



Early Detection of Invasive Plant Species Monitoring Plan

Standard Operating Procedure #3: Safety

Version 2.2 (27 March 2017)

Change History

New Version	Revision Date	Author	Changes Made	Justification
1.0	2010	A. Ainsworth	Developed.	Designed for the FTPC and EIPS protocols.
2.0	2/19/2013	M. Selvig	Updated EAP.	Adapted for veg. mapping work.
2.1	9/21/2015	A. Ainsworth	Removed references to PACN safety plan.	No longer maintained.
2.2	3/27/2017	A. Ainsworth	Updated JHA's.	JHA additions (feral animals, infectious diseases, driving) and updates (fatigue, lost).

Only changes in this specific SOP will be logged here. Version numbers will be incremented by a whole number (e.g., Version 1.3 to Version 2.0) when a change is made that significantly affects requirements or procedures. Version numbers will be incremented by decimals (e.g., Version 1.6 to Version 1.7) when there are minor modifications that do not affect requirements or procedures for publication in the series.

Purpose

This SOP explains safety procedures that all field crew members should follow to ensure optimum safety when working within Pacific Island Network (PACN) parks as part of the Early Detection of Invasive Species Monitoring Plan (Ainsworth et al. 2017). This SOP includes information from PACN park safety plans, park job hazard analyses (JHAs), and the Pacific Cooperative Studies Unit (PCSU) field operation SOPs (PCSU 2010).

Safe Fieldwork Overview

Safety is our most important priority. It is essential that field crew members are both technically proficient in vegetation monitoring and function as an effective team focused on reducing the probability for human error. Recent NPS accident statistics show that human error continues to be the most significant cause of accidents in parks with many of the error-caused mishaps due to poor judgment, inattention, and ineffective supervision. Field accidents often happen when staff members are tired or distracted. Field staff must be mindful of this and stay focused and aware of their surroundings. Personal safety is everyone's responsibility. If one does not feel safe in performing some aspect of their job, the activity should be stopped and a supervisor should be notified. If one

feels that a co-worker is not performing safely, the activity should be reported to a supervisor. If the supervisor does not correct the safety issue, the Program Manager is to be notified. Any employee who knowingly commits an unsafe act, creates an unsafe condition, disregards the safety policy, or is a repeated safety offender, will be disciplined.

Rules and Regulations

All Inventory and Monitoring (I&M) vegetation field crews (staff and volunteers) are required to read and be familiar with this document. Additionally, all staff must be familiar with any park specific guidance on safety for the park they will be working in. Documented park safety plans range from nonexistent (WAPA) to very thorough (HAVO). Existing plans can be found for HAVO at: I:\1_PACN\Safety\PACN_Parks_Safety\HAVO /HAVO General Safety Policy 8.03.09 and all other parks at I:\1_PACN\Safety\PACN_Parks_Safety. Because park safety plans are living documents, field crews must contact the parks prior to conducting field work to ensure they have the most updated park specific safety and communication guidance. Park specific contact numbers and other details are available at the end of the PACN I&M Safety Plan document.

Only staff, cooperators, and approved volunteers are allowed to assist with field work. Friends, pets, and children are prohibited from accompanying field teams. Researchers or colleagues from other organizations are not allowed to accompany field teams without prior permission. The project lead should always be consulted if there are uncertainties regarding someone's eligibility to accompany the field crew.

When conducting field work, a crew must have at least one member with current Standard First Aid and CPR certification (preferably from a Wilderness organization). All field leaders and if available field crew members will attend NPS Operational Leadership Training (OLT) during or prior to the field season. OLT training focuses on reducing the probability for human error by increasing individual and team effectiveness. Each crew member must complete and sign the PACN Inventory & Monitoring Annual Safety Training Checklist and save a signed scanned version at I:\1_PACN\Safety\Training\I&M_PACN_safety_training_checklists. Field crews will always have a designated field leader and in areas concerning safety, the on-site field leader's decision is final. However, an individual still may refuse to engage in what they believe is an unsafe operation.

Any time field crews are in the field they must have and be familiar with their **Emergency Action Plan (EAP)**. It is essential that the EAP identify a point of contact (POC) person, crew return date and time, check-in procedures, field map, chain-of-command contact list and actions to be taken in the event that the crew fails to return or check-in. The POC is responsible for notifying the park's staff and the Safety Officer if a field person is injured. Any injury incurred on the job must be reported to the supervisor IMMEDIATELY. Failure to report injury may result in the denial of workers compensation claims and/or disciplinary action. The EAP example provided below should be modified for local circumstances, however it is important that supervisors and field crew clearly understand emergency and communication procedures for their specific location. For overnight trips or day trips in restricted areas in Hawaii parks, crews are also required to submit a backcountry travel plan (I:\vegetation\Documents\Safety\ReadinessReview docs\FY17\HAVO\Supplemental documents\HAVO_Employee_Backcountry_TravelPlan) to the park's "dispatch" or Pacific Area Communications Center (808-985-6170), project lead (PL), park POC in addition to daily POC.

