

2012-2022

STATEWIDE NOXIOUS INVASIVE PEST
PROGRAM (SNIPP)
STRATEGIC PLAN



Hawai‘i Department of Transportation
Highways Division



The 2012-2022 SNIPP Strategic Plan

Message from the Governor

Our efforts to save Hawai'i rainforests and protect our natural resources from damaging invasive species will soon have a new set of land stewards.

At the heart of the Hawai'i Department of Transportation's Statewide Noxious Invasive Pest Program is a commitment to mitigate the introduction, spread and impact of invasive species. SNIPP's multi-faceted approach includes prevention, early detection and rapid response, restoration, and collaboration. Included in the control of non-native invasive plants will be their replacement with native Hawaiian species, which often consume less water than non-indigenous species.

Hawai'i DOT Highways Division will follow best management practices to avoid and minimize impacts to wildlife within the State highway rights-of-way, especially to threatened and endangered species. Included in these wildlife conservation practices are lessening impacts to bird and bat migratory patterns and breeding seasons, as well as minimizing negative impacts to spawning, rearing and migration of native aquatic fauna.

The SNIPP Strategic Plan includes protective management for thousands of acres of State highway rights-of-way close to ecologically sensitive areas: national parks, wildlife refuges and natural area reserves on all Islands. Implementation of HDOT's innovative approach to practice more sustainable methods of operation will save the State millions of dollars a year.

Protection of the biodiversity and beauty of the Hawaiian landscape begins anew. We hope this holistic and visionary strategy by HDOT's Highways Division inspires others to join in becoming good environmental stewards. As such, leaving our Island resources healthy for future generations will be our greatest legacy.



The Honorable Neil Abercrombie
Governor, State of Hawai'i

TABLE OF CONTENTS

Foreward	3
Executive Summary	4
Hawai'i's Invasive Species Problem.....	6
National Transportation Policy Context	8
The 2012-2022 SNIPP Strategic Plan Content and Organization	9
PREVENTION	11
<i>Introduction</i>	<i>11</i>
STRATEGIC GOAL (P): Prevent invasive species introduction, spread and establishment along Hawai'i State roads.	13
<i>Objective P.1: Prevent intentional introduction and establishment of invasive species along State roads..</i>	<i>13</i>
<i>Objective P.2: Minimize accidental introduction and establishment of invasive species along State highways. Implementation Task P.2.1 Develop, update and maintain a HDOT Highways Division specific biosecurity plan that identifies pathways of introduction and mitigation measures appropriate to the perceived level of risk.....</i>	<i>13</i>
<i>Objective P.3: Work cooperatively with the public to prevent the spread of invasive species.</i>	<i>15</i>
EARLY DETECTION AND RAPID RESPONSE.....	15
<i>Introduction</i>	<i>15</i>
STRATEGIC GOAL (EDRR): Support and enhance the State's capacity to identify, report and effectively respond to newly detected or localized invasive species.	17
<i>Objective EDRR.1: Develop the capacity for high priority audiences to report incidental detections of invasive species along State highways.</i>	<i>17</i>
<i>Objective EDRR.2: Implement systematic measures to detect and document invasive species.</i>	<i>17</i>
<i>Objective EDRR.3: Develop the means to effectively respond to incipient invasive species identified within DOT ROW.....</i>	<i>18</i>
CONTROL AND MANAGEMENT	19
<i>Introduction</i>	<i>19</i>
STRATEGIC GOAL (CM): Control and manage invasive species to reduce their harmful impacts along State highways.	20
<i>Objective CM.1: Improve HDOT Highways Division's capacity to control and manage invasive species to protect priority values.....</i>	<i>20</i>
<i>Objective CM.2: Develop workforce competencies to improve control and management activities along the rights-of-way.</i>	<i>21</i>
<i>Objective CM.3: Develop regional partnerships for the effective control and management of priority invasive species.....</i>	<i>21</i>

The 2012-2022 SNIPP Strategic Plan

RESTORATION..... 22

Introduction 22

STRATEGIC GOAL (R): In high priority sites, restore and maintain culturally and ecologically appropriate plant and animal communities along Hawai'i roads..... 23

Objective R.1: Restore high priority/high value areas along State highways..... 23

Objective R.2: Support and develop cost-effective methods to restore highways' rights-of-way with native plant species..... 24

Objective R.3: Support and enhance the development of an island-based native plant industry..... 24

Objective R.4: Develop partnerships to ensure the long-term success of restoration projects..... 25

COMMUNITY AND ORGANIZATIONAL COLLABORATION 25

Introduction 25

Strategic Goal (OC): Maximize HDOT's collaboration on invasive species issues with federal, state and county agencies, as well as private organizations and individuals, focusing on neighboring landowners. 26

Objective OC.1: Enhance communication about invasive species issues along State highways..... 26

Objective OC.2: Coordinate and expand HDOT's invasive species programs and leverage resources. 27

Objective OC.3: Enhance HDOT's invasive species outreach..... 27

Objective OC.4: Increase funding for invasive species work along State highways and secure dedicated funding..... 28

FUNDING AN EFFECTIVE RESPONSE TO INVASIVE SPECIES 29

KEY INVASIVE SPECIES MANAGEMENT STAKEHOLDERS 30

REFERENCES..... 31

APPENDIX: Letters of Support..... 32

Foreword

I am pleased to present the Highway Division's Statewide Noxious and Invasive Pest Program (SNIPP) Strategic Plan. This 10-year (2012-2022) SNIPP Strategic Plan will allow the Hawai'i Department of Transportation (HDOT) to meet its responsibilities as a good steward of State lands and contribute toward its primary mission to provide a safe, efficient and accessible highway system for Hawai'i. There is a clear nexus between the Division's primary mission and the goals of this plan because roads are pathways for the introduction and spread of invasive species. Implementation of the SNIPP Strategic Plan will not be done by HDOT alone, but also in cooperation with stakeholders in the public and private sectors. Through this plan for the continued prevention and control of invasive species, the Highways Division will substantially build on its ongoing efforts to care for the environment of Hawai'i.



