



Early Detection of Invasive Plant Species Monitoring Plan

Standard Operating Procedure #5: Creating Target Species Lists

Version 1.0 (1 June 2017)

Change History

New Version	Revision Date	Author	Changes Made	Justification
1.0	6/1/2017	A. Ainsworth, J. Gross	Developed.	Significant changes to draft ED narrative document.

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 describes how to locate and generate species lists necessary to conduct early detection surveys within Pacific Island Network (PACN) parks as part of the Early Detection of Invasive Species Monitoring Plan (Ainsworth et al. 2017). In addition to recording unknown or undocumented species not described on park checklists (e.g. NPSpecies, more specific ecoregion checklists, etc.), early detection surveys will also record occurrences of known threats compiled on a target species list. Ideally, the park's resource management staff will already have an up-to-date list of non-native target species that require early detection and rapid response. If this is not the case, then the following SOP can be used as a guide to collaborate with resource management to create or update target lists, and additionally, to create outreach products (identification cards, calendars). A target species list will help the field crew to identify species that are known or perceived threats to the study area and promote integration of early detection surveys with the ongoing management activities conducted within the park. For example, in some parts of HAVO the invasive tree *Morella faya* has been nearly eradicated and any new occurrences are quickly controlled. The field crew might incorrectly assume *M. faya* should not be recorded because it is common throughout other areas of the park and because it is documented on the species checklist. By collaborating with resource

management on a target species list, the field crew would understand that the incipient population of *M. faya* would be a serious concern to resource management and needs to be recorded in specific locations of the park.

Included in this SOP is a list of references that may be helpful for selecting, identifying, and familiarizing oneself with potential invasive plant species in Hawai'i and the Pacific. A list of organizations that are well versed in non-native plants and can add valuable information regarding recent changes in species distribution and priority species is also provided.

Developing Target Species Lists

Any species that is unknown or undocumented in the study area could be an invasive species threat and is recorded during early detection surveys. In addition to these unknown/undocumented species, target species are also recorded regardless of whether or not they were previously documented within the area. The number and type of species selected for the target species list is a judgement call made by resource management, the project lead, and the field crew. Lists of target species can be developed in several ways, depending on the goals, needs, and resources of a particular park or region. Listed below are a few examples of species that are typically chosen as targets.

- Species for which additional information is needed
- Species listed in the state or region as noxious
- Species not yet established in the area of concern, but established in nearby or similar areas
- Species with the potential to severely impact areas of high conservation value
- Species for which control programs already exist
- Species previously removed from an area
- Species not yet naturalized or with very limited distributions
- Species invasive elsewhere in similar habitats and not yet present on island

Several tools can help to gauge both feasibility of removal and threat level. The likelihood of successful eradication can be estimated through an analysis of factors including, the number and extent of known locations, the efficacy of control techniques, and the presence of supporting legislation which prioritizes or mandates removal (e.g., noxious weed laws). Once invasiveness and the likelihood of successful removal are known for a list of given species, those that have a high invasiveness level and a high likelihood of successful removal can be selected as survey targets.

In 2013, I&M worked with the University of Hawaii and resource managers from each park to develop lists of invasive plants targeted for early detection and response as part of a pilot study. These lists range from 15-25 species per park and were the basis of identification cards and calendars distributed to park staff to increase invasive plant species awareness and detection (Appendix E). Outreach products will be created opportunistically when funding are available. Species additions or removals from target lists and outreach products will be decided by input from park resource managers, the project lead, and the field crew and may need to be modified based on field observations during early detection surveys. For example, a target species may be removed from the target list if the crew finds the species to be overly abundant in the study area. Modifications to the target species list will need to be coordinated with resource management and the project lead to ensure information on the species status is properly communicated and future management needs are addressed.

While some invasive species have the potential to be found throughout an entire park, other species may have a more limited distribution within a park given changes in environmental conditions and differences in land use history. For example, in HAVO koa haole (*Leucaena leucocephala*) is an aggressive invader of the dry coastal lowland but is absent from the wetter uplands dominated by wet forest. Therefore, habitats or ecological zones should be considered when generating lists.

