

### **Avoidance, Minimization, and Conservation Measures for listed plants in the Pacific Islands**

Project activities may affect listed plant species by causing physical damage to plant parts (roots, stems, flowers, fruits, seeds, etc.) as well as impacts to other life requisite features of their habitat, which may result in reduction of germination, growth and/or reproduction. Cutting and removal of vegetation surrounding listed plants has the potential to alter microsite conditions (e.g., light, moisture, temperature), damaging or destroying the listed plants and also increasing the risk of invasion by nonnative plants, which can result in higher incidence or intensity of fire. Activities such as grazing, use of construction equipment and vehicles, and increased human traffic (i.e., trails, visitation, monitoring), can cause ground disturbance, erosion, and/or soil compaction, which decrease absorption of water and nutrients and damage plant root systems and may result in reduced growth and/or mortality of listed plants. Soil disturbance or removal has the potential to negatively impact the soil seed bank of listed plant species if such species are present or historically occurred in the project area.

To avoid or minimize potential adverse effects to listed plants that may occur on the proposed project site, we recommend minimizing disturbance outside of existing developed or otherwise modified areas. When disturbance outside existing developed or modified sites is proposed, conduct a botanical survey for listed plant species within the project action area, defined as the area where direct and indirect effects are likely to occur. Surveys should be conducted by a knowledgeable botanist with documented experience in identifying the native flora of the island where the project occurs, including Hawai'i, the Marianas, and other Pacific Islands, including listed plant species. Botanical surveys should optimally be conducted during the wettest part of the year (typically October to April in Hawai'i and mid-July through November in the Mariana Islands) when plants and identifying features are more likely to be visible, especially in drier areas. If surveys are conducted outside of the wet season, the Service may assume plant presence.

The boundary of the area occupied by listed plants should be marked with flagging by the surveyor. To avoid or minimize potential adverse effects to listed plants, we recommend adherence to buffer distances for the activities in Table 1. Where disturbed areas do not need to be maintained as an open area, restore disturbed areas using native plants as appropriate for the location.

Whenever possible, we recommend using native plants for landscaping purposes. The following websites are good resources to use when choosing landscaping plants: Plant Pono (<https://plantpono.org>), Landscape Industry Council of Hawai'i Native Plant Poster (<https://hawaiiscape.com/Publications>), Native Hawaiian Plants for Landscaping, Conservation, and Reforestation (<https://www.ctahr.hawaii.edu/oc/freepubs/pdf/of-30.pdf>), and Best Native Plants for Landscapes (<https://www.ctahr.hawaii.edu/oc/freepubs/pdf/OF-40.pdf>).

If listed plants occur in a project area, the avoidance buffers are recommended to reduce direct and indirect impacts to listed plants from project activities. However, where project activities will occur within the recommended buffer distances, additional consultation is required. The

impacts to the plants of concern within the buffer area may be reduced by placing temporary fencing or other barriers at the boundary of the disturbance, as far from the affected plants as practicable.

Table 1. Recommended buffer distances to minimize and avoid potential adverse impacts to listed plants from activities listed below.

Activity		Buffer Distance (feet (meters) - Keep Project Activity This Far Away from Listed Plant	
		Listed Grasses/Herbs/Ferns/ Shrubs and Terrestrial Orchids	Listed Trees and Arboreal Orchids
Walking, hiking, surveys		3 ft (1 m)	3 ft (1 m)
Cutting and removing vegetation by hand or hand tools (e.g., weeding)		3 ft (1 m)	3 ft (1 m)
Mechanical Removal of Individual Plants or Woody Vegetation (e.g., chainsaw, weed eater)		3 ft (1 m) up to height of removed vegetation (whichever greater)	3 ft (1 m) up to height of removed vegetation (whichever greater)
Mechanical Removal of Vegetation with Heavy Equipment (e.g., bulldozer, tractor, "bush hog")		2x width equipment + height of vegetation	820 ft (250 m)
Use of Approved Herbicides (following label)	Ground-based Spray Application; Hand Application (No Want Applicator; Spot Treatment)	10 ft (3 m)	Crown diameter
	Ground-based Spray Application; Manual Pump with Wand, Backpack	50 ft (15 m)	Crown diameter
	Ground-based Spray Application; Vehicle-Mounted Tank Sprayer	50 ft (15 m)	Crown diameter
	Aerial Spray, Ball Applicator	250 ft (76 m)	250 ft (76 m)
	Aerial Application - Herbicide Ballistic Technology - Individual Plant Treatment	100 ft (30 m)	Crown diameter
	Aerial Spray, Boom	Further consultation required	Further consultation required
Use of Insecticide (potential impacts to plant pollinators and seed dispersers)		Further consultation required	Further consultation required
Ground/Soil Disturbance/Outplanting/Fencing (Hand Tools, e.g., Shovel, 'ō'ō, fusiños), Small mechanized tools (e.g., Auger)		20 ft (6 m)	2x crown diameter
Ground/Soil Disturbance (Heavy Equipment)		328 ft (100 m)	820 ft (250 m)
Surface Hardening/Soil Compaction	Trails (e.g., Human, Ungulates)	20 ft (6 m)	2x crown diameter
	Roads/Utility Corridors, Buildings/Structures	328 ft (100 m)	328 ft (100 m)
Farming/Ranching/Silviculture		820 ft (250 m)	820 ft (250 m)
Prescribed Burns or otherwise exposing vegetation to >932°F (500 °C)		Further consultation required	Further consultation required

The above guidelines apply to areas outside of designated critical habitat. If project activities occur within designated critical habitat unit boundaries, additional consultation is required.

All activities, including site surveys, risk introducing nonnative species into project areas. Specific attention needs to be made to ensure that all equipment, personnel, and supplies are properly checked and are free of contamination (weed seeds, organic matter, or other contaminants) before entering project areas. Quarantines and or management activities occurring on specific priority invasive species proximal to project areas need to be considered or adequately addressed. This information can be acquired by contacting local experts such as those on local invasive species committees (Kaua'i: <https://www.kauaiisc.org/> ; O'ahu: <https://www.oahuisc.org/>; Moloka'i: <https://www.molokaiisc.org/>; Maui: <https://mauiinvasive.org/>; and Hawai'i: <https://www.biisc.org/>).

Definitions (Wagner, W.L., Sohmer, S., and D.R. Herbst. 1999. Manual of the flowering plants of Hawaii, revised edition. Honolulu, Hawaii. University of Hawaii and Bishop Museum Press. 1,919 pp)

Crown: The leafy top of a tree.

Herb: A plant, either annual, biennial, or perennial, with the non-woody stems dying back to the ground at the end of the growing season.

Shrub: A perennial woody plant with usually several to numerous primary stems arising from or relatively near the ground.

Tree: A woody perennial that usually has a single trunk