Targeted Surveys Provide Opportunities to Assess Threats to Managed Areas

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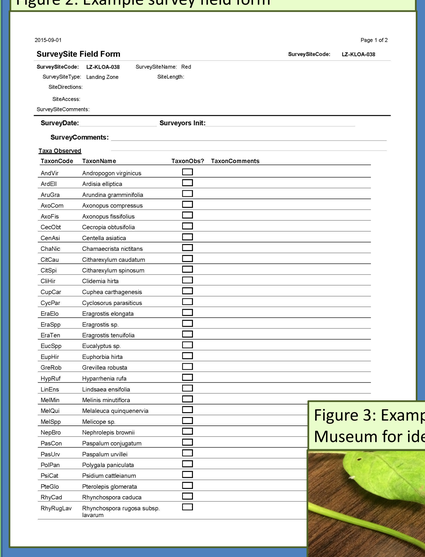
Abstract: Surveys can be the first line of defense in detecting invasive plant species. Effort spent searching targeted areas can provide numerous novel specimens that can be assessed for management action. The Oahu Army Natural Resources Program (OANRP) uses inventory surveys to identify potential new threats to endangered species Management Units (MUs) and to detect and prevent the spread of weeds on Army Training Ranges. These inventories are a low-tech method of detection that have provided valuable results. Each year OANRP surveys approximately 325 km along Army Training Range and MU access roads, 50 helicopter landing zones, 7 high-use field sites (such as campsites), and 15 highly trafficked trails (Fig. 1). With identification assistance from the Bishop Museum and the Oahu Early Detection program (OED), OANRP has documented 29 new island records for O'ahu, 9 new State of Hawaii records, and 13 new records of naturalizing taxa since 2004. Not all new species result in management actions, but early detection provides the opportunity to decide if a particular taxon requires action before it becomes a significant threat to resources in managed areas. The threats posed by new finds are assessed with the use of the Hawaii Weed Risk Assessment (HWRA) program, collection and naturalization data from Bishop Museum, the Smithsonian National Museum of Natural Botany Department, and expert botanical field knowledge. New taxa are assessed and management actions are determined using a management decision matrix.

Background and Methods:

Early detection is critical in allowing managers maximum flexibility in addressing incipient or novel invasive weed populations. Once a weed reaches a certain threshold infestation size, they can become too large to effectively control, particularly with limited staff time. OANRP conduct surveys at potential locations of introduction and spread on OANRP managed areas (Fig. 1). The surveys help to address Army requirements to minimize the threat of alien species introductions resulting from range maintenance, construction and training activities within and adjacent to landing zones, trails, and roadsides, as well as to address potential weed spread into areas of native forest managed for rare taxa. Information about the current distribution of a species, its invasiveness, and location are all used to determine an appropriate management response.

On each survey, staff record all non-native taxa observed within the defined survey area (Fig. 2). Survey data are entered into the OANRP Database and the following reports can be generated to assist with taxa assessments: 1) new taxa observed on a survey, 2) a list of surveys for which a particular taxa is present, 3) the date a taxa is first observed on any given survey, and 4) a list of taxa observed on previous survey dates. For species difficult to identify, specimens are sent to Bishop Museum for identification (Fig. 3).

Figure 2: Example survey field form



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SurveySite Field Form SurveySiteCode: LZ-KLOA-038

SurveySiteCode: LZ-KLOA-038 SurveySiteName: Red
SurveySiteType: Landing Zone SiteLength:
SiteDirections:
SiteAccess:
SurveySiteComments:

SurveyDate: Surveyors Init:
SurveyComments:

