

APPENDIX A: Methods for Species Prioritization Assessments

This Appendix presents the draft working protocol used in 2015-2017.

Methods for Species Prioritization Assessments

This document represents Kauai Invasive Species Committee’s (KISC) strategy to prioritize individual plant species based on predictions of invasive impacts and eradication feasibility on Kauai. This process results in a comparative species prioritization tool for long-term management that can be updated as new species-specific data or feasibility information becomes available. Currently, this process incorporates the ideas of multiple established prioritization schemes. However, the value of this method is currently being assessed, and thus, this document will be updated as new data regarding the impact and feasibility predictions within Kauai and throughout the world become available.

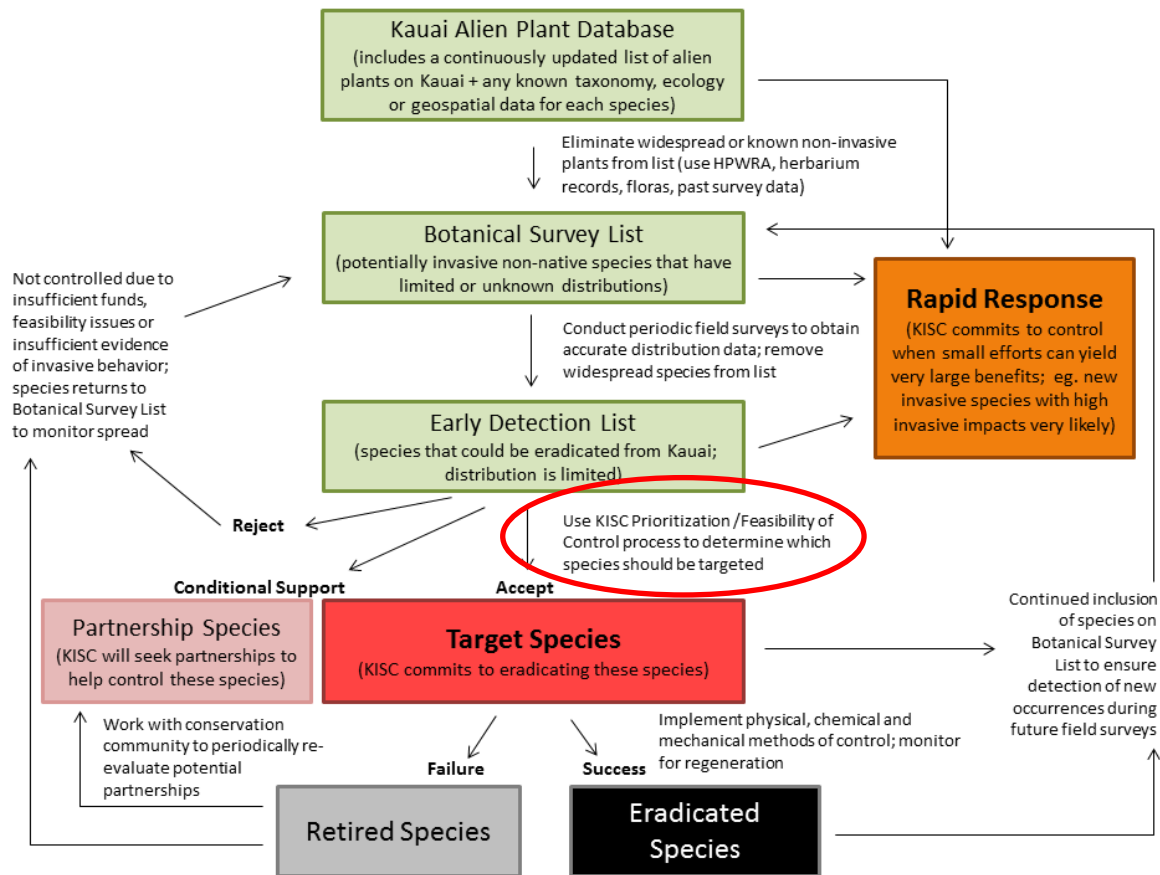


Figure A-1. Outline of the KISC Early Detection Program with the Prioritization Process circled in red.

