

# Invasive Species Management



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## What is an invasive species?

On February 3, 1999, President Clinton signed an Executive Order (EO) 13112 saying that each Federal agency should “not authorize, fund or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States ... ”

The EO said that an “invasive species means an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.”

“Alien species means with respect to an ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem.”

In Hawaii, native species are descendants of all plant and animal species that arrived here naturally over 70 million years ago, by wind, water or on the wings of birds, without the help of humans. For example, naupaka, the seeds of which reached the Hawaiian shores long before humans inhabited the islands is native. Plumeria, however, was introduced by humans and is not a native species.



## **Definitions**

**Weed** – An invasive plant. The term “weed” is loosely used by many to address a plant that is simply unwanted in a given area irrespective of its impact on the environment, economy and human health. However, for the purpose of roadside vegetation management in this manual we will refer to a weed as an invasive species.

**Pest** – An invasive animal, including insects and other invertebrates.

**Pathway** – The way in which an invasive species arrives to a new location. For example, the coqui frog came into Hawaii on nursery plant materials. Guava was intentionally introduced as a food crop.

**Eradication** – The complete removal of a species from a region or island where there is low likelihood that it will re-establish. This is only feasible if the species is detected early in the invasion process.

**Containment** – Restricting an invasive species to a limited area so that it does not spread to new sites.

**Control** – The removal or treatment of invasive species to control unacceptable impacts at a local level, or its spread to other areas.

**ROW** – Right-of-way, the land along the side of the road that is managed by the Department of Transportation.

**ISC** – Invasive Species Committee; there is one in each county.

**HISC** – Hawaii Invasive Species Council



## What is the process of a plant or animal becoming invasive?

Introduction, establishment, spread and impact describe the stages of a biological invasion. First, a species must be introduced into a new location where it is not native. It then must persist at this location and produce several offspring naturally without human assistance to be considered as having “established” at the new location. Spread of the species beyond its point of introduction on its own via natural dispersal, such as wind or birds, indicates that the species has established a wild population. If such an established wild population of a plant or animal is having a negative impact on the environment, economy and/or human health, it is regarded as “invasive.”



## Isn't the roadside full of weeds?

**Yes!** Sometimes, the roadside is overrun with weeds and pests. You do not have to remove all of them. Not all weeds and pests merit removal, and not all infested sites warrant protection. Our definition of an invasive species includes the concept of spread and harm or impact. So, unless a species spreads and causes harm or is believed to potentially cause harm in the future to the environment, economy or to human health, it does not need to be controlled or managed. When thinking about management, think about “impact” before you think “invasive.”



## How do I know which weed or pest on the roadside to control?

You are required to control HDOT’s priority weeds and pests in the rights-of-way. Controlling invasive species can be difficult and expensive work. We must be clear that the invader harms something we value. Because we cannot manage all invasive species everywhere, we must restrict our efforts to reducing their impacts on selected high priority sites, species or values. When prioritizing species for control, it is the impact or harm the species may cause that is the primary concern.

Pests and weeds prioritized for management in HDOT’s rights-of-way are referred to as “priority weeds and pests” or “priority invasive species” and they include the following:

## Remember

Invasive Species managed by HDOT = Priority Invasive Species = Priority Weeds = Priority Pests



### “Priority weeds” include:

- ▶ Plants/weeds identified in the HDOT contract specifications.
- ▶ Plants on the USDA Federal Noxious Weed List and in the Hawaii DOA “Noxious Weed Rules” (HRS 4:6:68) **provided that** HDOA and/or ISC **also** recommend that weed as a target.
- ▶ Weeds identified as targets for early detection, eradication or containment/control by the Invasive Species Committees (ISC) and/or the State Department of Agriculture (HDOA) in each county. At the start of contract and annually, check ISC and HDOA for updates on priority species.
- ▶ Plants known to impact roadside maintenance operations, infrastructure or public safety as determined by HDOT.
- ▶ Plants that are of concern to neighboring landowners because of their impacts and agreed upon by the Engineer.