Taxa Observed

TaxonCode	TaxonName	TaxonObs?	TaxonComments
AndVir	Andropogon virginicus		
ArdElli	Ardisia elliptica		
AruGra	Arundina gramminifolia		
AxoCom	Axonopus compressus		
AxoFis	Axonopus fissifolius		
CecObt	Cecropia obtusifolia		
CenAsi	Centella asiatica		
ChaNic	Chamaecrista nictitans		
CitCau	Citharexylum caudatum		
CitSpi	Citharexylum spinosum		
ClidHir	Clidemia hirta		
CupCar	Cuphea carthagenesis		
CyoPar	Cyclosorus parasiticus		
EraElo	Eragrostis elongata		
EraSpp	Eragrostis sp.		
EraTen	Eragrostis tenuifolia		
EucSpp	Eucalyptus sp.		
EuphHir	Euphorbia hirta		
GreRob	Grevillea robusta		
HypRuf	Hyparrhenia rufa		
LinEns	Lindsaea ensifolia		
MelMin	Melinis minutiflora		
MelQui	Melaleuca quinquenervia		
MelSpp	Melicope sp.		
NepBro	Nephrolepis brownii		
PasCon	Paspalum conjugatum		
PasLnv	Paspalum urvillei		
PolPan	Polygala paniculata		
PsiCat	Psidium cattleianum		
PteClo	Pterolepis glomerata		
RhyCad	Rhynchospora caduca		
RhyRugLav	Rhynchospora rugosa subsp. lavarum		

Figure 1: Map of all weed surveys. Surveys are conducted at different intervals and therefore not all surveys shown are completed each year.

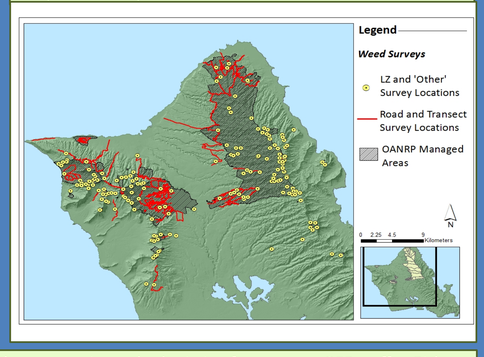
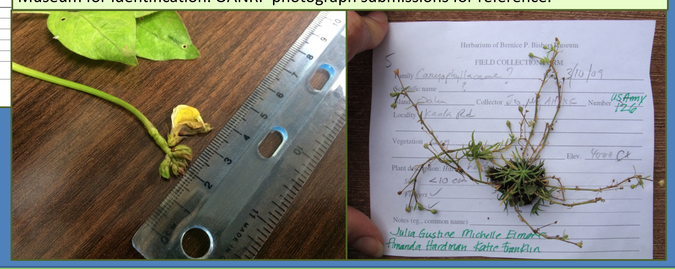


Figure 3: Examples of unknown species and submission form sent to OED staff at Bishop Museum for identification. OANRP photograph submissions for reference.



Survey Types:

Road: Effort varies for each survey depending on length (up to 2 kilometers) and quality of road (paved vs four wheel drive) and can range from half a day to two days to complete. Roads on Army Training Ranges and high-use OANRP access roads are surveyed annually, and the remaining OANRP access roads are surveyed every other year. On Army Training Ranges, road surveys include all drivable roads as well as training sites that appear to have had use. Ranges may be separated into several surveys to facilitate access and tracking. Each year some roads are too overgrown to drive, or new roads are created. Staff take GPS tracks of all areas surveyed to document annual survey effort and to map new roads.

Weed Transect: Most of these surveys are located along corridors of high traffic such as fencelines or staff trails that lead from a trailhead or parking area to an MU.

Camp/Other: These surveys aim to capture any spread of invasive weeds from staff and gear. 'Other' surveys are a catchall for locations of potential contamination and spread such as washrack sediment disposal sites, and sand or gravel stockpiles used to deploy fill across ranges. Surveys of the piles and the surrounding vegetation can give a good idea of which species may be moved to new areas with deployment of materials.