Glenn Okimoto
Director, Hawai'i Department of Transportation

Executive Summary

This Strategic Plan describes Highway Division's Statewide Noxious Invasive Pest Program (SNIPP). In July 2009, Hawai'i Department of Transportation (HDOT) worked with federal, state, county and non-government stakeholders to formulate the program's objectives and tasks to address the problem of invasive species. Implementation of the plan will provide the Department with the means to mitigate the introduction, spread and impact of invasive species along Hawai'i State roads.

Management of invasive species in Hawai'i was estimated to cost over \$150 million per year in 2006 and this did not account for hundreds of millions of dollars in indirect losses, such as loss of productivity. Invasive species mitigation is expensive but necessary because the impacts of alien invasive species are immense, insidious and often irreversible. The transportation sector should share part of the burden of managing invasive species because it is clearly implicated in the spread and establishment of invasive species across this State. Invasive insects, plant seeds and animals can hitchhike on heavy equipment moved from the mainland or other islands. Large construction projects and maintenance activities leave soil exposed for extended periods of time providing the perfect habitat for quick-growing invasive plants and invasive insects. Imported construction materials, such as topsoil, gravel and grass seeds, sometimes contain invasive seeds or invertebrates. Invasive plants overgrow our roadside plantings, sometimes causing significant safety issues by blocking sight distances, obstructing the road, invading the clear zone, and impacting nearby natural or agricultural areas. Invasive species can also impact human health and safety, tourism and ecosystems with economic and biodiversity values.

Annually, HDOT spends millions of dollars on new landscape installations. A suite of invasive species cause roadside landscapes to deteriorate and increase maintenance costs by an estimated 5-10%. Roadside vegetation maintenance costs an average of \$4,800/acre/year and \$240-\$480 of these costs are attributable to invasive species management (an estimated \$2.1 to \$4.2 million statewide). Implementation of proactive measures in this strategy could reduce these costs by 60-80%. Costly ad hoc responses to specific invasive species also incur significant costs. One example is the recent albizia tree incident on Kaua'i. HDOT spent \$1 million per mile to remove 1,000 albizia trees; removal of one large tree can cost as much as \$10,000. At other locations statewide, along an estimated 50 miles of road, the albizia tree population is maturing and reaching high densities where it will pose a significant safety risk to highway users – potentially imposing \$50 million in management costs. Added to this are liability risks.

Meanwhile, one aggressive pest not yet established in Hawai'i is the red imported fire ant, or RIFA (*Solenopsis invicta*), which would cause severe economic losses to the Department and state. In Florida, RIFA have been shown to tunnel under roads, causing their collapse. Since the late 1930s, the RIFA has spread across a 300 million-acre swath from the southeastern U.S. to Southern California, costing billions of dollars annually in damage. Projected monetary impacts in California alone are expected to

cost as much as \$9 billion over the next 10 years. If RIFA reaches Hawai'i via accidental importation from the mainland (on heavy equipment for example), it will have significantly negative impacts on human health, infrastructure, and the quality of life in Hawai'i. One economic study estimates the cost to the State could reach \$211 million/year. Projected expenditures over a 20-year period following introduction total \$2.5 billion.

As recipients of federal funds, HDOT is required by the Presidential Executive Order 13112 to prevent and control the introduction and spread of invasive species. Also, for cost and public safety reasons, it is in HDOT's best interest to prevent, contain or mitigate the introduction of potentially harmful species. This plan identifies effective and meaningful responses to the problem of invasive species while considering HDOT's limited resources. The Department has identified five priority action areas for invasive species management to help fulfill its stewardship responsibilities despite the overwhelming number of incipient, established and potential invasive species threats, including the scale of their influence, dominance, abundance, rates of spread and persistence. SNIPP's multi-faceted approach includes:

1. **Prevention.** Prevent invasive species introduction, spread and establishment along State roads.
2. **Early Detection and Rapid Response.** Support and enhance the State's capacity to identify, report and effectively respond to newly detected or localized invasive species.
3. **Control and Management.** Control and manage invasive species to reduce their harmful impacts along State highways.
4. **Restoration.** Where appropriate, restore and maintain culturally and ecologically appropriate plant and animal communities along Hawai'i roads.
5. **Organizational Collaboration.** Maximize HDOT's collaboration on invasive species issues with federal, state and county agencies, as well as private organizations and individuals, focusing on neighboring landowners.

Adequate funding levels in the range of \$1 to \$3 million are needed annually to implement this SNIPP Strategic Plan and produce meaningful results. An additional \$2 million should be invested in short-term projects over the 10 years covered by the plan. Recently, federal funds provided in SAFETEA-LU became available to address invasive species problems associated with maintenance and construction activities; thus, federal aid could fund most of the work. By leveraging federal funds to the amounts needed and investing in invasive species management, SNIPP is likely to reduce future costly ad hoc reactionary responses to problematic invaders. Districts would need to program for the 10-20% State matching funds; they already spend that amount doing regular maintenance activities. A long-term commitment by HDOT and the implementation of SNIPP will provide benefits not only to HDOT, but to the people and environment of Hawai'i, saving the State of Hawai'i millions of dollars annually.