Suggested References to Select Target Species

The following list of references may be helpful for selecting, identifying, and becoming familiar with potential incipient invasive plant species in Hawai‘i and the Pacific.

Books and journals

Bailey, L.H. and E.Z. Bailey. 1976. Hortus. 3rd ed. Macmillan General Reference, NY.

Binggeli, P. 1998. An overview of invasive woody plants in the tropics. School of Agricultural and Forest Sciences Publication Number 13, University of Wales, Bangor, UK.

Brickell, C. and J.D. Zuk. 1997. The American Horticultural Society A-Z encyclopedia of garden plants. DK Publishing, Inc., NY.

Courtwright, G. 1988. Tropicals. Timber Press, Portland, OR.

Daehler, C., J. Denslow, S. Ansari, and K. Huang-Chi. 2004. A risk-assessment system for screening out invasive pest plants from Hawaii and other Pacific Islands. Conservation Biology 18:360-368.

Dehgan, B. 1998. Landscape plants for subtropical climates. University Press of Florida, Gainesville, FL.

Graf, A.B. 1992. Tropica. 4th ed. Roehrs Company, East Rutherford, NJ.

Haselwood, E.L. and G.G. Motter, eds. 1983. Handbook of Hawaiian weeds. 2nd ed., revised and expanded by R.T. Hirano. Harold L. Lyon Arboretum, University of Hawai‘i, Honolulu, HI.

Jacobi, J.D. and F.R. Warshauer. 1992. Distribution of six alien plant species in upland habitats on the Island of Hawai‘i. *In: Alien plant invasions in native ecosystems of Hawai‘i*, C.P. Stone, C.W. Smith, and J.T. Tunison, eds. University of Hawai‘i Press, Honolulu, HI.

Juvik, S.P and J.O. Juvik. 1998. Atlas of Hawai‘i. 3rd ed. Department of Geography, University of Hawai‘i press, Honolulu, HI.

Langeland, K.A. and K.C. Burks. 1998. Identification and biology of non-native plants in Florida’s natural areas. University Press of Florida, Gainesville, FL.

Little, E.L. and R.G. Skolmen. 1989. Common forest trees of Hawai‘i. Agriculture Handbook No. 679. United States Department of Agriculture, Washington, DC.

Medeiros, A.C., L.L. Loope, P. Conant, and S. McElvaney. 1997. Status, ecology, and management of the invasive plant *Miconia calvescens* (Melastomataceae) in the Hawaiian Islands. Bishop Museum Occasional Papers 48:23-36.