Landing Zone(LZ): Most OARNP LZs are small and located in remote mountainous locations. Army LZs on the other hand are often large fields across which staff conduct surveys. Army LZs are surveyed annually, and OANRP LZs are surveyed quarterly when used within a given quarter.

Evaluations of new taxa:

Each year dozens of new species are found on surveys or observed in new locations during the course of other management actions. These taxa range from being widely naturalized on Oahu to new island or state records. Figure 4 illustrates the process used for determining appropriate OANRP management actions ranging from targeting for eradication to no control. Information about species that are found outside of OANRP managed areas and that may warrant further control or monitoring is shared with relevant landowners and partners so that they may assess management priorities. Basic information about individual taxa considered as part of the decision matrix includes: known distribution of taxa, invasiveness (use HWRA for determination), and location found. Additionally, potential control partners, availability of effective control methods, type of location (terrain, accessibility), resources/funding, etc., are also important inputs in deciding how to manage a new invasive species but are often more difficult to evaluate.

Figure 5 shows the process of assessing management actions with examples of species that were found during surveys or incidentally. The list also highlights that assessments and management responses are challenging as taxa information is sometimes incomplete, resources for control may be unavailable, and management responsibility may be best suited to another agency.

Figure 4: Management Decision Matrix

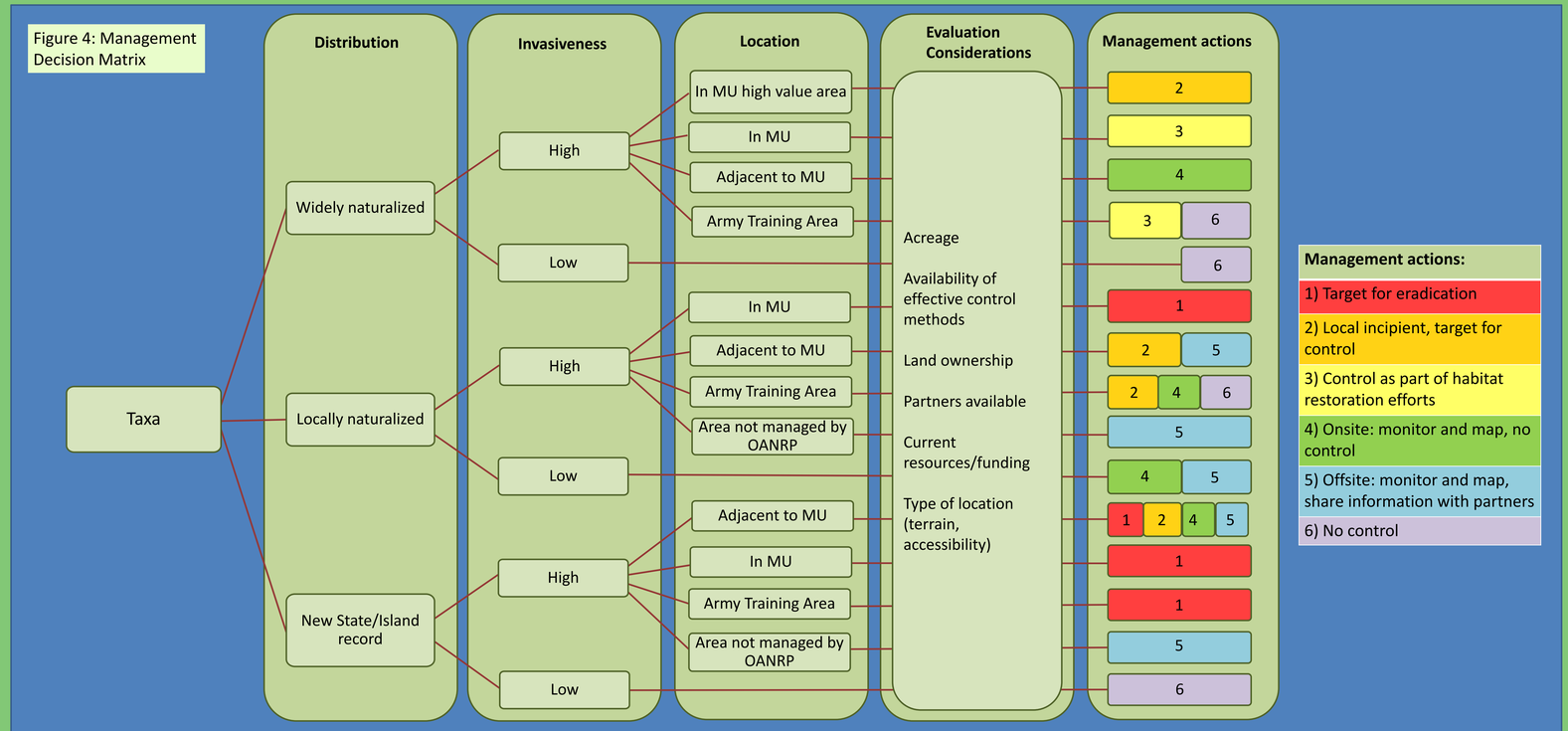


Figure 5: OANRP examples of working species through the decision matrix

Species	Common name	Distribution	Invasiveness	Location	Evaluation considerations	Management actions
Albizia adianthifolia (Fabaceae)	Flat Crown	New State Record	Not thoroughly researched by OANRP staff although observed naturalizing on range	On Army Training Range	Only known from Training Range, but recently observed 2km from core. Appears to behave similarly to *F. moluccana*.	Onsite: Monitor and map naturalizing individuals; if resources and time available for control, should target prioritized plants (4)
