



Data Quality Standards for Early Detection of Invasive Plant Species in the Pacific Island Network

Natural Resource Report NPS/PACN/NRR—2017/1543



ON THE COVER

Sonchus oleraceus and *Euphorbia prostrata* at Kalaupapa National Historical Park

Photograph by: Jacob Gross NPS

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Introduction

The purpose of this report is to document the standards, used by the Pacific Island Network (PACN) for activities related to the collection, processing, storage, analysis, and publication of data as described in the Early Detection of Invasive Plant Species Monitoring Plan (Ainsworth et al. 2017). The policies and procedures documented in this data quality standards plan for activities complement the quality-assurance plans for other monitoring activities conducted by the PACN and supplement the National Inventory & Monitoring Division Quality Management Plan. The plan also serves as a guide for all PACN personnel who are involved in program activities and as a resource for identifying memoranda, publications, and other literature that describe associated techniques and requirements in more detail.

Overview

Oceanic islands are extremely vulnerable to invasion by non-native plant species from continents because of their evolution in relative isolation and in the absence of some of the forces shaping continental organisms. As a result, ecologically disruptive or invasive species are able to completely displace native vegetation and alter ecosystem processes. Non-native plant invasions can also lead to significant economic and cultural costs.

By targeting invasions at initial stages, significant costs may be reduced or avoided in the long-term. The Pacific Island Network early detection program involves 1) repeated early detection field surveys along park dispersal corridors (e.g., roads, trails, fence lines) and other high-risk sites (e.g., parking lots) within PACN parks, 2) maintaining a database (NPSpecies) consisting of all species documented in PACN parks, and 3) the development of educational materials such as identification cards and calendars designed to increase park staff invasive species awareness and reporting capability.

Field crews knowledgeable of the native flora, will survey sections of corridors and high-risk invasion sites in order to document non-native plants that are new to the area, or of interest to the park. Documentation will include GPS points, photos of the species encountered, and associated attributes related to the species' age, abundance, and distribution. Field effort will be documented by GPS track logs. Field surveys under this monitoring plan emphasize dispersal corridors and other high-risk sites as these are important areas for non-native plant species transport via humans and animals and non-native plant species establishment via ground disturbance and/or increased light availability. Information on incipient species found during surveys are communicated with park management to guide rapid response efforts. This is a long-term program that requires repeated survey efforts every three years with the goal of detecting and reporting new invasive or suspect plants before they become widespread. After each field season, the project lead will summarize the survey data from that year in a report. Reporting will highlight species attributes (e.g., species richness, life form, reproductive status), spatial distribution attributes (i.e., maps, frequency of detections relative to distance from trailheads and/or populated areas), updated status of species identified during previous sampling events (i.e., species now considered widespread and not included in survey), and overall survey effort (e.g., worker hours, distance surveyed, time required to identify

unknown species). When paired with rapid response, early detection of invasive species along corridors is a cost-effective way of addressing plant species before they cause long-term damage to park resources and other areas of conservation value.

For all parks, the NPSpecies database includes all species documented within the park and source evidence identifying who and when new species were included (e.g., research studies, pers. comm.). This database will be updated to include any new species documented within parks during early detection surveys. It is imperative that NPSpecies be kept up to date and reviewed by park staff, local experts, and field crews prior to conducting future early detection corridor surveys. Educational materials (e.g., field plant identification guides, calendars) based on an incipient subset of invasive species are developed for park staff and volunteers to increase the park's early detection capabilities.

Objectives:

- 1) Survey dispersal corridors and other high-risk sites for incipient populations of potentially invasive plants.
- 2) Provide timely information to park managers regarding the presence of new and potentially invasive plant species in order to facilitate a rapid management response.
- 3) Update and maintain a plant species database (NPSpecies) for each park including new species detected during field surveys.
- 4) Develop and distribute invasive plant outreach materials to park staff to increase awareness and reporting capability.

Activities and Modules

Data are collected or derived as a part of the Early Detection of Invasive Plant Species Monitoring Plan (Ainsworth et al. 2017) in seven different activities or modules (Table 1).

Sampling Design

Information regarding the sampling design is provided in Table 2.

Table 1. Activity matrix for *Early Detection of Invasive Plant Species*.

Category	Activity Number	Activity	Description
Site Recon, Establishment, and Maintenance	1	Site recon	Accessible roads, trails, fence lines, power lines and developed areas.
	2	Target corridors	1) Gather or update GIS transportation layers of potential corridors. 2) Define the corridors and assign them a priority category. 3) Select the corridors to survey using park-specific prioritization criteria. See SOP #6 "Selecting Survey Locations."
Field Observations	3	Incipient species detections	Incipient species presence, age, phenology, abundance, distance from corridor, direction from corridor. See SOP #8 "Conducting Corridor Surveys".
Sensor Data	4	GPS track log and waypoints	GPS track log initiated at start of corridor survey, with additional waypoints taken for each detected incipient species. See SOP #7A "Using Global Positioning System (GPS) Units", SOP#7B "Using ArcCollector for Offline Data" and SOP #8 "Conducting Corridor Surveys".
	5	Photos	Photos of incipient species detected if unknown or as necessary for management response relocation. See SOP #8 "Conducting Corridor Surveys".
Field Sample & Specimen Collection and Processing	6	Identification of unknown species	Data, photo documentation, and specimen collection to facilitate identification to the species level upon return from the field. Includes collection of field notes to aid in identification and record of individual making final identification. Species collected and returned to the office for processing will be mounted and accessioned in permanent park collections if not on current species list. Unknown species photos will be updated with final identification and properly archived. See SOP #9 "Collecting and Vouchering".
QA/QC Data	7	Repeat measures	For activities 3 - 5 select transect sections are re-sampled mid-season. If observations among observers do not meet with acceptable variability, data will be flagged as suspect and site will be re-sampled.