Emergency Action Plan for failed communication

The point of contact (POC) is responsible for making sure that an emergency alert and/or process is initiated if field personnel do not return when scheduled or no radio or cell phone contact is received

from the field at the expected preplanned call-in time. Field crews will communicate at check-in and check-out with PACC and status checks with park-specific POCs. The POC should attempt to contact the field crew 30 minutes after the scheduled call-in or return time if contact with the crew cannot be made.

1. If the 0700-0800 check-in or the 1700-1800 check-out times are not made by the field crew, it will be considered a failed check in/out and PACC will contact the listed POC on the backcountry plan.
2. POC will monitor the radio and phone for 30 min from the crews designated call in time or planned return time.
3. POC will call PACC to see when the crews last communication was. If there is no contact after 30 min beyond the planned call or return time, POC will attempt to call the field crew.
4. POC will review the copy of the filed backcountry travel plan (HAVO-overnight trips/closed areas only; KALA- wet forest only).
5. POC will contact crew supervisor or designate that was involved in the initial planning process.
6. Coordinate efforts with the following to re-establish communications with the crew.
 - a. Supervisor
 - b. I&M Project Lead
 - c. I&M Program Manager
 - d. NRM Chief
 - e. Chief Ranger
 - f. Aviation Manager
 - g. PACC
 - h. Other field crew
7. Consult and identify the potential of an emergency, and contact PACC to initiate emergency response procedures. If there are one or two people, the potential for life threatening illness/injuries may be higher than if there are three or four people.
8. Continue to try and reach the failed check in crew.

Remember that failed check in/out can be a serious matter, and all efforts to maintain communications need to be addressed in pre-planning.

Emergency Response Plan

“Call, Contact, Care” describes the required immediate response to an emergency. *Always call* PACC first or 911 if the situation warrants. Be sure to give the following information: name, location of emergency, type of emergency and type of help required. *Contact* park staff (Dispatch), colleagues in the field, supervisor, to alert them to the incident and any relevant danger. Field crews are required to carry lists of emergency contact phone numbers as a backup to those programmed into project cell phones. *Care* for injuries by giving and getting prompt medical treatment. All injuries that warrant compensation require paperwork. Report all incidents of any type to your supervisor immediately.

Communication

Field work will be planned ahead of departure, discussed with a supervisor, and the appropriate information including a clear communication plan will be documented on the EAP (e.g., contact, sample site locations, return time). Communication is essential for safe field work and for all PACN parks the portable radio should be the primary form. In Hawaii parks, the Pacific Area Communications Center (PACC 808-985-6170) is the central radio dispatch and is physically located

at HAVO. Radio communications for the outer island parks run through the park superintendents or resource chiefs. Cell phones can also be effective tools in parks that can receive cell phone reception.

Communication Training

All crew members will receive training on the operation of park radios, cellular phones, and other communication devices (e.g., satellite messaging device, personal locator beacon) prior to beginning field work. Training will cover appropriate use of communication devices, site specific communication issues (i.e., known park radio/cell phone dead zones), and review of what to do in an emergency.

Portable Radios

Portable radios are the primary communication tool to ensure staff safety in the field when working in PACN parks. At least one park radio (preferably two) and charger(s) will be assigned per crew. Portable radios keep field crews abreast of park emergency situations (e.g., wildfires), allow other staff in the park to know the location and status of crew members particularly in the case of an emergency, and are a means of communicating locally between separated field crew members.

Before entering the field in a park, field crews must ensure that their radios are correctly programmed including all park repeaters or, if necessary, borrow park pre-programmed radios. Because some radio and emergency procedures differ among parks, it is essential that field staff discuss current radio and emergency SOPs with park personnel prior to field work.