Cenchrus setaceus (Poaceae)	Fountain Grass	Locally naturalized	Highly	Adjacent to MU and degraded training area	Grass in a fire prone area on leeward side of island. Seedbank <1 yr; eradicable	Target for eradication (1)
Chromolaena odorata (Asteraceae)	Devil Weed	New State Record	High. Well documented as highly invasive worldwide	In high-use areas of Army Training Range	Likely military introduction therefore OANRP commitment to control. Infestation covers large area, so important to have good strategy.	Target for eradication (1)
Dietes iridioides (Iridaceae)	African Iris	Widely naturalized	Unknown	Inside MU	Small patch near native forest	Local incipient, target for control (2)
Dovyalis hebycarpa (Flacourtiaceae)	Ceylon gooseberry	Locally naturalized	Highly	On Army Training Range	Need to monitor	Onsite: monitor and map, no control (4)
Nephrolepis brownii (Dryopteridaceae)	Rough Sword Fern	Widely naturalized	Highly	Inside MU	Invades disturbed/open areas after canopy control and creates thick understory	Control as part of habitat restoration efforts (3)
Olea Europa (Oleacea)	Wild Olive	Locally naturalizing	Highly	Access road; area not managed by OANRP	On access road to MU, but currently a safe distance from trailhead	Offiste: Monitor and map; share information with partner agencies (5)
Petrorhagia velutina (Caryophyllaceae)	Tunica	New Island Record	Unknown; not likely to become ecosystem altering	On Army Training Range	Small, only found in degraded locations	Not a control priority (6)
Senecio madagascariensis (Asteraceae)	Fire Weed	New Island Record	Not a high threat to OANRP managed areas, but is a State noxious agricultural weed	On Army Training Range	Likely introduced by military training; don't want to spread further	Target for eradication (1)

Conclusions:

- Surveys highlight the way that military training and natural resource management practices can result in unintended introductions and movement of weedy species. Strict sanitation protocols are necessary.
- Time spent looking specifically for invasive weed introduction or spread at regular intervals, increases the chance of identifying an infestation early in establishment.
- Even with targeted surveys, invasive taxa may go unnoticed; surveys conducted at regular intervals are therefore important to catch missed species.
- Identification experts and Bishop Museum records are critical in helping to make management decisions.