Hawai'i's Invasive Species Problem

The arrival of humans 1,500 years ago led to dramatic changes in the Hawaiian biota. Today, Hawai'i is home to more than 10,000 native plants and animals, descendants of species that arrived naturally to the islands over 70 million years without human help by wind, water, or in the wings or stomachs of birds. Many of these plants and animals are unique to Hawai'i and are found nowhere else on Earth (Eldredge and Evenhuis 2003). A large proportion of plants and animal species present in Hawai'i are introduced species, brought to the islands by people either intentionally or inadvertently. The rate of human-mediated introduction and establishment of alien species is thousands of times faster than the natural rate of arrival of species, especially in terrestrial ecosystems (Eldredge and Evenhuis 2003). Many introduced species remain in cultivation or domestication and help meet certain human needs and wants, such as food, fiber, cultural or aesthetic; but some have established wild populations or become invasive. Invasive species are defined according to a 1999 Executive Order 13112 as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health."

Invasive species are the single greatest threat to the environment, economy, and the health and quality of life of the people of Hawai'i. There are many examples, some in our homes and some in wild natural areas. For example, ground termites cause considerable damage to houses and other structures in Hawai'i

and cost over \$200 million per year to control. Farms, gardens and homes in Hawai'i are impacted by insect pests and diseases (e.g., scales, cockroaches, mites, rusts) which have mainly arrived in the last 200 years, reducing productivity and costing us time, money and chemicals to control them. In the wild, dense stands of strawberry guava (*Psidium cattelianum*) and miconia trees (*Miconia calvescens*) shade



In Tahiti, landslides occur in places invaded by dense stands of miconia (*Miconia calvescens*) and interfere with road building. There is still time to prevent the widespread invasion of miconia on Maui, O'ahu and Kaua'i.

Photo: The Nature Conservancy

out native species. Their shallow root system drastically increases water runoff and soil erosion, completely take over native forests, shading out native plants and causing severe erosion and water runoff (Meyer 1996). Coqui frogs (*Eleutherodactylus coqui*) are disrupting the balance of vulnerable native ecosystems by eating native insects and causing a nuisance to people in rural and urban areas due to their loud mating calls from dusk until dawn. Properties in heavily infested areas have experienced a significant drop in real estate value (Kraus and Campbell 2002; Kaiser and Burnett 2006). Introduced rodents (*Rattus* spp.), cats (*Felis catus*), and mongoose (*Herpestes javanicus*) have caused population declines in native birds and have been implicated in species extinctions (Stone and Anderson 1988). Unrestricted grazing by introduced feral goats, pigs, deer, sheep and cattle alter native forest and shrub land dynamics and drive many native species toward extinction (Stone and Anderson 1988). Mosquitoes (primarily *Culex quinquefasciatus*) in Hawai'i spread diseases to humans, domestic animals and wildlife (Van Riper III et al. 1982). The Hawai'i Invasive Species Council's (Hawai'i Invasive Species Council 2007) report to the legislature documented that federal and state agencies spent at least \$40.8 million in 2006 on management of invasive species in Hawai'i, and estimated that another \$110 million is spent on household and agricultural pest control. This does not address indirect losses, such as productivity or export opportunity losses, which can be attributed to invasive species impacts. So, the actual cost of invasive species to Hawai'i is higher than these estimates indicate. A 2004 Cornell University study estimates invasive species induced damages and losses across the United States at \$120 billion (Pimentel et al. 2005).

In addition to battling existing invasive species, Hawai'i has to be vigilant against potential invaders, such as the brown treesnake (*Boiga irregularis*), the red imported fire ant (*Solenopsis invicta*), and the West Nile virus. The brown treesnake could cost the State hundreds of millions of dollars annually, and would likely cause many extinctions in our vertebrate fauna (Burnett et al. 2008). The West Nile virus (present on the mainland) is a potentially serious illness carried by mosquitoes that threatens human health, livestock, and the remaining native birds in Hawai'i (LaDeau et al. 2007). If imported red fire ants were to establish in Hawai'i, as they have in the southernmost portion of the U.S., estimates show that their impacts would cost \$211 million per year for Hawai'i, but above all else their impacts to utilities, farming, tourism and human health would lead to major lifestyles changes in Hawai'i (Gutrich et al. 2007). These potential pest threats would make our current invasive species problems seem relatively insignificant.



Mosquitoes (primarily *Culex quinquefasciatus*) in Hawai'i spread diseases, such as the West Nile virus, dengue and malaria to humans, domestic animals and endemic wildlife like this 'apapane. Photo: Jack Jeffrey

Introduced or non-native species arrive in Hawai'i via many pathways and become "invasive" when they cause harm. Some of these introductions come to Hawai'i as hitchhikers on commodities, such as

nursery stock or cut flowers. Others are stowaways in packing materials and transport equipment. Once in Hawai'i, pest species may spread via wind or water, or by animals and people on fur, feathers, clothing or vehicles. Transportation corridors provide opportunities for the movement of invasive species through the landscape. Roadways serve as an avenue for movement and spread of invasive plants and animals (Hodkinson and Thompson 1997; Sullivan et al. 2009).