Step 1: Background

This section includes a summarization of local background and life history information specific to Kauai that should not affect the scoring sections of this document (Step 4 and 5). This may include local uses, taxonomic issues, historic control efforts and previous decisions regarding the management of this plant. The current status of this species according to KISC’s early detection program (e.g. “Retired”, “Early Detection”, “Target”), as well as current knowledge gaps and contingencies affecting progress by KISC, are reported here.

Step 2: Detection and Distribution

This section will summarize current detection and distribution data for the species. This includes island-wide surveys, herbarium records and citizen reports to assess distribution extent and notes regarding density and maturity to assess population structure. Additionally, maps revealing patterns of dispersal will be discussed to hypothesize how the plant is being spread. Species considered in the late “management” or “restoration” phases of their population growth (see figure A.2 below) will not continue to step 3. Alternatively, potential conservation and weed management partners may be consulted to assist in control efforts.

Phases of Invasion and Associated Control Strategies

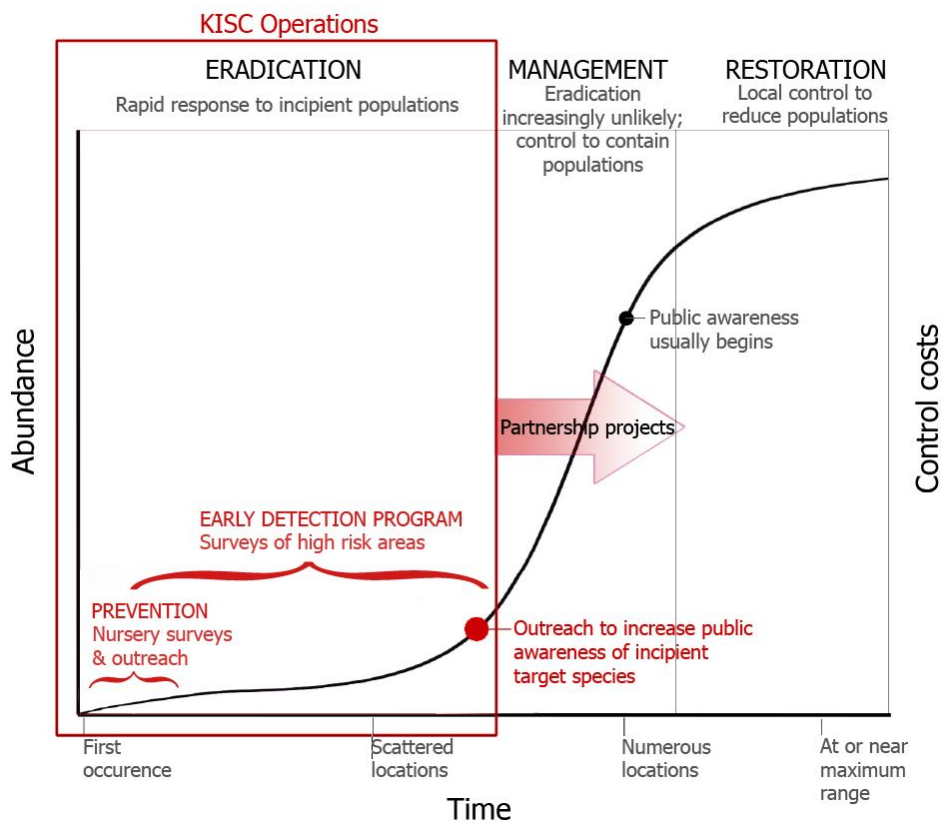


Figure A-2. The role of KISC in relation to the phases of population growth in an invasive plant and its associated management strategies.