### “Priority pests” include:

- ▶ Animals and pathogens designated as high priority invasive species for early detection, eradication or containment by the ISCs or the DOA in each county.
- ▶ Animals and pathogens known to impact roadside maintenance operations, infrastructure or public safety as determined by HDOT.
- ▶ Animals and pathogens that are of concern to neighboring landowners and the Engineer agrees should be targets for HDOT.

Because it is the context of what (site, species or value) is being harmed that determines HDOT’s priority weeds and pests, such a list can be

different for different stretches of the road. Staff and contractors must always verify the priority weeds and pests to be controlled with the Engineer.



## How can I effectively manage invasive species along roadsides?

An effective management strategy for invasive species includes prevention, early detection and eradication, and control. This strategy corresponds to the phases of weed/pest invasion – introduction, establishment, spread and impact.

The cost of managing a pest or weed is zero when the species does not occur in your area!

**Prevention** is making an effort to stop a weed or pest from entering your management area or spreading from your area to another. Some potential invasive species may be introduced to your area or start to establish.

**Early detection** requires you to actively monitor your area to find any weeds or pests that have not yet become widespread and can be easily removed.

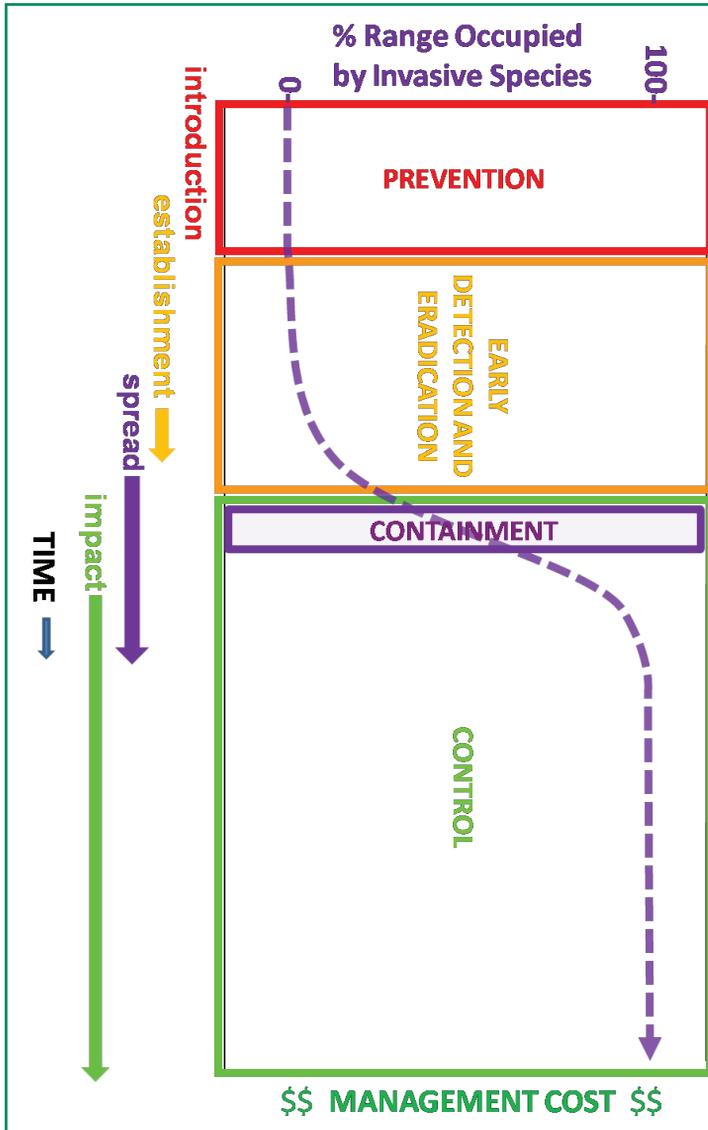
If detected early enough, **eradication** is the complete removal of a weed/pest not just from your area of management but from the entire island. Re-invasion must be unlikely for eradication to be successful; otherwise, continuous control will be required. Usually, eradication will be handled by another agency, but you might discover a potential problem species that should be the focus of their work.

Containment of an established pest within a limited area may also be appropriate but may be regarded as a type of control. **Control** involves limiting the impacts or spread of weeds/pests to protect valuable sites or reduce any associated and unacceptable risks.