Transport of invasive plant seeds by vehicles is particularly common (von der Lippe and Kowarik 2007). An Australian study found that approximately half of tourist vehicles entering a National Park carried weed seeds (Lonsdale 1994). Invasive plants can also be introduced to a site during roadside construction either attached to equipment or through the use of imported soil, mulch, gravel and sod. In Hawai'i, the noxious fireweed (*Senecio madagascariensis*) may have been introduced on O'ahu and Maui through the hydro-seed mix sprayed along the rights-of-way (ROW) after construction activity. Fountain grass (*Pennisetum setaceum*) is suspected to have arrived on Maui through imported construction material. Invasive plants can move from site to site during roadside maintenance operations as well. Some landscape plantings resulted in the inadvertent establishment of invasive species. Effective management of invasive species along roadsides is a critical part of any landscape-level effort to address invasive species.

National Transportation Policy Context

The Statewide Noxious Invasive Pest Program (SNIPP) was initiated by Hawai'i Department of Transportation (HDOT) and funded via transportation legislation (August 2005), SAFETEA-LU, Section 6006, which makes funds available for the control of legally declared state and federal noxious weeds and establishment of native species. This legislation grants funds for construction and maintenance activities including restoration where "environmental degradation caused wholly or partially by a transportation facility" has occurred. The addition of Section 329 to Title 23 U.S. Code not only provides for federal-aid eligibility for weed control by DOT, but also supports their work concurrently with, in advance of, or following the construction of a project funded under this title. This flexibility should be of great assistance to DOT to respond to weed infestations at any time. Revegetation with native species or non-invasive alien species is preferred to provide stormwater abatement, soil stabilization and aesthetic enhancement.

Executive Order 13112 addresses invasive species and directs federal agencies to combat the introduction and spread of plants and animals not native to the U.S. The U.S. Department of



Invasive plants and animals can be transported inadvertently on vehicles and equipment. Photo: Christy Martin

The 2012-2022 SNIPP Strategic Plan

Transportation's policy is to fully support the administration's efforts to prevent the introduction and spread of invasive species by:

- a) pursuing appropriate authorities and funding for implementation;
- b) participating on interagency committees;
- c) analyzing invasive species' effects in accordance with Section 2 of Executive Order 13112;
- d) increasing coordinated research;
- e) implementing, at DOT facilities and DOT-funded facilities, the Presidential memorandum on beneficial landscaping;
- f) coordinating with international organizations, such as the International Maritime Organization, the International Civil Aviation Organization, and the International Organization for Standardization on cooperative efforts;
- g) training agency personnel and informing the public;
- h) coordinating with other federal agencies and with state, local and tribal governments; and,
- i) encouraging innovative designs for transportation equipment and systems.

The 2012-2022 SNIPP Strategic Plan Content and Organization

This 2012 Statewide Noxious Invasive Pest Program's (SNIPP) Strategic Plan represents Hawai'i DOT's commitment in mitigating the introduction, spread and impact of invasive species in Hawai'i. The strategy seeks to identify ways in which HDOT Highways Division can make an effective, meaningful response to the problem of invasive species. This is especially relevant considering HDOT's limited resources; the overwhelming number of actual and potential invasive species in Hawai'i; invasive species' scale of influence, dominance, high abundance, rates of spread and persistence; and of course the negative impacts invasive species may have on the things we value, such as quality of life, livelihoods, safety, health and the environment. The impacts of alien invasive species are immense, insidious and usually irreversible. Management decisions will rightfully be driven by perceived costs and benefits.

The organization of HDOT's SNIPP Strategic Plan is modeled after the National Invasive Species Council's (NISC) Strategic Plan (2008) and contributes to the goals of the Hawai'i Invasive Species Council Strategic Plan. The U.S. Department of Transportation is a member of the NISC. The content for this SNIPP Strategic Plan was developed with input gathered at a July 2009 workshop involving approximately 35 federal, state, county, non-governmental and private stakeholders. This Strategic Plan is consistent with invasive species management and priorities that are now widely accepted by experts nationally and internationally (IUCN 2000; NISC 2008; SPREP 2009; Wittenberg and Cock 2001). As for any management decisions, we acknowledge that the perceived benefit-to-cost ratio provides motivation for management action. SNIPP's 10-year Strategic Plan establishes five major "Strategic Goals" that focus HDOT's efforts in invasive species work relative to the following areas:

1. Prevention (P);
2. Early Detection and Rapid Response (EDRR);

The 2012-2022 SNIPP Strategic Plan

3. Control and Management (CM);
4. Restoration (R); and,
5. Community and Organizational Collaboration (OC).

The above areas of work are associated with specific goals that are discussed in order of priority. For each of these, we provide an introductory rationale for their relative importance within the broader Strategic Plan.