General radio guidelines:

1. Read and review the radio user guide
(I:\safety\Device_Info\Radio_info\SOP_Radio_User_Guide_Icom_2008.pdf).
2. Identify the appropriate park channels.
3. Ask park staff if the crew members should be assigned call numbers or just use a general name such as "I&M vegetation crew" on the radio.
4. Protect radios from moisture, dust, and hard impacts.
5. Bring an extra battery.
6. Radios must be loud enough to hear at all times in the field.
7. Always scan all park channels.
8. Communicate between separated team members using the park's appropriate line of sight channel.
9. When hiking along a trail, if team members spread out along the trail the last team member must have a radio and ideally the first do too.
10. Avoid accidentally activating the radio key. This can happen in a backpack or wearing a belt harness while using the seatbelt in a vehicle. Everyone in the park will hear your conversation and having the radio key activated will keep the system out of use for other traffic, including emergencies.
11. Turn off and charge radios whenever out of the field.
12. Communicating with the radio:
 - a. Check that your radio is on with a charged battery (green LED light illuminated).

- b. Think about what needs to be relayed before calling on the radio. Be brief and concise to keep the airwaves clear and save battery power.
- c. State the call number of the person you are trying to reach or Park you are in “Dispatch” (e.g., HAVO Dispatch), followed by your own call number if assigned or name. For example, state: “HAVO Dispatch, 720.” And the dispatcher will respond with, “720, this is dispatch.”
- d. After firmly pressing the push-to-talk button (PTT) on the radio (red LED light illuminated), wait a second before speaking to prevent the start of the radio communication from being cut off. Speak clearly and face the wind when talking into the radio to prevent the wind from directly hitting the microphone and causing static. If your transmission is longer than 30 seconds, you must break your transmission to allow other emergency radio traffic. Say “break”, take a breath, listen for any other traffic and then resume your transmission if there is no other traffic.
- e. During park emergencies, dispatch will “SECURE THE RADIO FREQUENCY.” All traffic on the radio should relate to the ongoing incident until the original incident is done and the dispatchers “RELEASE THE FREQUENCY TO NORMAL TRAFFIC.” If there is another emergency during the initial incident then the frequency should be interrupted to call for assistance.

Cellular Phones

Cellular phones are valuable communication devices that field teams will carry when working in parks with reception (HAVO, HALE, and KALA). Note that not all areas of these parks have reception and crews will receive updated cellular phone coverage maps or verbal information from park staff during the communication training. All PACN cellular phones will need to have their roaming coverage updated and park’s emergency contacts, park primary point of contact, and PACN staff home and work numbers programmed prior to each field season. Field crews will also take a hard copy of the contact list for use with personal cellular phones in the event of a work phone malfunction. Field crews will take chargers for multi-day trips with access to electricity or a vehicle.

Field Work

Daily tailgate safety briefings are required prior to any field work. Briefings are conducted in the field before hiking to the work site and include: objectives for the day, communication, maps, and safety hazards. Any relevant Job Hazard Analyses (JHAs) should be reviewed during these tailgate safety sessions. JHAs identify existing and potential hazards and recommend corrective measures for basic job steps or activities such as hiking in backcountry. These are intended to be quick references and should be reviewed and updated regularly. At the end of each field day, the vegetation crew will have a debriefing in which near misses are identified and any general concerns addressed. In the event that an incident occurs and the affected party is unable or uncomfortable immediately discussing the issue due to possible injuries or stress, other crew members should hold a prompt debriefing.

Field personnel safety is the highest priority when collecting vegetation data. No data is worth the risk of injury or death. Worker injuries, in addition to causing physical harm, directly impact productivity by reducing personnel and funds available for monitoring vegetation. Although most workers possess a reasonable degree of wilderness hiking knowledge and experience, the hazards of wilderness hiking or backpacking should not be taken for granted. A large number of injuries result from slips, trips, and falls while hiking. Just like any other work activity, hazards must be identified, safe procedures and techniques must be developed, and workers must be trained to perform tasks safely.

Below are some of the risks and concerns associated with PACN vegetation field work. See the JHAs at the end of this SOP for further safety guidelines.

Weather and Gear

Field personnel need to be aware of weather forecasts, changes in the weather, and be prepared to alter field work and clothing accordingly. The following are required field safety equipment and clothing needed for every trip into the backcountry.

1. Communication equipment (see Field Communication for Backcountry Travel). At least one portable radio (with back-up battery) and a cellular phone where appropriate.
2. Water and food to sustain you for 24 hours. Not drinking enough water is a common and potentially life-threatening problem during field work.
3. First aid kit, flashlight, fire-starter or matches (waterproof or in a zip-lock bag), whistle, sunscreen, hat, insect repellent, and sun/safety glasses.
4. Sturdy boots that provide ankle support and traction. Boots that are at least ankle high with Vibram® soles will help prevent slips, falls, and ankle sprains. Depending on park and terrain, alternate footwear may be worn if approved by a supervisor (e.g., Tabis in and around water, rugby shoes in steep forested terrain of NPSA, rubber boots in rain forests).
5. Rain gear/outerwear at all times to keep the field worker warm and dry. Rain gear typically includes rain pants and a rain jacket. The combination of clothing must be adequate to keep the worker warm and dry during an unplanned stay overnight with no shelter.
6. An emergency blanket and if working more than three miles from access a small tarp and rope should be carried by each team in the event of an unplanned stay overnight with no shelter.
7. Tents and sleeping bags for overnight stays during field work. Tents must be serviceable and in good condition to withstand most wind and rain, and sleeping bags must be sufficient to keep staff warm.
8. Respirator when working in high SO₂ areas of HAVO. Medical clearance and fit testing/training are necessary for operation.