### Remember

Prevention is the best way to manage invasive species. Always report new weeds to the Engineer as soon as detected.





The phases of invasion in relation to the spread of an invasive species: As its range increases and available habitat is filled, its impacts and the costs associated with management increase, forcing a change in strategy from species-based prevention, early detection, eradication and containment to local control to mitigate the highest priority harmful impacts.



## How can I prevent invasive species from entering my roadside management area?

Successful prevention occurs when you limit the introduction, establishment and spread of pest species in your management area. It involves paying close attention to the common pathways through which invasive species are transported to the right-of-way area that you manage. Weed seeds and pests are well known to hitchhike on vehicle tires and machinery, such as weed eaters and mowers.

### **The following BMPs should help you form an effective prevention plan.**

1. Be informed of the weeds and other pest species in your area.
2. Contact the local Invasive Species Committee to determine what plants and animals are on its target list for prevention. ISC can also help you develop a list of target species for prevention in your area.
3. Wherever possible, minimize disturbance of soil.
4. Immediately re-vegetate disturbed areas with desirable vegetation.
5. Only use weed-free seed, mulch and soil.
6. Be sure to thoroughly clean/wash equipment prior to use in your management area. Special attention should be paid where equipment is moved to new sites.
7. Weed seeds can attach to clothing, such as coveralls, work clothes, gloves, etc. These should be thoroughly dusted after working in an area infested with priority weeds and before moving to a different location. If possible, use a new or fresh set of outer work apparel when moving from an infested to an uninfested area in the ROW.
8. Monitor high risk areas, such as transportation corridors and bare ground.
9. At least annually, evaluate the success of your prevention efforts and modify plans accordingly the following year.

## **Decontaminating equipment/machinery and vehicles**

Cleaning equipment, machinery and vehicles can significantly prevent the introduction of invasive plants and other pest species (e.g., little fire ants or coqui frogs). A routine cleaning procedure will prevent contaminants from building up and will ensure that cleaning is quick, easy and effective.

### **1. Clean equipment**

Equipment and vehicles should arrive at the work site each day clean and free of invasive species or any soil, plants or plant parts, including seeds; insects, including eggs; and reptiles and amphibians, including eggs. All vehicles and equipment brought in for maintenance work from off island should be thoroughly washed at the port of export and again before they are used for vegetation management. Use extra care and scrutiny if invasive species are found along the stretch of road that you are maintaining. If invasive species are found at the site, all vehicles and equipment must be washed before leaving the site; if not feasible at the site, then at the baseyard or at one of your cleaning stations (see below). Even within your management area, clean maintenance vehicles and equipment before moving from an infested to an un-infested area.

All equipment should be cleaned and be completely free of soil, seeds, vegetative matter, or other debris that may contain plant parts or seeds prior to the initial arrival and/or before leaving the maintenance site or, at a minimum, before leaving the baseyard.

For cleaning, you should use any effective tools, including brushes, brooms, air compressors, vacuums and/or high-pressure water guns. If using high-pressure water, apply only as much water as needed to avoid unnecessary runoff. Pay close attention to problem areas, such as wheel wells, chassis or other areas where dirt and debris may accumulate.

The supervisor shall ensure that a log is kept of vehicle cleaning to meet the minimal daily cleaning requirement.

Amphibians, reptiles or insects hitchhiking on equipment should be reported to the Hawaii Department of Agriculture by calling 643-PEST (7378), the Engineer and your local Invasive Species Committee.

Equipment should not be sprayed with herbicides as a preventative

measure. Spraying equipment with herbicides is not consistent with label specifications. Additionally, many herbicides target a wide range of vegetation and using herbicides in this way may harm desirable vegetation.

Planting or seeding plants can lead to the unintentional spread of invasive species. Inspect all seeding and planting equipment or materials, including plants, to ensure they are free of invasive plant propagules.