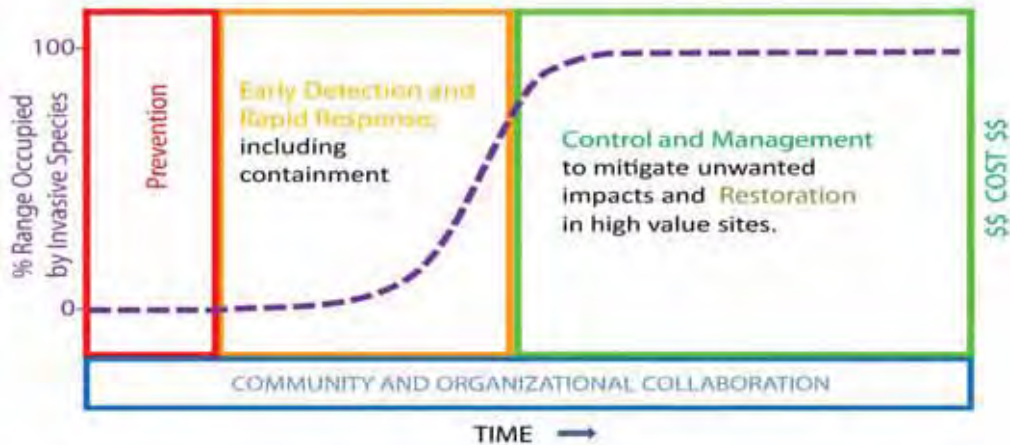


The hierarchy of goals, objectives, tasks, performance measures and suggested funding.

Each Strategic Goal is associated with long-term “Objectives” and shorter-term “Implementation Tasks,” “Performance Measures” and “Suggested Funding.” Goals are broad guide posts for managing invasive species. Objectives outline general areas of work that contribute to achieving each goal over the medium to long term. Implementation Tasks are specific actions that help to achieve each objective. The Performance Measures are concrete deliverables that demonstrate progress toward accomplishment of specific Implementation Tasks, Objectives and Strategic Goals. Accomplishment of the Implementation Tasks outlined here will be dependent upon agency budgets, institutional will and, in some cases, legal or regulatory changes. For each “Performance Measure” there may be a “Suggested Funding” amount that describes estimated funding requirements, either as a one-time cost or an annual amount if indicated (e.g., \$20,000 p.a.). If activities are to be conducted by HDOT staff or the SNIPP project, this is indicated under “Suggested Funding” too.

HDOT Highway Division’s SNIPP Strategic Plan helps the Division to map out the road ahead, for invasive species management on the land under its care. The general approach is similar for any successful invasive species program, and this SNIPP Strategic Plan documents and recommends the implementation of a context-sensitive rationale applicable to Hawai’i State highways. HDOT Highways Division is not acting alone; various stakeholders at the national and the state level are implementing innovative programs to address invasive species and these stakeholders share the broad goals outlined

in this Strategic Plan. By implementing this Strategic Plan, HDOT’s Highways Division is embracing its role as a responsible steward of the land it manages and contributing meaningfully to a statewide collaboration to protect Hawai’i from the adverse impacts of invasive species.



The strategic approaches to invasive species management in relation to the phases of invasion: Before and during the establishment phase management efforts should focus on the species wherever it occurs. At this time prevention and eradication (or containment) costs are relatively low and future impacts can be avoided. As invasive species spread, a species-based approach becomes too costly and managers must shift their focus toward mitigating unwanted impacts to priority values/sites and carry out restoration. All efforts must be underpinned by community outreach and organizational collaboration.

PREVENTION

Introduction

Prevention is the first line of defense in the effort to protect Hawai’i from invasive species impacts. Preventing the introduction of alien invasive species is the preferred option as the least expensive and most effective solution. Thus, prevention warrants the highest priority because impacts and associated management costs can be completely avoided if an invasive species is not allowed to establish or spread in areas currently free of the species.

HDOT is a steward of more than 2,500 miles of paved highways, freeways and roads which cross our island landscape. Once invasive species reach the shores of the Hawaiian Islands, roads provide the major avenue for movement of many invasive species. Road construction activities provide a pathway for the introduction of invasive species. Weed propagules, and even insects, can hitchhike on trucks and equipment; hydro-mulch can have weed seeds in it. Poor landscaping choices may introduce invasive plants to an area.

The most important action HDOT can take to protect Hawai'i is to institutionalize management practices that ensure HDOT activities do not introduce new species of invasive organisms to Hawai'i. Choosing non-invasive plants for landscaping, ensuring hydro-seed is weed free, and cleaning construction and maintenance equipment will close the pathways that have introduced invasive species to Hawai'i in the past. Institutionalizing these actions are key to preventing new invasive species introductions in Hawai'i because no other State agency has the power to close these pathways.

A successful prevention strategy requires HDOT to adopt measures that recognize or detect invasive species, allowing for effective intervention prior to their establishment in areas that are free of the invasives. The aim is to reduce the spread of invasive species through common pathways.

Invasive species prevention is unlikely to ever be 100% effective. Our best prevention efforts should achieve a reduction in the frequency of invasive species introduction and establishment. The goal is to ensure our prevention efforts will be most effective against the most serious invaders. Success can be claimed when a specific prevention protocol is well adopted, or "institutionalized." Adopting a culture of continuous improvement requires documentation of instances and mechanisms of invasive species introductions to new sites to learn from our "failures" and prevent future problems of a similar nature. HDOT will support and compliment the ongoing, quarantine, monitoring and surveillance strategies adopted by other agencies and groups to prevent the spread of invasive species (e.g., Department of Agriculture, Invasive Species Committees, Department of Land and Natural Resources).



The aggressive red imported fire (*Solenopsis invicta*) damages electrical equipment, has a powerful bite which can cause death in allergic people, and impacts biodiversity. Its arrival and establishment in Hawai'i could cost more than \$200 million annually. Other species of fire ant are restricted to the Big Island, with small populations on Maui and Kaua'i, and should not be spread between islands on equipment.