Hiking and Backpacking

Hiking and backpacking hazards will be addressed during the daily tailgate safety briefings. Relevant hiking JHAs should be reviewed during these sessions and crew members should properly stretch during this time prior to hiking to any field sites. Much of PACN vegetation monitoring takes place in remote locations and requires backcountry hiking and backpacking for access. Field personnel need to be aware of the hazards associated with backcountry travel, including hiking over rugged or steep terrain, and long distance travel off-trail.

Field crew members should avoid working alone and never traverse difficult terrain without another crew member. If you do become separated and lost or disoriented it is important that you STAY WHERE YOU ARE. You may be overcome by panic. Sit down and quietly organize your thoughts on where you are. A few moments of recollection may clarify your situation. If not, find a comfortable place to rest. Use your whistle or other means to attract the attention of anyone around you. Do not try to leave the area if there are no signs of where to go. Do not follow a stream downhill, as it will almost certainly go over a waterfall at some time. Do not travel at night.

Though efforts have been made to reduce field personnel exposure to unsafe areas, some travel over rough or steep terrain may still be required. Field crews must use extreme caution and take the time to continue safe practices. When traveling over rough or steep terrain, conservative decision making

is required and the safest route is to be chosen, even if it results in increased travel time. Rerouting to avoid risky terrain may result in fewer sites monitored. The NPS realizes this tradeoff and still places safety as a higher priority than productivity. Attached to the end of this SOP are the PACN I&M Vegetation Monitoring JHAs which contain more information on risks, including travel over rough and steep terrain, and mitigation methods during vegetation monitoring in the backcountry. These analyses were compiled from a number of HAVO JHAs and other I&M networks (KLMN, PINN, PWR, SFAN) monitoring protocols.

Travel in Vehicles

Vehicles must be operated safely and all staff must complete the DOI Learn defensive driving course.

Follow the guidelines below for vehicle use:

1. You must have a valid driver's license before driving any vehicle whether on or off-road.
2. Persons not experienced in 4-wheel driving may require on the job training in off-road driving.
3. Always carry emergency equipment (i.e., first aid and basic survival kit and car jack).
4. Always be sure someone in the park knows where you are going and expected to return.
5. On private land the owners/workers have right of way. Drive slowly so as not to kick up dust.
6. Any vehicle being used to reach sampling sites should have fluid levels checked weekly.
7. Vehicles should be cleaned prior to entering new sections of the park to prevent inadvertent invasive seed transport.
8. Report any vehicle problem immediately to the supervisor and maintenance.
9. Report accidents to your supervisor immediately.
10. Use common sense.
11. Obey the rules of the road even when driving off-road.
12. Driving safety policies are listed in NPS Reference Manual 50B, Section 6.0 Motor Vehicles.

Travel in Helicopters and on Commercial Flights

Field staff that fly in helicopters for work related activities, are required to take the Office of Aircraft Service's Basic Aviation Safety Training (A100). If you will be flying on commercial airlines, you are not permitted to take any fuel for cook stoves or have it packed in your luggage. All fuel must be purchased at your destination. It is also prohibited to fly commercially with any fuel containers (even if they are empty) or stoves using fuel containers that have previously contained fuel. You can be fined and/or arrested for attempting to bring these items on commercial airlines. For a listing of what is not allowed on commercial airlines, visit the Federal Aviation Administration (FAA 2010) or the Transportation Security Administration (TSA 2010) websites.

Health Concerns

It is the employee's responsibility to notify the supervisor regarding any health problems that might put the employee at additional risk of injury in the field. Such problems include fever, aches, fatigue, colds or other ill health, as well as allergies and other long-term and chronic health concerns.

An open cut may become infected easily under field conditions; therefore all scratches and cuts should be given appropriate attention, such as disinfecting and bandaging, and any injury should be

monitored. Antibacterial cream may be applied to reduce the chances of infection. Persons with serious injuries should seek professional medical attention as soon as possible.