Table 2. Activity-level sample design matrix for *Early Detection of Invasive Plant Species*. Numbers (left column) match those in the Activity Matrix (Table 1).

Category	Activity Number	Activity	Sampling Design	Revisit Design
Field Observations	3	Incipient species detections	All unknown plant species are considered incipient and recorded as detections. Known incipient species are sampled if not found on the park list, park regional list, or listed on the current park-provided “target” list.	Revisit every three years; however, species recorded as detections may differ among sampling events. The purpose of these surveys are to provide early detection information to parks while rapid response is still a viable option, once a non-native species is widespread it no longer qualifies as an early detection species.
Sensor Data	4	GPS track log and waypoints	Track logs will be collected for all surveyed corridors and waypoints will be recorded for all incipient species detections or populations (i.e., larger patch of incipient individuals will have one waypoint).	Revisit every three years. Importantly, track logs will document if corridors are monitored in a different direction or follow a different fork. Incipient waypoint locations may document spread and/or management efficacy.
	5	Photos	Photos will be taken of all unknown species detections and if detections may be difficult for rapid responders to locate and manage (e.g., small individual under other plants).	Revisit every three years with photos following the same sampling guidelines each time (e.g., only new unknowns to each sampling event will be photographed).

Data Quality Objectives

Data quality values and standards for implementation are provided in Table 3 through Table 6.

Table 3. Data quality values for *Early Detection of Invasive Plant Species*.

Category	Data Quality Value	Definition	Considerations
Intrinsic Data Quality	Accuracy	Measurements reflect the true value of the parameter being observed. This applies to measures (distance/ direction) or classes (species or categories). Includes components of precision and bias.	All plants are properly identified to the species level for all observations. Incipient species detections include measurements (distance and direction from nearest corridor) and classes (phenology, age/size class, abundance, and distribution).
Contextual Data Quality	Comparability	The degree to which data can be compared among sample locations, data sources, or periods of time.	This ED plan is designed to maximize early detection of locally incipient plant species during each sampling event to facilitate a rapid response by management. Therefore, while some comparisons can be made spatially and temporally all must be done with caution as different species may be included as detections. When applicable, reporting will include a short description of the current status of detections from previous sampling events.
	Timeliness / Currency	How recent the data need to be to be considered valid for their intended use. Data represents conditions and/or is available in a format for use at the appropriate phase for decision-making.	Following the completion of each survey, established contacts within park resource management staff will be informed of all new and targeted species detected.
	Completeness	All data/ measures required to evaluate accuracy and representativeness are present. Data records contain values as planned across the period of record.	All corridors are surveyed as scheduled; however, because species considered as early detections change by location and time period, comparisons must be done with caution. Unknown species records will require continual management to ensure associated data are updated as new information becomes available.

Table 3 (continued). Data quality values for *Early Detection of Invasive Plant Species*.

Category	Data Quality Value	Definition	Considerations
Representational Data Quality	Consistent Representation	Use of standard definitions when describing data quality or resource quality based on data.	Species are identified to minimally the specific epithet level. Definitions for phenology follow standard conventions for tropical species including any indication of reproductive material. Definitions of juvenile versus adult detections are species specific following guidance provided in the Hawaiian Flora (Wagner et al. 2012) and other tropical flora texts as necessary. Abundance cover and density classes and distribution classes are defined in accordance with rapid response measurements to aid managers in estimating control efforts.
Data Accessibility	Secure	Access to data, products, and systems limited to appropriate audiences.	Data is not sensitive in nature and can be released to the public.

Table 4. Measurement quality objectives for *Early Detection of Invasive Plant Species*. Activities (shaded cells) match those in the activity matrix (Table 1).

Measure	Quality Indicator	Quality Objective
Incipient species detections	Taxonomic Resolution	Identifications made to the species level (see taxonomic standards)
	Identification Accuracy	95% accuracy
	Distance from nearest corridor	+/- 5m
	Abundance measurement accuracy	+/- 1.0 sq. m for cover or +/- 10 individuals for density estimates
GPS track log and waypoints	Accuracy	+/- 5.0m (as standard for GPS Garmin devices)
Photos	Image resolution	16 megapixel
	Image format	JPG w/ embedded EXIF metadata
Identification of unknown species	Taxonomic Resolution	Identifications made to the species level at a minimum (see taxonomic standards)
	Identification Accuracy	100% accuracy

Table 5. Taxonomic standards to be used for *Early Detection of Invasive Plant Species*. Activities match those in the activity matrix (Table 1).

Category	Activity Number	Activity	Standard to be Used	Reference / Authority
Collection of Observational Data	3	Incipient species detections	Scientific Publication	Wagner et al. 1999, Palmer 2003, Wagner et al. 2012, ITIS, additional publications of non-native plant species as needed for identification.
Reporting of Observational Data	3	Incipient species detections	Scientific Publication	Wagner et al. 1999, Palmer 2003, Wagner et al. 2012, ITIS, additional publications of non-native plant species as needed for identification.

Table 6. Data protection standards for *Early Detection of Invasive Plant Species*. With the exceptions noted, all data collected are to be made publicly available in a timely fashion.

Category	Activity	Protection	Description
Resource Data and Information	Incipient species locations	Publicly available	Non-native species
Location Data and Information	Survey locations	Publicly available	Corridors are public roads, trails, etc.
Personally Identifiable Information	Non-NPS staff information	Legally protected	All but first name and last initial redacted from public release

Literature Cited

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