Photo: Hawaii Dept. of Agriculture

Approximately 90% of the most troublesome invasive plants were intentionally brought to Hawai'i to meet our needs for food, fodder, fiber, fuel, medicine, timber or aesthetics. Similarly, many of our invasive animals were brought to Hawai'i intentionally. However, some of the worst species, such as brown treesnake, red imported fire ant and fireweed (*Senecio madagascariensis*), probably will be accidental introductions. With this current understanding of invasive species, HDOT has a responsibility to avoid planting or introducing potentially invasive species and do its best to avoid accidental introductions.

STRATEGIC GOAL (P): Prevent invasive species introduction, spread and establishment along Hawai'i State roads.

Objective P.1: Prevent intentional introduction and establishment of invasive species along State roads.

Implementation Task P.1.1: Develop and update a list of acceptable and unacceptable species for planting along roadsides.

Performance Measure P.1.1.1: Adopt existing Hawai'i Landscape Industry Council (LICH) invasive species list.

Suggested funding: \$30,000 p.a. contributes funds to Hawai'i Landscape Industry Council (LICH) for benefit-cost assessment of potentially invasive plants.

Performance Measure P.1.1.2: Screen plants typically used in roadside planting programs and not on LICH's invasive species list using the Hawaii Pacific Weed Risk Assessment (HPWRA).

Suggested funding: see P.1.1.1

Performance Measure P.1.1.3: Adopt and maintain a list of species that contains both acceptable and unacceptable plants for planting along roadsides and post online.

Suggested funding: see P.1.1.1

Performance Measure P.1.1.4: Ensure that all appropriate HDOT staff and contractors know about and use the approved list of plants for planting.

Suggested funding: see P.1.1.1

Performance Measure P.1.1.5: Write and publish specifications for construction and maintenance that codify the mechanisms to prevent the use of potentially invasive species by DOT staff and contractors.

Performance Measure P.1.1.6: Work with other agencies and industry to adopt consistent standards for selecting plants for planting in Hawai'i.

Suggested funding: Activities to be covered as part of HDOT staff responsibilities.

Objective P.2: Minimize accidental introduction and establishment of invasive species along State highways.

Implementation Task P.2.1 Develop, update and maintain a HDOT Highways Division specific biosecurity¹ plan that identifies pathways of introduction and mitigation measures appropriate to the perceived level of risk.

Performance Measure P.2.1.1: Conduct research to describe the principal road pathways and likely prevalence of accidental movement of invasive species from construction activities and recommend preventative measures.

¹ "Biosecurity" means protection from the risks posed by organisms to the economy, environment and people's health, through exclusion, eradication and control.

Suggested funding: \$100,000 — conduct research on the movement of invasive species along State roads and via construction activities.

Performance Measure P.2.1.2: Create specifications and training materials for construction contractors; prevent invasive species from spreading to new sites through maintenance or construction vehicles by washing vehicles and equipment prior to moving them to new sites; and by instigating pre- and post-construction inspections.

Suggested funding: Should be covered by SNIPP budget.

Performance Measure P.2.1.3: Write a biosecurity plan and keep it updated with the best available information.

Suggested funding: This component would best be done in conjunction with P.2.1.1; updates could be done every five years — \$18,000.

Implementation Task P.2.2: Ensure that seeds for revegetation of rights-of-way are free of unwanted invasive species.

Performance Measure P.2.2.1: Work with Hawai'i Department of Agriculture to improve testing and seed sources to ensure that seeds for hydro-seeding are free of invasive species (ongoing).

Suggested funding: Should be covered as part of HDOT staff responsibilities.

Performance Measure P.2.2.2: Establish or adopt protocols to ensure that hydro-seed sources are free of invasive species.

Suggested funding: \$10,000 p.a. to support protocols.

Performance Measure P.2.2.3: Establish or maintain a list of approved certified seed suppliers that can provide seed free of invasive species.

Suggested funding: Activities should be covered as part of HDOT staff responsibilities.

Performance Measure P.2.2.4: Develop and implement methods for hydro-seeding with native plants and seed bank development.

Suggested funding: \$300,000 to support further research.

Implementation Task P.2.3: Improve staff and contractor adoption of measures that mitigate accidental movement of invasive species via the most important pathways.

Performance Measure P.2.3.1: Develop training materials that describe prevention measures for contractors, maintenance staff and inspectors.

Suggested funding: Development of training materials should be covered by the SNIPP project.

Performance Measure P.2.3.2: Train contractors, maintenance staff and inspectors about specification requirement.

Suggested funding: \$50,000 p.a. — two training courses per year per county.

Performance Measure P.2.3.3: Audit, review, and make improvements to ensure the measures adopted in the specifications are effective.

Suggested funding: Should be covered as part of HDOT staff responsibilities.

Objective P.3: Work cooperatively with the public to prevent the spread of invasive species.

Implementation Task P.3.1: Work with landowners that share concerns about invasive species to improve prevention efforts.

Performance Measure P.3.1.1: Identify and cooperatively work with major landowners and agencies concerned about invasive species prevention on State highways to address priority threats (ongoing).

Suggested funding: see OC.1.2.3

Implementation Task P.3.2: Identify major landowners and road users that contribute to invasive species spread and involve them in prevention efforts.

Performance Measure P.3.2.1: Identify and work with adjacent landowners and road users that may exacerbate invasive species problems (ongoing).