Leptospirosis

There is a known risk of contracting leptospirosis in Hawaii, American Samoa, and likely Guam and Saipan. This is a disease caused by bacteria (*Leptospira interrogans*) that are transmitted between mammals. The bacteria can survive long periods of time in fresh water and mud and can enter the body through the eyes, nose, mouth and broken skin. It is inadvisable to drink or swim in potentially contaminated water (i.e., streams and ponds). The last outbreak in American Samoa was reported in 2004, which appeared to be related to contamination of streams from pig farms (Goldberg 2010). Avoid entering freshwater if you have breaks in the skin.

Recently, two park employees experienced similar symptoms after working near streams at KALA without any obvious open cuts. Therefore, anyone who becomes sick on return from field work in these settings should see a doctor and discuss leptospirosis.

Literature Cited

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Job Hazard Analysis - Hiking in backcountry

<u>Basic Job Steps/Activity</u>	<u>Existing and Potential Hazards</u>	<u>Recommended Corrective Measures</u>
Hiking in backcountry	Physical injury	Always be prepared for the day's tasks, mentally, physically, and with the proper equipment. At a minimum, all field crews should have first aid kits, field maps, a compass, cell phone, radio, raingear, lunches, and water. Conduct safety briefings on hiking hazards prior to hikes. Know how to initiate rescue via radio. Stay physically fit. Know your limits! Forcing yourself to go beyond your limits may increase the chance of an accident.
	Losing footing, falling on jagged, sharp lava	Wear gloves and long pants when on a'a lava. Move with cautious, sure footing. Try not to place your whole body weight on each step taken. - - Be ready to react if necessary. Look near and not far for footing. Take your time, ascending and descending.
	Losing footing, falling on shelly/unstable lava	Develop an awareness of the type of lava you are encountering. If it appears brittle, avoid it. Look and listen.
	Unstable/uneven footing, tripping	Wear high cut boots with good ankle support. Check soles of boots periodically to ensure adequate thickness. Mentally pick a path through the flow then focus on rocks or features that you will be stepping on. Always anticipate that the rock will move underfoot. Try not to place your whole body weight on each step taken. Be ready to react if necessary. When stepping off small ledges, land on the balls of your feet rather than heels. Be especially wary when carrying heavy tools or equipment. Make sure your pack is balanced with a good center of gravity. Do not rush. No project is worth an injury. Pay particular attention to traveling on steep slopes, unstable terrain, through dense vegetation, and in foggy conditions. Practice fall-arrest techniques (roll on stomach, dig elbow, feet and knees in). If you are not participating in a sweep, travel single file and step only where the previous person has stepped. In heavy undergrowth, lift your knees high to clear obstacles. Slow down and exaggerate steps in the area of exposed roots to keep from catching your toes. Always be aware of your surroundings. Conversations on trails could distract you from avoiding cracks/crevasses or other obstacles on the ground. Warn other crew members of potential hazards you may see such as cracks, loose rocks, etc.

PACN updated 3/22/2017

Job Hazard Analysis - Hiking in backcountry (continued)

<u>Basic Job Steps/Activity</u>	<u>Existing and Potential Hazards</u>	<u>Recommended Corrective Measures</u>
Hiking in backcountry	Losing footing, falling on steep slopes	If a target location is on a slope greater than 35 degrees, do not attempt to navigate to sample area. If slope is less than 35 degrees, however, seems unsafe to any of the crew members, find an alternate route around the slope or omit target location. Stay focused and anticipate changes in ground level. Use trekking poles if appropriate to help maintain balance and ease strain on knees. Maintain safe walking and working distance between people (10-foot minimum). Stagger spacing when on slopes such that people are not directly below other personnel higher on the slope. Be sure other workers in the vicinity know where you are. If something comes loose from a slope, warn others by yelling "ROCK!!!" When contouring a steep slope, do not lean into the hill. This tends to loosen footing. Erect posture, or slightly leaning out gives more secure footing. When moving uphill or in sandy soils, lean slightly forward, turn feet outward, shorten stride, and use as much of the inside of the foot as possible. Another technique is to toe into the slope by kicking your toe in and creating a step. On slippery loose ground, or going downhill, keep most of your weight on your heels. Shorten your stride, keep knees bent, and lean slightly backward. Make sure of secure footing and safe working positions. Walk - never run down slopes. Rocky slopes, especially loose rock and steep country, are treacherous. Have one hand free, preferably the uphill side, for protection against falls. Always carry tools on your downhill side. When slipping, lean into the slope and grasp for things to help arrest your descent. Use trees and solid rocks for handholds when they are available. Check footholds before using them. Do not lean out away from the slope, as this may result in a head-over-heels tumble. If you feel yourself slipping, pick a landing spot. Even before this, as you traverse a steep area, survey the area and look for good landing spots. Carry webbing for use when hiking or working in steep environments. Be conservative when deciding to use webbing. Remember, it's always easier to go up, than down. "Curse your fall." This means shout out an exclamation as you fall. This ensures you exhale as you land releasing air from your lungs. This can help minimize damage to your internal organs. Do not stick your arms out to break a fall. Keep your arms slightly bent in front of your head.
	Falling in areas with hidden earth cracks	Identify areas near fault zones or caldera that are known to have an abundance of earth cracks. Walk slowly and test footing. Uluhe, a native fern, is very effective at concealing holes and cracks, so be especially careful when walking in areas covered by uluhe. If possible, travel single file. Review plot/transect notes from previous sampling events for safety issues. Walking poles / ropes were tested at HAVO, but hampered movement through dense fern terrain.

