencies, neighboring landowners, universities, etc. that will allow the parks to leverage personnel and funding available for monitoring.**
    1) Potential partnerships with
        i. Hi Dept. of Aquatic Resources West Hawaii Aquarium Fish Project (WHAP)
        ii. University of Hawaii Hilo
        iii. USGS reef sedimentation project
        iv. Bishop Museum All Taxa effort
        v. USGS BRD
        vi. Hawaii Invasive Species Committee

PUUHONUA O HONAUNAU NATIONAL HISTORICAL PARK

1. **What are the park's most significant resources for which information about status and trends is needed?** (E.g., Native koa and ohia forest distribution and health at HAVO, water quality at KAHO, harvested marine fish species at WAPA.)

- Status and trend data is needed for populations of threatened & endangered, sensitive, native (indigenous, endemic, Polynesian introduced), and exotic (invasive and non-invasive) species of plants and animals.
- Status and trend data is needed for biotic communities and associations, especially the rare ones (anchialine pond saltmarsh) and heavily impacted ones (coastal strand).
- Water quality data is needed for anchialine ponds, springs and waterholes, and nearshore marine waters.
- Data is needed on nearshore marine resources, particularly the coral reef. Although currently outside the boundary and legal jurisdiction of the Park, snorkeling and diving and tourism activities are increasing and should be monitored.
- tidepools

2. **What park resources have regional, or even national significance due to their unique nature, or because they may serve as indicators of regional trends?** (e.g. coral reefs at NPSA, wetland at AMME, endemic forest birds at HALE,)

- The saltmarshes surrounding the anchialine ponds (the Royal Fishponds), inside and outside the Puuhonua.
- The anchialine ponds
- The biotic communities of the strand.
- The keanaee pali (a refugium for uncommon plant species: *Plumbago zeylanica*, *Peperomia* sp.)
- The marine environment is outside the boundary and legal jurisdiction of the Park, however, humpback whales use Park coves as maternity grounds, endangered green sea turtles forage along the coast and haul out to rest on Park shores, and the coral reef in Honaunau bay attracts increasing numbers of tourists.

3. **Are there particular resources that the park has special mandates, or commitments to protect either by park legislation, in a general management plan, or in other laws or planning documents?** (e.g. Federally listed species, water rights, viewsheds, etc.)

- Federally listed species: the Hawaiian bat, loulu palms, Hawaiian poppy, and green sea turtle all occur in the Park proper. At the mauka garden (detached parcel) several other species of endangered plants are maintained in cultivation: *Kokia drynarioides*, *Abutilon menziesii*, *Hibiscus brackenridgei*, and *Caesalpinia kavaiensis*.

- Sensitive and native (indigenous, endemic, Polynesian introductions) plant species: *Heteropogon contortus, Capparis sandwichiana, Wikstroemia pulcherrima, Tephrosia purpurea, Ipomoea tuboides*, and others.
- Saltmarsh and Strand biotic communities will be designated special ecological areas for rehabilitation and preservation by the revised vegetation management plan.

4. **What, in your opinion, are the greatest current threats to significant park resources?** (E.g. trail impacts, subsistence take, illegal harvest, impacts from established alien pests, aircraft noise, etc.)

- Impacts from established invasive alien plant species, principally *Leucaena leucocephala* and *Pithecellobium dulce*.
- Water quality of springs, fishponds and nearshore marine will deteriorate as upland development continues.
- Impacts from established invasive fish species, tilapia and gambusia, in the anchialine ponds.
- Impacts from feral animals: cats, mongoose, rats, goats, pigs.

5. **What are the greatest potential threats to significant park resources?** (e.g. incipient alien invaders, anticipated air or water quality changes, climate change, landscape-level changes on adjacent lands, etc.).

- Incipient alien invaders such as ivy gourd.
- Development up-slope from the Park will negatively impact water quality.
- The Park has no management authority over marine resources which are experiencing increasing activity from tourism. I am not aware that DLNR is monitoring populations of sensitive marine organisms for decline and someone should be watching over this resource.
- Rising sea level due to global warming will eventually wipe out the Park.
- alien fish in anchialine pools

6. **Are there significant current or planned community or ecosystem restoration projects in the park for which long-term monitoring information is needed?** (E.g., prescribed fire restoration activities at HAVO and KAHO, fishpond restoration at KAHO.)