- Medeiros, A.C., L.L. Loope, and C.G. Chimera. 1999. Flowering plants and gymnosperms of Haleakala National Park. Cooperative National Park Resources Studies Unit, University of Hawai‘i at Mānoa, Dept. of Botany. Tech. Rept.
- Motooka, P., L. Castro, D. Nelson, G. Nagai, and L. Ching. 2002. Weeds of Hawai‘i’s pastures and natural areas: An identification and management guide. Unpublished report. College of Tropical Agriculture and Human Resources, University of Hawai‘i at Mānoa, Honolulu, HI.
- Neal, M.C. 1965. In gardens of Hawai‘i. Bernice P. Bishop Museum Special Publication 40, Bishop Museum Press, Honolulu, HI.
- Palmer, D.D. 2003. Hawai‘i’s ferns and fern allies. University of Hawai‘i Press, Honolulu, HI.
- Riffle, R.L. 1998. The tropical look. Timber Press, Portland, OR.
- Skolmen, R.G. 1960. Plantings on the forest reserves of Hawai‘i: 1910-1960. Unpublished report. Institute of Pacific Islands Forestry, Pacific Southwest Forest and Range Experiment Station, United States Forest Service, Honolulu, HI.
- Smith, Clifford W. 1985. Impact of alien plants on Hawai‘i’s native biota. *In*: Charles P. Stone and J. Michael Scott, eds.: Hawai‘i’s terrestrial ecosystems: Preservation and management. Cooperative National Park Resources Studies Unit, University of Hawai‘i, Mānoa, HI.
- St. John, H. 1973. List and summary of the flowering plants in the Hawaiian Islands. Pacific Tropical Botanical Garden Bulletin 1:1-519.
- Staples, G.W. and D.R. Herbst. 2005. A tropical garden flora. Bishop Museum Press, Honolulu, HI.
- Staples, G.W., D. Herbst, and C.T. Imada. 2000. Survey of invasive or potentially invasive cultivated plants in Hawai‘i. Bishop Museum Occasional Papers 65:1-35.
- Starr, F., K. Starr, and L.L. Loope. 2005. Roadside survey and expert interviews for selected plant species on Moloka‘i, Hawai‘i. Unpublished report prepared for Moloka‘i Invasive Species Committee, Honolulu, HI.
- Stone, C.P. and L.W. Pratt. 1994. Hawai‘i’s plants and animals: Biological sketches of Hawai‘i Volcanoes National Park. University of Hawai‘i Press, Honolulu, HI.
- Turner, R. J. Jr. and E. Wasson. 1997. Botanica. Mynah, USA.
- Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999. Manual of the flowering plants of Hawai‘i. 2 vols. Bishop Museum Special Publication 83, University of Hawai‘i and Bishop Museum Press, Honolulu, HI.
- Whistler, W.A. 2000. Tropical ornamentals. Timber Press, Portland, OR.

On-line resources

- Australian Weeds Committee. 2010. National weeds strategy (web site).
<http://www.weeds.org.au/aws.htm> (accessed 30 Jul 2014).
- California Invasive Plant Council (Cal-IPC). 1999. Cal-IPC: The inventory database (web site).
<http://www.cal-ipc.org/paf/>. (accessed 30 July 2014).
- Flora of North America Association. 2000. Flora of North America: Families in the flora (web site)
<http://www.fna.org/families> (accessed 7 Sept 2010).
- Germplasm Resources Information Network (GRIN). 2010. National Plant Germplasm System (web site). <http://www.ars-grin.gov/> (accessed 7 Sept 2010).
- Invasive Alien Species Indicator. 2010. Invasive alien species indicator database (web site).
<http://academic.sun.ac.za/iasi/login.asp> (accessed 7 Sept 2010).
- Google. 2010. Google images (web site). <http://www.google.com/images> (accessed 7 Sept 2010). A vast image search tool.
- Missouri Botanical Garden. 2014. Tropicos: Specimen database (web site). <http://www.tropicos.org/> (accessed 30 Jul 2014).
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<http://sciweb.nybg.org/science2/VirtualHerbarium.asp> (accessed 30 Jul 2014).
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<http://www.agric.nsw.gov.au/noxweed/> (accessed 30 Jul 2014).
- Smithsonian Institution. 2014. Flora of the Hawaiian Islands (web site).
<http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/> (accessed 30 Jul 2014).
- Starr, F. and K. Starr. 2010. Plants of Hawai'i (web site).
<http://www.starrenvironmental.com/images/?o=plants>. (accessed 30 Jul 2014).
- State of Queensland. 2010. Queensland herbarium (web site).
<http://www.qld.gov.au/environment/plants-animals/plants/herbarium/> (accessed 30 Jul 2014).
- United States Department of Agriculture (USDA). 2014. Plants database (web site).
<http://plants.usda.gov> (accessed 30 Jul 2014).
- United States Forest Service, Pacific Island Ecosystems at Risk (PIER) (website). Available at
<http://www.hear.org/pier/> (accessed 30 Jul 2014).
- University of Hawai'i. 1998. Hawaiian alien plant studies (web site).
http://www.botany.hawaii.edu/faculty/cw_smith/aliens.htm (accessed on 7 Sept 2010).
- Wunderlin, R. and B. Hansen. 2002. Atlas of Florida vascular plants (web site).
<http://www.florida.plantatlas.usf.edu/> (accessed 30 Jul 2014).