Suggested funding: see OC.1.2.3

Performance Measure P.3.2.2: Implement outreach to educate and obtain the help of landowners and road users to prevent the spread of invasive species (ongoing).

Suggested funding: see OC.1.2.3



Coqui frogs are regularly moved in nursery plants and vehicles from the Big Island. Known populations on the other islands are under containment or successfully eradicated to date. Photo: Hawaii Dept. of Agriculture

EARLY DETECTION AND RAPID RESPONSE

Introduction

When a potential or actual invasive species has been detected (i.e., when prevention has not been successful), steps to mitigate adverse impacts include eradication, containment and control. We purposely distinguish Early Detection and Rapid Response (EDRR) efforts from prevention and control. EDRR involves detecting an invasive species early, before it becomes widespread on the island. Rapid response involves either eradication which is the removal of all individuals of a species from an island, or containment which is limiting the species within a certain area on an island. Eradication aims to completely remove an invasive species from an area where reinvasion is unlikely or infrequent. When eradication is not possible containment is a method of control, still relatively early in the invasion process, aimed at limiting the spread of an invasive species beyond defined geographical boundaries. Meanwhile, Control and Management (see next section) is focused on mitigating invasive species impacts to the environment or human health and welfare.

Early detection of newly introduced actual or potential invasive species, together with the capacity to take rapid action, is key to successful and cost-effective eradication or containment. The decision-

making process will be driven by the perceived risk or impact potential of the species, as well as the feasibility of eradication. If eradication is feasible and successful, most of the impacts of the invasive species are avoided, and the costs are finite, being limited to those associated with the eradication effort which ends once eradication is achieved.

Containment is the next best option after eradication. The range of the species is actively restricted within known limits, or “core” areas, and only outlier populations are subject to control efforts. Containment is designed to prevent spread and avoid impacts in the rest of the invasive species’ potential range; however, costs are ongoing as the core of the containment area is not subject to control. This approach is adopted when a species is considered too costly to eradicate or control, except on the fringes of its current range but only when its impacts are considered severe enough to warrant the effort. Containment is a high priority on State roads with adjacent pristine native habitats.

Because it is humanly impossible to prevent all plant and animal introductions, prevention efforts as detailed in a previous section sometimes fail. Following such failures, eradication, containment or control is required. Otherwise, management options may quickly become difficult, expensive or impossible with normally available resources. Therefore, early detection of incipient (i.e., recently introduced) populations with a limited distribution should be attempted, and eradication carried out if feasible. The implementation of an appropriately rapid management response is the next available best plan of action (e.g., local or island-wide eradication). The interval between a species’ introduction, its detection, and the implementation of management actions will determine the outcome and feasibility



Miconia calvescens is a serious invader successfully contained on Maui, and is set for eradication on O’ahu and Kaua’i. Photo: MISC

of eradication. An appropriately “rapid response” depends on the species’ rate of spread, which is determined by the biology of the species and the characteristics of the receiving environment.

Both passive and active detection programs are useful. State roads traverse much of the landscape, and thousands of road users can keep an eye out for unusual plants and animals that may be invasive. Maintenance crews and construction contractors are particularly familiar with roadside flora and fauna and, therefore, are in a prime position to detect new species or changes in the distribution of known invasive pests. In addition, systematic roadside surveys can document the distribution of invasive plants or other species both in the ROW and in adjacent neighboring properties.

Early Detection and Rapid Response efforts already have been initiated for plants along roads in every county by the Invasive Species Committees’ early detection crews. Hawai’i Department of Agriculture offices and Invasive Species Committees in each county focus on Early Detection and Rapid Response, and have

criteria and information about the species for which eradication and containment are feasible options. In addition to general surveys of transportation corridors, these agencies also survey areas around new landscaping efforts, nurseries, ports, airports, dumps and quarries which are likely hotspots for the introduction of a variety of invasive species (e.g., red imported fire ants, coqui frogs, fireweed or new invasive plants). Except in rare circumstances, HDOT's Early Detection and Rapid Response efforts would ideally implement EDRR efforts in transportation corridors via cooperative efforts with other agencies.

STRATEGIC GOAL (EDRR): Support and enhance the State's capacity to identify, report and effectively respond to newly detected or localized invasive species.

Objective EDRR.1: Develop the capacity for high priority audiences to report incidental detections of invasive species along State highways.

Implementation Task EDRR.1.1 Develop educational materials and train key target audiences, contractors, road users and staff who may report invasive species along State highways.

Performance Measure EDRR.1.1.1: In cooperation with the Invasive Species Committees, CGAPS and HDOA, develop educational materials and train relevant target audiences (and trainers) to facilitate the identification of invasive species along State roads.

Suggested funding: see OC.1.2.3 and P.2.3.2

Performance Measure EDRR.1.1.1: Distribute materials to target audiences each year and document the number of people reached with the training program for each key audience.

Suggested funding: see OC.1.2.3 and P.2.3.2

Implementation Task EDRR.1.2: Support and encourage the use of the existing State pest hotline system 643-PEST.

Performance Measure EDRR.1.2.1: Measure the level of staff or contractor awareness about the toll-free statewide pest hotline (annual report from surveys conducted before and after training).

Suggested funding: see OC.1.2.3 and P.2.3.2

Performance Measure EDRR.1.2.2: Monitor the number of reports of species along State roads made to the hotline (annual report from HDOA).

Suggested funding: see OC.1.2.3 and P.2.3.2

Objective EDRR.2: Implement systematic measures to detect and document invasive species.