- The saltmarsh vegetation surrounding the anchialine ponds and patches of the strand are both reasonably pristine communities of native organisms which are going to be designated Special Ecological Areas in the revised vegetation management plan. There are a number of species which are absent from these communities however. Species which by all accounts ought to be present, such as: *Sesbania tomentosa, Heliotropium curassavicum, Sida fallax, Jaquemontia ovalifolia, Vitex rotundifolia*, etc.). Rehabilitation of these communities will improve the resiliency of these biotic communities through redundancy and will involve propagating and planting out selected native species.
- Native plant community nuclei will be established in designated special ecological areas free of archeological and cultural resources. These nuclei will be planted with native (indigenous, endemic, Polynesian intro.) species which are capable of shading out *Leucaena* and *Pithecellobium* as they mature and close canopy. The hope is that these nuclei will expand over time through seedling recruitment and slowly exclude the exotic invaders thus reducing the Park's dependence on herbicides.

7. **We want information produced by the I&M program to be widely interpreted. What is the best way to make this information available to interpretive staff and the public?** (E.g., establish a web site; conduct periodic written or oral briefings, liaison with Learning Center.)

- Establish a web site with self guided tours and explanations which provide edutainment so that learning new information is fun and easy.
- Distribute CDs with power point presentations to staff so that all who have access to a computer can teach themselves via a slide show/tutorial at their own pace.
- Hold periodic oral briefings, like an annual symposium or conference with concurrent sessions, in order to facilitate cross pollination between Parks. Bring NR personnel from each of the PIN parks to an annual conference to present research results, updates, innovative solutions to common problems, and allow folks to network.

- Produce informative, full-color, tri-fold brochures handed out at visitor station explaining purpose and need of those projects most visible to visiting public.
- Bring elementary school classes to Park for hands on experience.
- I&M on web, learning center, publish grey literature, CSU publications on web

8. **What natural resource monitoring projects or relevant research have been undertaken in the past or are ongoing now?** Please indicate approximate time spans of the projects and project leaders or principle investigators, if known. (E.g., rare plant and endangered bird monitoring at HAVO; water quality and waterbird monitoring at KAHO, fruitbat monitoring at NPSA, etc.)

- Vegetation monitoring began in 1986 (Leishmann, Tech Report 57) with the publication of the first vegetation map based on a 1976 aerial infrared photograph. Deardorff (2002) digitized this map in ArcView and is currently digitizing vegetation of the Park from photographs taken in 1996 (satellite and aerial imagery) with ground-truthing in 2002. The percent change in vegetation will then be calculated using Ecologist's Tool Box. Deardorff intends to publish a Revised Vegetation Management Plan in 2002. GIS vegetation maps are soon to be published on the web by the NPS GIS Clearinghouse.
- Vegetation inventories of the Park were done in 1986 (Smith et al, Tech Report 56) and in 1998 (Pratt, Tech Report 121) with recommendations as to exotic species removal and native plant restoration.
- Water Quality inventory and monitoring began in 1999 with a study of the water quality of the anchialine fish ponds (Chai and Dendel, UH Internship Program project paper). Deardorff initiated an inventory of water quality of springs, waterholes, anchialine ponds, and nearshore marine waters in 2002.
- Green Sea Turtle inventory and monitoring (George Balasz) was carried out in 2001 and possibly in the past as well. Marine turtles at the Park are quite healthy and free of tumors.

- In 2002, Deardorff completed an inventory of terrestrial arthropods along two transects in the Coconut forests of the Wainoni and Keamoali'i areas of the Park prior to removal of 30 years worth of coconut debris. A post debris removal inventory will also be carried out to monitor change in species frequency or abundance if any. David Foote is identifying the arthropods and has, I believe, carried out similar arthropod surveys in the Park in the past.

- Alien vegetation removal has been ongoing for years but data have not been collected systematically.

9. **Are there other issues you would like considered? For example, interdisciplinary topics, landscape-level changes, or topics about which you think we need more information to help us further identify important monitoring needs?** (E.g., identifying the role of air quality in coral reef health; is ohia forest cover changing above 5,000ft?)