PACN updated 3/22/2017

Job Hazard Analysis - Hiking in backcountry (continued)

<u>Basic Job Steps/Activity</u>	<u>Existing and Potential Hazards</u>	<u>Recommended Corrective Measures</u>
Hiking in backcountry	Tripping while walking, hiking after dark or before light	Carry and use good quality, strong flashlight. Carry extra batteries, bulb and back-up light. Allow additional time; walk with extra caution at dusk or dark.
	Falling due to wind	Be extra alert as wind gusts can affect balance.
	Losing footing due to wet, rainy conditions	Slow down; use extra caution on the often slippery surfaces, especially on sloping terrain.
	Losing footing near cliffs and cracks	Stay away from cliffs and cracks when possible. Watch footing near edges/cracks may easily break. When you need to walk near cliffs use extra caution, especially when conditions are dark, wet, windy, or produce limited visibility.
	Ankle sprains and blisters	Keep boot laces tight, treat hotspots immediately with moleskin.
	Fatigue	Prepare for environment of the target locations prior to going into the field (e.g. high elevation and sun exposure vs. densely vegetated wet forest). When sampling "out-and-back" go to the furthest site first and work back. This reduces the likelihood of crews being far from the vehicle late in the day. If crews need to return to area to complete sampling, they will have less distance to traverse. Be realistic with what the crew can complete in a single day. If crews become tired, slow down and rest.
	Eye injury	Be aware of ground hazards as well as above-ground hazards. Watch for fallen branches, bare twigs, etc. If needed, wear safety glasses and a still brim hat.
	Branches and trees, other dangerous obstacles	Do not jump off trees. Examine for the safest way around.
	Getting lost	Provide a daily plan to your point of contact (POC) which identifies travel routes (e.g. trails, roads, parking) needed to access sample sites. Ensure all personnel are knowledgeable with map and compass as well as GPS. Record GPS coordinates of vehicle and when navigating off-trail so crews can return to this location at end of the day. Review field maps and target locations to familiarize with the topography and plan out a route that will avoid steep slopes, cliffs, or other challenges. Obtain weather report to be aware of expected conditions. Temporarily mark the center of your sampling area with flagging for easy relocation. Work in pairs and check on each other frequently enough so your general location is known to your partner at all times.

PACN updated 3/22/2017

Job Hazard Analysis - Hiking in backcountry (continued)

<u>Basic Job Steps/Activity</u>	<u>Existing and Potential Hazards</u>	<u>Recommended Corrective Measures</u>
Hiking in backcountry	Getting lost	High-visibility bright colored clothing should be worn for all field operations to more readily locate workers in the wilderness. Carry radio and cell phone with enough batteries to last the whole trip. Keep track of current position and location prominent landmarks with frequent map updates. Whenever possible, stick to established trails.
Hiking in backcountry	Dehydration, over-exposure to sun.	Carry and drink at least 3 liters of water daily. Apply sunscreen 20 minutes prior to exposure Wear sunglasses. Remember to reapply sunscreen if working in sun for extended periods. Cover skin surfaces as much as is comfortable (e.g. wear long-sleeve shirts and wide-brim hat if possible). Take an umbrella into the field to provide shade if none is found nearby.
	Hypothermia	Practice prevention: stay dry; wear appropriate clothing; cotton kills; wear layers, shed layers as needed (don't overheat as sweat can cause hypothermia); watch or listen to the weather forecast (see Radio SOP), and plan accordingly; stay hydrated, cover head with warm clothing, stay active. Be aware of the role that wind-chill can play in hypothermia; under certain conditions, hypothermia can occur without any rain or being wet.
	Electrical Storms – lightning	Watch the sky for signs of thunderstorms (e.g., darkening skies, towering cumulus clouds, increasing wind) and seek shelter before the weather deteriorates. Thunderstorms may occur without any forecast (particularly in Hawaii on calm and hot days), POC will help field crew monitor weather and if field crew hears thunder they will immediately begin exit from field. If outside with no shelter, do not congregate. In case of lightning strike, someone must be able to begin revival techniques (e.g., CPR). Metal does not attract lightning, it does conduct it so be aware and stay away from metal fences. Avoid standing near isolated trees or in open spaces. Do not use telephones. Seek lower elevations such as valleys or canyons; avoid being on peaks and trees. If you feel your hair standing on end and your skin tingling, this is a sign that lightning might be about to strike – crouch immediately (feet together, hands on knees).
	Altitude sickness	Know and recognize signs of “acute mountain sickness”: headaches; lightheadedness; unable to catch your breath; nausea; vomiting. Practice prevention: acclimate to high elevations slowly and stay hydrated. If symptoms progress: difficulty breathing, chest pain, confusion, decreased consciousness or loss of balance, descend to lower elevations immediately and seek medical attention.
	Giardia	Treat, filter, or boil all drinking water. Do not drink untreated water from streams, lakes, or springs. Keep any open wounds out of water.