Step 3: Hawai'i Pacific Weed Risk Assessment

The HPWRA asks 49 questions regarding the likelihood and consequences of an invasion, including: climate and distribution, whether it has been recorded as a weed elsewhere, undesirable traits (e.g. thorns, toxicity to animals), life history traits (e.g. aquatic, grass, N-fixing), reproductive mechanisms, dispersal vectors, and any persistence attributes of the species (prolific seed production, seed bank). Answers to these questions are quantified to result in an overall rating of “Low Risk”, “High Risk” and “Evaluate” (insufficient information). Step 3 reviews the traits useful to consider during the prioritization process and specifically lists those that imply the **consequences** of an invasion rather than the **likelihood** that an invasion will occur. This reflects the potential invasive impacts of the species if left uncontrolled and more accurately informs management decisions for species already present on Kauai than when combined with likelihood-based questions. Requests for assessment will be sent to HPWRA staff for species that have not been scored. Species that are “Low Risk” and show no invasive tendencies from field data will not continue on to Step 4. However, HPWRA staff will be updated if evidence from field surveys on Kauai may contribute to a differential scoring.

Step 4: Assess Potential Invasive Impacts

The species that pass through step 3 are assigned an Invasive Impacts score. This part of the prioritization process attempts to gather specific information regarding potential ecological and agricultural impacts of a plant species. This score is determined by researching the species' behavior in areas where it has been introduced. The score is derived from summing three scores indicating minor, moderate or major impacts to 1) natural community structure and composition, 2) agriculture, culture and other human systems, and 3) biotic and abiotic system processes.

Half scores can be given and references will be cited to document the reasoning behind each ranking. Scoring contingencies (i.e. knowledge gaps that affect scoring) and other scoring assumptions will be listed here as well.

Criteria Affecting Potential Impacts Score:

1. Impact on Natural Community Structure and/or Composition

- 0 = No perceived impact:** establishes in an existing layer without influencing its structure and/or causes no apparent change in native populations
- 1 = Minor impacts:** influences structure in one layer (e.g., changes the density of one layer) and/or influences community composition (e.g., reduces the number of individuals in one or more native species in the community)
- 2 = Moderate impacts:** influences structure in at least one layer (e.g., creation of a new layer or elimination of an existing layer) and/or significantly alters community composition (e.g., produces a significant reduction in the population size of one or more native species in the community)
- 3 = Major impacts:** major alteration of structure (e.g., covers canopy, eradicating most or all layers below) and/or causes major alteration in community composition (e.g., results in the extirpation of one or several native species, reducing biodiversity or change the community composition towards species exotic to the natural community)

2. Impacts to Agriculture, Culture and Human Systems

- 0 = No perceivable impact.**
- 1 = Minor impacts:** May include: an occasional weed of agriculture/horticulture and other human cultivated areas, minor losses of rangeland productivity/palatability or crop yields, minor increases in operating costs, is easily controlled with routine weed management
- 2 = Moderate impacts.** May include: an occasional weed of agriculture/horticulture and other human cultivated areas, has spines or burs that cause minor injury to people or animals, contaminates product, moderate losses to rangeland productivity/palatability and crop yields, threatens cultural resources without routine management, routine control methods are effective.
- 3 = Major impacts.** May include: common weed of agriculture/horticulture other human cultivated areas, forms monocultures, toxic to grazing animals, toxic or causes allergies in humans, has spines or burs that cause significant harm to people or animals, contaminates product, is an alternate host to agricultural/horticultural plant pathogens, threatens cultural resources despite routine management, routine control methods are moderately effective or ineffective.

3. Impacts to Biotic and Abiotic Processes

- 0 = No perceivable impact** on biotic or abiotic processes
- 1 = Minor impacts.** May include: mild influences on soil nutrient and moisture availability
- 2 = Moderate Impacts.** May include: moderate influences on soil nutrient and moisture availability, soil erosion, minor allelopathy, increased sedimentation rates along streams or coastlines, reduces open water

that are important to waterfowl, minor reduction in nesting/foraging sites, reduction in habitat connectivity, interference with native pollinators, injurious components such as spines, toxins.