- Rising sea levels due to global warming need to be monitored. Archeology resources near the shore are increasingly eroded during storm plus high tide events. Absence of vegetation in the strand increases vulnerability of resources to these events.
- The Royal fish ponds at PUHO are both a natural and a cultural resource. How do the perspectives of each of these disciplines differ with regard to the same resource? How are they the same? Where is there synergy between disciplines?
- Traditional uses and harvesting of natural resources (noni, coconut, fish) have continued as the use of chemicals on upslope coffee farms (herbicides, pesticides, fertilizer) increased with the advent of modern agricultural practices. Use of agricultural chemicals at the Park has dramatically decreased in recent years but in the past large quantities of Atrazine (for example) were used. A survey for contaminants should be carried out and tissues of fruits and fish analyzed along with water and sediments from nearshore marine, anchialine ponds, and springs and waterholes.

10. **Identify any opportunities for monitoring partnerships with other agencies, neighboring landowners, universities, etc. that will allow the parks to leverage personnel and funding available for monitoring.** (We want to describe any widely-accepted monitoring efforts used by other agencies in the general region. We are particularly interested in monitoring that provides the network with opportunities to compare data, put the network's data in context, and assist in interpretation of data collected in parks).

- University of Hawaii, Manoa and Hilo
- USGS BRD
- US Fish and Wildlife T & E species.
- Hawaii Dept. of Land and Natural Resources, Aquatic resources

HAWAII VOLCANOES NATIONAL PARK

1. What are the park's most significant resources for which information about status and trends is needed? (sort of in priority order)

1. Diverse mesic forest ecosystems and plants/invertebrates on lower slopes of Mauna Loa, and also on Kilauea above Kalapana Trail.
2. Rain forest ecosystems and plants/invertebrates.
3. Upper montane, subalpine, and alpine ecosystems and species on Mauna Loa, esp: a) understanding community trends (montane Mauna Loa, 4000-6000 ft elevation); b) follow communities changing as koa and mamane colonize native shrubland/grassland.
4. Rare plant and animal species, including endangered species and species examples of evolutionary processes.
5. Early successional lava flows and kipuka complex on rift zones?
6. Relict dry forest ecosystems and species.
7. All other lowland ecosystems proposed for restoration.
8. Geological processes and volcanic activity.
9. Culturally significant native communities, e.g. traditional gathering areas and species.
10. Anchialine ponds, beach, intertidal and coral reefs

Not prioritized: forest birds, procellarids, nene, cave ecosystems

2. **What park resources have regional, or even national significance due to their unique nature, or because they may serve as indicators of regional trends?**

- Diverse mesic forest and portions of HAVO rain forest, particularly plants and invertebrates (unique). Monitoring forest stand regeneration of key tree, tree fern species (RL)
- Early successional lava flows and kipuka mosaic and examples of evolutionary processes (unique)
- Probably some subset of rare species (unique or indicators)
- Mesic forest and to some extent the rain forest are important to Native Hawaiians as a reference source for resources that influenced cultural practices due to the derogation of many native plant comminutes outside of the park.
- Coastal resources may be unique as a baseline due to the geographical isolation from population centers where heavy marine gathering and pollution occurs.
- Native biodiversity
- Invasive alien control techniques & philosophy

3. Are there particular resources that the park has special mandates, or commitments to protect either by park legislation, in a general management plan, or in other laws or planning documents?

- 25 T&E plants
- 5 T&E vertebrates
- Little guidance from planning documents other than RMP, but Master Plan lists restoration of "endemic species", "remnant Hawaiian ecosystems" and "endangered species" as a park goal.
- Coral reef initiative and management direction for parks to be take a proactive role in protecting, monitoring and restoring adjacent marine resources.

4. What, in your opinion, are the greatest current threats to significant park resources?

a) Alien species invasions and displacement of native communities/landscapes (plants, ungulates, rats, disease, mosquitoes, ants); loss of biodiversity
b) small population size and loss of endemic species
c) Lava flows

d) Fire
e) Potential park development
f) Visitor impacts (in that order)

5. What are the greatest potential threats to significant park resources?

- Same as above,
- Plus potential industrialization of boundary areas or incompatible uses, e.g. cattle grazing in Kapapala Ranch, in areas where park is a small sample of the landscape
- Lack of management of surrounding natural areas, e.g. no alien species management in Tract 22 and Kahaualea NAR.
- New invasive aliens (specifically, brown tree snakes, Melastomes, grasses)

6. Are there significant current or planned community or ecosystem restoration projects in the park for which long-term monitoring information is needed?