PACN updated 3/22/2017

Job Hazard Analysis - Hiking in backcountry (continued); Hiking to work areas on beaches and across streams

<u>Basic Job Steps/Activity</u>	<u>Existing and Potential Hazards</u>	<u>Recommended Corrective Measures</u>
Hiking in backcountry	Encountering feral dogs	If you detect a feral dog and it has not engaged you, don't scream, don't draw attention, don't make eye contact, leave area and get back in your vehicle quickly. If an attack is imminent (dog is aggressively approaching) blast air horn, prepare defense tool (machete, stick, rock) and use to fight off dog, try to keep as much distance between you and dog as possible (a backpack is a good barrier), try to stay standing and retreat to vehicle as soon as possible. Do not run!
	Encountering feral pigs	If you hear pigs nearby, shout, throw sticks and make a raucous to scare them away. If charged, climb a tree or grab a branch and lift your legs. This is a last resort.
	Bees and wasps	Be aware of bee/wasp activity around the area by listening and watching. Avoid areas with high activity. Inform supervisor and fellow crew members of allergies ahead of time. Carry Benadryl, epi-pen or other anti-histamine if you have known allergic reactions.
	Scorpions	Inspect items left lying on the ground, e.g. clothing, prior to putting them on, especially camping.
	Mosquitoes	Wear bug repellent and long sleeve shirt to prevent bites; be aware of West Nile Virus symptoms.
	Encounters with strangers	Report uncomfortable encounters with strangers in park to a supervisor as soon as possible; report apparent illegal activity to a park ranger, do not get into a confrontation with a visitor in the park.
Hiking to work areas on beaches and across streams	Exposure to high tides on beach, routes cut off	Check tide tables before going out and plan travel accordingly. If caught on beach on a rising tide, move as high up the cliff as possible, but in an area that you can be seen from above. Use alternate land routes if possible for one leg of the trip. Be careful on slippery logs, intertidal areas covered in algae, and watch footing on either side of stream or channel crossings. Adjust pace and footing to allow you sure footing as you move through the tidal zone. Don't allow incoming waves to rush you.
	Crossing streams	Scout the area to determine a safe spot to ford the stream. Avoid crossing where the water is knee high or higher. Do not cross on logs that span the stream. Do not attempt crossing during heavy rainfall or if upslope thunder has been noted. Walk slowly and deliberately to allow for proper evaluation of upcoming terrain in order to avoid any potentially dangerous obstacles. Place your feet carefully in firm footholds. Avoid loose rocks, high water flow, slippery rocks, and overly steep or muddy terrain. When climbing rocks or crossing rocky areas attempt to have three points of contact at all times and keep your center of gravity low. A wading pole is required to aid balance around drop offs. Appropriate footwear with traction (tabies, or shoes with a felt or nylon sole, lace-on oversoles, or bonded carpeting sole) should be used for stream work. If wearing a non-quick release backpack, slip off the upstream shoulder strap so the pack can be discarded in an emergency situation. Reliable weather reports should be obtained for the areas that influence the streams or river beds in areas where work will be conducted, prior to leaving for the field. Avoid working in flooded areas or where water is moving swiftly. Cancel work activities during or following weather changes, especially upslope of stream sites (excessive rain, although it may be sunny at the site).