## 2. Cleaning stations

Apart from your baseyard, you should designate one or more cleaning stations within your area at convenient locations. Consider the following when selecting a cleaning station in your area:

- a) Cleaning stations should not contribute to further contamination of machinery. To prevent this, gravel or other appropriate material shall be used to minimize contact with mud or dirt, which may contain invasive plant seeds.
- b) Cleaning stations should be located in low value areas, close to the control area and away from native vegetation.
- c) The designated cleaning area must provide an environment for operators to safely do the required cleaning procedures (i.e., safe for road traffic and personnel).



### **How can I help with early detection of an accidentally introduced invasive species?**

Prevention efforts are not foolproof; they reduce the chance of a species being introduced to new sites. It is important to detect weeds or other pests soon after their arrival to a new site. Early detection involves identifying and documenting any new species that may have entered your management area. Keep an eye out for unusual and suspicious alien species, especially species on target lists for each island and any other new species that may show up. Your reports of new or priority pests and weeds may determine if they can be eradicated or contained.

## You can help with early detection by following these BMPs:

1. Get trained. Attend HDOT's training workshops and learn to identify the targets of early detection in the ROW. Always carry identification aids, such as photographs of the target species.
2. Report any new alien or target species in your area to the Pest Hotline 643-PEST (7378).



3. Also, send an e-mail to the local Invasive Species Committee with a copy to the Engineer. Include photographs and details of the location (GPS point if possible) of the plant.

Always report a new or suspicious looking species in a timely manner. It might not be new or bad but, if it is, you could save Hawaii millions of dollars and prevent irreversible ecological, economic and social damage caused by an invasive species.



## How do I eradicate an invasive species?

Eradication requires a rapid response to the early detection of a pest or weed. Its goal is to completely remove it from an island. All known reproducing individuals must be killed. If this is achieved, no further work is needed and future impacts from the species can be avoided. However, eradication can only be considered where re-invasion is unlikely or infrequent. After you detect and report a new species in your management area, Invasive Species Committees or the Department of Agriculture on your island will decide whether to attempt eradication of that species. They may ask for your help detecting more plants, or to prevent further spread from known infestation areas.

Feasibility of eradication or containment (see section below about con-

trol) and the perceived harm from the species will determine whether an eradication is attempted. HDOT can significantly help in eradicating a species; however, eradication requires a long-term effort, careful monitoring, and the ability to work wherever the species is found, no matter who owns the land. The Invasive Species Committees and the Department of Agriculture are key agencies for eradication and control in Hawaii.

### Remember

Successful eradication programs tend to involve small populations of pests and weeds that are easiest to eliminate. Report sightings of priority pests and new and unusual species to **643-PEST**.



## When should invasive species control work be done?

Eradication is generally a species-based approach, while control is a value-based approach. Your decision to **control** an invasive species is based on the importance or priority you place on the impacted resources or values at a site. Unlike eradication, control is an ongoing activity. You do not expect control to lead to regional or island-wide eradication; you accept that re-invasion cannot be easily prevented and will probably occur at your site of work. Your concern about weed or pest impacts justifies your continued effort. Your aim is to limit the local impacts of a species. Containment is a form of control where the goal is to restrict the distribution of the species within a “core” area and prevent further spread outside areas of known infestation.

### Invasive species control should be done along roadsides when:

1. The species is a hazard to road users, such as albizia trees (*Falcataria mollucana*).
2. The property owner or agency adjacent to the ROW is controlling a weed or pest. You should make efforts to prevent the spread of the weed or pest from the ROW into their property. For example, fireweed is locally abundant on Maui; however, if a landowner is controlling fireweed in their pastures then you should control nearby infestations of fireweed along the roadside.

3. A road passes through a conservation area, such as a national park or a preserve. Make sure you control invasive species that are uncommon or under control in the conservation area, even if those species are otherwise common elsewhere on the island.
4. An invasive species is locally abundant only along a stretch of road where you might make efforts to contain that species to a limited area. This requires knowledge of the species' total distribution.

For HDOT staff, most weed control work will be an incidental part of normal maintenance activities. Regular mowing, weeding, trimming and pruning are likely to minimize the impacts of most problem plants. Contract specifications detail key invasive species to control. Use the following BMPs to try and reduce the threat invasive species pose to the environment, economy, or human health and welfare.