Additional lists

Ecological weeds on conservation land in New Zealand (web site).

http://www.hear.org/weedlists/other_areas/nz/nzecoweeds.htm (accessed 30 Jul 2014).

Invasive species committees & councils of Hawaii (web site). <http://www.hear.org/alliscs/>. Accessed 30 Jul 2014

Several invasive species committees and councils exist in Hawai‘i, formed to combat problems in Hawai‘i posed by invasive non-native species.

Noxious weeds of Australia (web site). <http://www.weeds.org.au/noxious.htm> Accessed 30 Jul 2014.

Owen, S.J. 1996. Ecological weeds on conservation land in New Zealand: A database. Department of Conservation, Wellington, NZ.

PCA - Plant Conservation Alliance Alien Plant Working Group. Least wanted: Alien plant invaders of natural areas (web site). <http://www.nps.gov/plants/alien/fact.htm>. Accessed 30 Jul 2014.

Space, J. C. and M. C. Falanruw. 1999. Observations on invasive plant species in Micronesia. Unpublished report prepared for meeting of Pacific Island Committee Council of Western States Foresters, Majuro, Marshall Islands.

Space, J. C. and T. W. Flynn. 2000. Observations on invasive plant species in American Samoa. Unpublished report. Department of Agriculture, US Forest Service, Pacific Southwest Research Station, Institute of Pacific Islands Forestry, Honolulu, HI.

Sherley, G. 2000. Invasive species in the Pacific: A technical review and draft regional strategy. Unpublished report. South Pacific Regional Environment Programme (SPREP), Pago Pago, AS. Available at http://www.hear.org/pier/pdf/invasive_species_technical_review_and_strategy.pdf. Accessed 30 Jul 2014.

Organizations Specializing in Invasive Plants

The following organizations are versed in invasive plants and can add valuable information regarding recent changes in species distribution and priority species and should be consulted when developing a potential incipient invasive species list. The address and contact information for these agencies and organizations are provided in Expert Interviews and Literature Searches section in SOP #8 “Conducting Corridor Surveys.”

National Park Service (NPS)

- Ala Kahakai National Historic Trail (ALKA)
- American Memorial Park (AMME)
- Haleakalā National Park (HALE)
- Hawai‘i Volcanoes National Park (HAVO)
- Kaloko-Honokōhau National Historical Park (KAHO)
- Kalaupapa National Historical Park (KALA)
- National Park of American Samoa (NPSA)
- Pacific Islands Exotic Plant Management Team (PI-EPMT)
- Pu‘uhonua o Hōnaunau National Historical Park (PUHO)

- Pu‘ukoholā Heiau National Historic Site (PUHE)
- War In The Pacific National Historical Park (WAPA)

Invasive Species Committees (ISCs) in Hawai‘i

- Maui Invasive Species Committee (MISC)
- Moloka‘i Invasive Species Committee (MoMISC)
- Big Island Invasive Species Committee (BIISC)
- Note: Other island ISCs include Kaua‘i ISC and O‘ahu ISC

Others

- American Samoa Invasive Species Team (ASIST)
- Guam Invasive Species Advisory Council (GISAC)
- Bishop Museum (BISH)
- Coordinating Group on Alien Pest Species (CGAPS)
- Global Compendium of Weeds (GCW)
- Hawai‘i Department of Agriculture (HDOA)
- Hawai‘i Department of Land and Natural Resources (DLNR)
- Hawai‘i Invasive Species Council (HISC)
- Pacific Island Ecosystems at Risk (PIER)
- The Nature Conservancy of Hawai‘i (TNCH), Hawai‘i Program and Asia Pacific Program
- United States Geological Survey (USGS), Biological Resources Division (BRD)
- University of Hawai‘i (UH) (UH at Mānoa and UH at Hilo)