Ecological restoration is underway in some form or degree in all park ecosystems. This includes restoration emphasizing natural recovery following removal of key alien species (e.g. rain forest, upper montane, subalpine, alpine) and complex restoration programs including alien species removal, outplanting and seeding of native plants, and reintroduction of rare species (faya invaded rain forest, koa forest, dry ohia woodland, lama forest, coastal lowlands, coastal strand. All restoration projects need long term monitoring.

'Inspections' rather than scientific, statistically modelled monitoring is suggested for fences and snares. Additional long-term monitoring is needed for the following: koa and ohia forests, invasive grasses, forest birds, pigs, goats and rats.

7. We want information produced by the I&M program to be widely interpreted. What is the best way to make this information available to interpretive staff and the public?

- Establish a web site
- Conduct periodic written or oral briefings
- Field trips and training with Interpretation division
- New media
- Participation of interp in resource activities
- Learning center
- Publish grey literature
- CSU publications on web
- Researchers write popular articles

8. What natural resource monitoring projects or relevant research have been undertaken in the past or are ongoing now?

- Fire effects studies in recent burns
- Effects of goat and pig removal on vegetation
- Vegetation mapping
- Monitoring of restoration experiments
- Rare plant population monitoring
- Selected bird population monitoring (bird transects)
- Monitoring of nene, petrel, silversword, and other rare species targeted for recovery
- Alien plant mapping
- air quality and atmospheric deposition
- Monitoring of selected invertebrate taxa in mesic and wet forest, esp. Drosophila
- IBP transect
- Outplantings
- Fences
- Snares
- Fayatree

9. **Are there other issues you would like considered? For example, interdisciplinary topics, landscape-level changes, or topics about which you think we need more information to help us further identify important monitoring needs?**

- Statewide or islandwide monitoring of invasive species.
- Think we need to consider our coastal marine related resources. There are a lot of questions I do not think we have really considered, from visitor impacts on anchialine ponds at our coastal camp sites, health of the marine tidal communities etc. Just like we look at adjacent terrestrial resources as being linked to the parks, we need to look at the adjacent marine resources as linked to the park.
- air quality
- soundscapes

10. **Identify any opportunities for monitoring partnerships with other agencies, neighboring landowners, universities, etc. that will allow the parks to leverage personnel and funding available for monitoring.**

- There is a great potential partnership with BRD for monitoring, especially in their fields of expertise, birds, invertebrates and rare plants.
- HVO has geological monitoring covered.
- Bishop Museum for inverts and their All Taxa project
- Olaa-Kilauea Partnership
- Hawaii Invasive Species Committee
- GAP

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Table 1. Summary of Monitoring Survey: Current and Potential Threats. X = current, p = potential.

	KALA	HALE	HAVO	PUHO	KAHO	PUHE	WAPA	AMME	NPSA	**Tally - Current**	**Tally - Potential**
Human-related Impacts											
Resource Collection											
Subsistence fishing and other take							x		x	2	
Coconut crab subsistence harvest									x	1	
Subsistence farming									x	1	
Aquarium fish collection					x					1	
Illegal fishing									x	1	
Marine harvest									x	1	
Harvest of local turtles, bycatch mortality									x	1	
Sand-mining on turtle nesting beaches									x	1	
Fire											
Wildfire (arson; unintentionally set)		x, P	x, P			x	x			4	2
Visitor impact											
Visitor impact in sensitive/wilderness areas	x	x, P	x, P	P	x			x		4	3
Dirt-biking						P					1
Existing/proposed horseback tour operations		P									1
Increasing park visitation		P		P	P	P					4
High use impact at some SCUBA diving sites					x					1	
Boating marina								x		1	
Illegal dumping								x		1	
Unleashed/leashed dogs					x					1	
Effects of nearby or encroaching activities											
Incompatible development of adjacent lands/watershed			P	x	x, P	P	x, P	x	x	5	4
Erosion (of sandy shoreline), sedimentation (affects water				x	x*	x	x	x		5	