### **BMPs for controlling invasive species in the ROW**

- ▶ For plants that spread by seeds, control should occur before the seeds set. This will reduce spread via seeds.
- ▶ Always set up a designated cleaning area close to the control area. Use this area for cleaning all equipment, machinery and vehicles. Also see "Cleaning stations" in this chapter.
- ▶ Routinely clean equipment and vehicles used in control activities. This will prevent re-introduction of weeds that you are trying to control.
- ▶ All equipment and vehicles used for control work should be cleaned before they are moved from an infested to an uninfested area, even if these areas lie within one management zone.
- ▶ Keep records of when and where the control work was done, the number of plants controlled, number of animals trapped, etc. This will help re-evaluate control efforts and develop better control strategies in the future.

### **Information signage at your place of work**

Invasive/noxious plant signage, fliers or posters should be prominently posted at the workplace. Signage should include priority weeds and

pests for your area. All signage should include “Notify the Engineer and Call 643-PEST” as the call to action and local Invasive Species Committee contact information.

Contact your local Invasive Species Committee, at a minimum, annually in January to obtain free information sheets (or electronic files) with invasive species photos that can be printed and laminated for use at the workplace. This is important for species that are a priority for early detection.

**Photos of invasive species are available at <http://www.hawaiiinvasivespecies.org/iscs/>**

**Oahu Invasive Species Committee (OISC):** 743 Ulukahiki St., Kailua, HI 96734, (808) 266-7994, Fax (808) 266-7995, E-mail: oisc@hawaii.edu

**Maui Invasive Species Committee (MISC):** P.O. Box 983, Makawao, HI 96768. Location: 820 Piihoho Road, Makawao, HI 96768, (808) 573-MISC (6472) or 573-6471, Fax (808) 573-6475, E-mail: misc@hawaii.edu

**Molokai Subcommittee of MISC (MoMISC):** P.O. Box 220, Kualapuu, HI 96757, (808) 553-5236, E-mail: lbuchanan@tnc.org

**Big Island Invasive Species Committee (BIISC):** 23 E. Kawili St., Hilo, HI 96720, (808) 933-3340, Fax (808) 933-3326, Hotline (808) 961-3299. E-mail: pageelse@hawaii.edu

**Kauai Invasive Species Committee (KISC):** P.O. Box 1998, Lihue, HI 96766. Location: 7370-K Kuamoo Rd., Kapaa, HI 96766, (808) 821-1490, Fax: (808) 821-1492, E-mail: kisc@hawaii.edu



## Where can I get training about invasive species management?

All field staff, HDOT or private contractors, should attend a mandatory training annually about prevention and cleaning protocols, identification of priority invasive plants, current ISC priority species and reporting procedures. Training is available from HDOT approved providers. Information about training can be obtained from the Engineer. Trainers will circulate a sign-in sheet at training courses for those individuals that complete the training.

## Inspections

Contractors should keep a log of daily cleaning activities related to vehicles or other equipment and turn it in to the Engineer prior to payment. Any priority species detected by staff and reported to authorities should be recorded in reports prior to receiving payment. An inspector may inspect cleaning logs and reports. The inspector may also inspect sanitation procedures and equipment to make sure the protocols are followed.

### Reporting & Inspection

Report any priority pests in the rights-of-way and keep a log of cleaning activities related to vehicles and other equipment. HDOT will inspect the rights-of-way and designated cleaning areas for the presence of priority pests, as well as cleaning logs. Staff and contractors should provide access to the State ROW to any person authorized by HDOT to detect, monitor or control invasive species. Botanists, representatives from Invasive Species Committees and the Hawaii Department of Agriculture are likely to need access. See Chapters 14 and 15.



### In a Nutshell

1. Prevention is the key to controlling invasive species: always clean your vehicles and equipment after working in an area with invasive species. Reduce the spread of weeds and other pests.
2. Early detection and rapid response: become familiar with invasive species and report them to the pest hotline (643-PEST).
3. Control only invasive species actively managed by adjacent landowners, DOA and ISCs; protect pristine habitats.
4. Roadways are the main vectors for the spread of invasive species. Plant natives and non-invasives along roads.
5. Work cooperatively with ISC, DLNR, DOA and watershed partnerships to protect Hawaii from invasive species.