Job Hazard Analysis – Hiking to work areas on beaches and across streams (continued); Backpacking with heavy loads; General heavy lifting; Communication; Working near volcanic fumes

<u>Basic Job Steps/Activity</u>	<u>Existing and Potential Hazards</u>	<u>Recommended Corrective Measures</u>
	Crossing streams	Be alert and listen for signs of a flash flood and move to higher ground immediately. Any sudden increase of debris, muddy water, or a low roar of thunder are indicators of a possible flash flood which can arrive very quickly. Leave yourself with exit routes in the event of flash flooding.
	Infectious disease	Many fresh water sites in the Pacific Islands have contained hazardous levels of various bacteria (e.g., leptospirosis) particularly after large storm events. At KALA, recently two park employees experienced flu-like symptoms after working around streams without any obvious open wounds. Anyone who becomes sick on return from field work in these settings should see a doctor and discuss potential bacterial diseases.
Backpacking with heavy loads	Load instability	Make sure your pack properly fits. Adjust the hip-belt and sternum strap correctly. Use both straps to carry pack. Carry no more than 1/3 of your body weight while traveling in the backcountry. When carrying heavy loads, pack the gear so that heavy equipment is carried low on your back to increase stability. Consider using hiking poles. DO NOT OVERESTIMATE YOUR LOAD CAPACITY.
	Muscular pain and soreness	Start slowly to ensure muscle groups are given adequate time to warm up. Use stretching exercises before starting.
	Back strain	Lift loads with your legs to avoid back injuries.
General heavy lifting	Strained back, arms and/or shoulders, hands, hernia, damaged fingers and/or toes, tripping, falling, and/or slipping	Before lifting, check intended route and point of placement for load. If the load is too heavy for you to safely lift, call for assistance immediately. Test the weight of the load. When testing load weight, do not attempt to lift item more than 3 inches. During lifting test, keep your hands and fingers on the sides of the item whenever possible Note the locations of your fingers, hands and feet in relation to the location of the load at all times Stand close to load with feet apart. Bend knees, keep back as straight as possible (although not necessarily vertical). Lift with legs, arms and shoulders – NOT WITH BACK AND STOMACH MUSCLES. Avoid quick, jerky motions. Keep back as straight and the load as close to the body as possible.
Communication	Unable to reach a radio repeater in a remote location	Make sure radio is charged and on the correct channel. Try to raise someone on the radio to inform them of your predicament. If you are unable to reach a repeater from your location, climb up a slope toward a ridgetop of knoll and try again. Try at regular intervals, just meandering around may help in getting a signal.
Working near volcanic fumes	Physical irritations – headache, sore throat, coughing, nausea	Follow guidelines found the “Effective Respirator Use” section (see HAVO safety section). If respirator does not eliminate symptoms, you may be especially sensitive to the fumes. Talk to your supervisor about possible relocation to an area with better air quality.

PACN updated 3/22/2017

PACN I&M Job Hazard Analysis (JHA) - Driving to and from field sites

SOP3.15

Tasks	Hazards	Potential Injuries	Abatement Actions
1. Driving to and from field sites.	1a. Narrow, single-lane, unpaved roads with rutted and uneven surfaces. 1b. Driving with limited visibility. 1c. Rocks, deep holes or obstacles in the roadway. 1d. Fatigue. 1e. Animals crossing or standing in roads. 1f. Storm conditions, wind, lightning, or slippery roads.	Auto accidents.	1a: - Wear seatbelts at all times when vehicle is moving. - Never use cell phones or other devices when operating a vehicle of any kind. - Maintain a safe speed (this is often below the legal speed limit) for the road conditions. - Stay clear to the right, especially on curves. - Drive with headlights on at all times. - When backing up/parking, the passenger should exit vehicle to guide the driver. 1b: - Clean both sides of windows when necessary (remember back window). - Slow down. - If blinded by sun or dust, proceed slowly or pullover and wait for hazard to pass; keep to the right hand side of the road and drive with your lights on. 1c: - Avoid driving over sharp rocks or in deep pits. - Reduce speed substantially in places with pots/holes, protruding rocks or other obstacles. 1d: - Be aware of signs of fatigue. - Pull over and rest. - Eat a snack or have a partner drive 1e: - Although animal encounters are unlikely at this location, mongoose, feral cats, feral sheep, mouflon sheep, axis deer, goats, pigs, wild dogs and pheasants may be in the road way. - Slow down where animals might be present to allow for reaction time. - Do not swerve abruptly to avoid hitting an animal, it's better to ride out the impact. 1f: - Keep informed on the current weather. Dial 808-973-5286 to reach the National Weather Service, ex. 237 to speak to a person. Also check the online forecast. - Avoid going to the field if lightning is present and avoid using radios and cell phones. - Drive slowly when roads are muddy and slippery.