quality)											
Expanding agriculture into primary forest in the park									x	1	
Human population growth (eg, loss of habitat buffer or reservoirs, degradation of air quality, water quality etc)									P		1
Groundwater contamination from industrial uses, spills, herbicides, pesticides leading to contamination of park waters.					x					1	
Nutrient loading of waters from upslope cesspools and septic tanks; phosphates from wash water originating in the harbor	x, P			x, P	x					3	2
Other activities that affect viewscape						P					1
Lack of supporting legislation (to eliminate/control pests before they enter the park)		P									1
Inadequate/Inappropriate Management											
Inadequate exclusionary fences		x								1	
Inadequate resource management in surrounding natural areas			P								1
Developing Park infrastructure		P	x, P		P	x				2	3
Loss of Components of Native Ecosystems											
Loss of key species (prey species, host species, plant dispersers and pollinators)		x, P								1	1
Loss of biodiversity	x	x	x, P		x				x	5	1
Further loss of biodiversity	P	P			P				P		4
Loss of endemic species			x, P							1	1

Small population sizes of endemic species			x, P							1	1
Invasive species											
Marine/anchialine species											
Algae					x		P			1	1
Invertebrates					x					1	
Crown of thorns									P		1
Alien fishes - general					P						1
Alien fish (in anchialine pools)				x, P	x					2	1
Terrestrial species											
Invasive species in general (uncontrolled and under-controlled spp)		x, P	x, P				x			3	2
Introduction and new invasions of alien plants and animals		x, P								1	1
Alien plants - general	x, P	x	x, P	x	x	x			x	7	2
Melastomes - general	P	P	P		P						4
Miconia									P		1
Grasses - general	P	P	P		P	x				1	4
Alien mammals - general		P									1
Ungulates-general	x	x	x, P	x	x				x	6	1
Pigs				x					x	2	
Goats				x						1	
Cattle (trespassers)		P									1
Small mammals											
Mongoose				x	x					2	
Cats				x	x					2	
Rats	x	x	x, P	x	x				x	6	1
Dogs					x					1	
Invertebrates - general		x, P								1	1
Mosquitoes	x	x	x, P		x					4	1
Ants	x	x	x, P		x				x	5	1
Reptilian predators		x, P								1	1
Brown tree snakes	P	P	P		P		P		P		6
Diseases - general	x	x	x, P		x				x	5	1
Diseases - avian		x, P								1	1
Natural Processes/Other											
Lava flows			x, P							1	1

Air Quality					P						1
Climate change (coral reef, sea level rise); Global warming				P	P				P		3
Coral bleaching, mortality and disease due to warming sea surface temperatures									P		1
Hurricanes									P		1

Table 2. Summary of Monitoring Survey: Education and Info Dissemination

SUGGESTIONS *REACHING THE PUBLIC*	KALA	HALE	HAVO	PUHO	KAHO	PUHE	WAPA	NPSA	**Tally**
Internet (web pages; I&M website linked to NPS website; pages added to each park website; distributed electronically; self guided tours; "edutainment")	x	x	x	x	x	x	x	x	8
Brochures (e.g. annual, catchy/easy-to-read, significant findings; full-color, tri-fold, hand out at visitor station)		x		x			x		3
Press releases (dramatic/ interesting findings)		x							1
Glossy publications and programs (with public relations spin)							x		1
Newspaper updates for local public					x				1
Public briefings (oral, visual, dynamic speaker, for lay		x	x				x		3

person)									
Public Service Announcements - radio		x							1
Public Service Announcements - television		x							1
Enhance relationships with key community partners						x			1
Elementary school trips for hands-on experience				x					1
Learning Center	x	x	x	x	x	x		x	7
Signs, brochures, exhibits for visitors					x				1
Interactive media center on site						x			1
EDUCATING NPS STAFF									
Intranet		x							1
LAN		x							1
Staff briefings					x				1
CD with powerpoint presentations so staff can educated themselves (at own pace)				x					1
Annual symposium/conference through cross pollination b/n parks; bring NR personnel from each of the PIN parks to present research results, updates, innovative solutions to common problems, and allow folks to network				x					1

Written briefings		x					x		2
Consistent recording of info/data between parks		x							1
Field Trips and Training for Interp Division			x						1
Interp Div participation in resource/monitoring activities	x		x		x				3
REACHING THE CONSERVATION COMMUNITY OR INTERESTED PARTIES									
HCC (break-out sessions)		x							1
Popular articles (written by researchers)	x	x	x		x			x	5
Publish grey literature (e.g. PCSU publications on web)	x	x	x	x	x	x	x	x	8