3 = Major Impacts. May include: major (possibly irreversible) effects on soil nutrient and moisture availability, significant allelopathic effects, alters herbivore dynamics, alteration of geomorphology or hydrology, affects fire frequency, occupies habitat adjacent to rare and endangered animal species, fixes substantial levels of nitrogen in natural ecosystems making soil unlikely to support certain native plants, and severe alteration of higher trophic populations (extirpation or endangerment of an existing native species/population, or significant reduction in nesting or foraging sites).

POTENTIAL INVASIVE IMPACTS SCORE

Potential Invasive Impacts = Natural Community (0-3) + Agriculture/Human Systems (0-3) + Biotic/Abiotic processes (0-3)



Step 5: Assess Feasibility of Control

The amount of effort required to delimit the target species, apply the initial control, and monitor for regeneration will be used as criteria for determining practicality of control. Each of these factors will be assigned a 3, 2, 1 or 0, reflecting minimal effort, moderate effort, substantial effort, or impossible, respectively. These scores will be summed to represent a total feasibility of control score that will be used to estimate the ease of eradication for a particular species. However, species receiving a 0 in any category will be regarded as an unfeasible target until solutions allow the score to be increased.

Criteria Affecting Feasibility of Control Score:

1. Delimiting Survey:

- 3 = Minimal Effort.** May include: a small number of cooperative landowners, terrain is gentle, few small populations, identification of species requires little training.
- 2 = Moderate Effort.** May include: a moderate amount of landowners or few uncooperative landowners, some terrain is difficult, few medium-large populations or several small populations, identification of species requires some training
- 1 = Substantial Effort.** May include: many landowners, uncooperative landowners (may be in critical infestation areas), terrain difficult, several large populations, identification of species requires a practiced taxonomist
- 0 = Impossible.** Delimiting surveys not possible now or in the future due to health and safety concerns or logistical/financial restrictions

2. Initial control:

- 3 = Minimal Effort.** May include: chemical control can be used, control method is very effective, few small populations, gentle terrain, target is easily seen.
- 2 = Moderate Effort.** May include: some non-chemical control required on small populations, control method is moderately effective, target is moderately easy to see
- 1 = Substantial Effort.** May include: mechanical or physical control, several large populations, control method is minimally effective, target is hard to see
- 0 = Impossible.** Control not possible now or in the future due to health and safety concerns, lack of effective control methods, or logistical/financial restrictions.

3. Monitoring:

- 3 = Minimal Effort.** May include: few follow up visits (e.g. potted plant or single cultivated individuals), time until regenerating plants set seed is more or less predictable (i.e. sites can easily be revisited before plants mature), vegetative reproduction is minimal, seed bank is short lived, target is easily seen (no plants missed during initial control), infestation is close to KISC base yard.
- 2 = Moderate Effort.** May include: moderate amount of follow up visits, time until seed set is rapid or less predictable (some plants mature before site is revisited), moderate vegetative reproduction, seed bank somewhat persistent, target is somewhat easy to see (some plants missed during initial control), far away from KISC base yard.
- 1 = Substantial Effort.** May include: many follow up visits, time until seed set is rapid or unpredictable (many plants mature before site is revisited), prolific vegetative reproduction, seed bank persisting for several years, target is hard to see (many plants missed during initial control), far away from KISC base yard
- 0 = Impossible.** Monitoring not possible now or in the future due to health and safety or logistical restrictions.

FEASIBILITY OF CONTROL SCORE:

Feasibility of control score = Delimiting Survey (0-3) + Initial Control (0-3) + Monitoring (0-3)



Step 6: Recommendations and Roundtable Prioritization Discussion

The last step in the process is to determine which species should be adopted as KISC Target Species. The KISC Early Detection Botanist will compile a list of recommended plants to be included in the KISC Target Species list based on prioritization scores. These recommendations will be reviewed at the committee level where additional stakeholder opinions and availability of funds will be considered before plants are added to the final Target Species list. This process will help ensure meaningful allocation of KISC resources towards eradication of species and can be re-evaluated as new data (i.e. new locations, taxonomic updates) are received.