Implementation Task EDRR.2.1: Develop context-sensitive methods to detect invasive species.

Performance Measure EDRR.2.1.1: Ensure construction and maintenance specifications or other policy documents that facilitate early detection and rapid response measures for invasive species.

Suggested funding: Should be part of SNIPP project.

Implementation Task EDRR.2.2 Document current status of invasive species along State roads, focusing on newly established populations of invasive species.

Performance Measure EDRR.2.2.1: Conduct or support surveys of invasive plants along State roads on O'ahu.

Suggested funding: Should be covered by the SNIPP project.

Performance Measure EDRR.2.2.2: Conduct or support surveys of invasive plants along State roads in each county.

Suggested funding: \$100,000 per county, one county per year for invasive plant and animal species surveys along State highways.

Performance Measure EDRR.2.2.3: Implement surveys by trained professionals for the early detection of invasive plant and animal species at all high risk sites associated with road construction and maintenance.

Suggested funding: \$20,000 per county; one county per year for invasive species surveys at all high risk sites.

Implementation Task EDRR.2.3 Develop a database/information system to share information about invasive species detected along State roads with other agencies and the public.

Performance Measure EDRR.2.3.1: Develop a geo-referenced database for documenting the distribution of invasive plants.

Suggested funding: Should be covered as part of the SNIPP project.

Performance Measure EDRR.2.3.2: Develop a GIS database (or data sharing agreement with another agency) for documenting the distribution of other invasive species (i.e., non-plant pests).

Suggested funding: Should be covered as part of the SNIPP project.

Objective EDRR.3: Develop the means to effectively respond to incipient invasive species identified within DOT ROW.

Implementation Task EDRR.3.1 Develop and support plans for (timely and effective) interagency responses to incipient invasive species that may occur on lands under DOT stewardship.

Performance Measure EDRR.3.1.1: Develop and participate in rapid response plans (e.g., HDOA's Red Imported Fire Ant Response Plan); identify responsible staff and possible funding mechanisms.

Suggested funding: Should be covered as part of HDOT staff responsibilities.

Performance Measure EDRR.3.1.2: Develop agreements with other agencies so they can work on lands under HDOT care to respond to invasive species issues.

Suggested funding: Should be covered as part of HDOT staff responsibilities.

Performance Measure EDRR.3.1.3: Implement or fund timely and effective eradication or control responses to priority incipient invasive species that are in, or spreading from, ROWs.

Suggested funding: \$975,000 p.a. statewide — divided between counties according to need.



Albizia trees have a tendency to drop large branches. Their establishment along roadsides needs to be controlled, as removal of large trees can be expensive. Location: Maui.

Photo: Forest and Kim Starr

CONTROL AND MANAGEMENT

Introduction

When prevention, eradication or containment has failed, we are left with the most commonly employed yet least desirable option of controlling, managing or mitigating invasive species impacts. Effectively, we are forced to find a way to “live with” the invasive species, but resort to taking measures to mitigate their least acceptable impacts. In the case of control and management, we are likely dealing with a perpetual effort because reinvasion from unmanaged areas is continuous. Control and management actions are driven by the importance we give to mitigating impacts rather than the simple fact that a species is considered to be invasive. Control is, therefore, limited to those areas or situations where the values we want to protect are threatened. This is context sensitive, usually on a site-by-site basis. For example, a species may be ignored where it is ubiquitous and surrounded by low-value non-native scrub, but becomes a priority in an area bordering a National Park.

This value-based management is

already in use; albizia (*Falcataria moluccana*) is a known invasive species in native forests but it also has a tendency to drop branches on the road. Control is sensibly limited to areas where it threatens our safe use of the road, rather than controlling the species wherever it occurs just because it is invasive. One exception to the value-based priority setting might be where compliance with legal mandates requires control actions on specific species. This includes state and federal noxious weeds included in the USDA Federal Noxious Weed List and those listed in the Hawai‘i Department of Agriculture’s Hawai‘i Administrative Rules (HAR) 68, “Noxious Weed Rules.” Additional animals and pests are considered invasive by the Hawai‘i Departments of Land and Natural Resources and Agriculture as described in HAR.



Felling albizia trees along less than two miles of road on Kaua‘i cost nearly \$1 million in 2009. *Photo: Star Bulletin*

For HDOT's roadside maintenance projects, invasive species management will be considered part of HDOT's *Highway Manual for Sustainable Landscape Maintenance*. A variety of methods may be used to control invasive species in any given location, such as physical or mechanical means, herbicides, and cultural methods like grazing and biocontrol. Biocontrol is a special case for control; naturally occurring co-evolved predators from an invasive species' native range can provide specific control for the target pest or weed (usually a plant, insect or other invertebrate pest). These natural enemies may reduce the growth rate or reproductive capacity of the target species, kill a proportion of the population, or otherwise reduce its competitive ability. Ultimately, biocontrol agents can reduce both the harmful effects and management costs of invasive species. The process to find natural enemies that are specific to the target and can be released without unintended impacts to non-target organisms has improved to an extent where non-target impacts are very rare; but this process can be very lengthy (up to 10 years or more) and costly. If successful, biocontrol agents operate continuously with little need for additional labor or other inputs and, therefore, are considered relatively sustainable. HDOT's role in biocontrol efforts is to support research for invasive pests known to occur in rights-of-way and which cause safety concerns and/or deterioration of the roadside landscape, or were introduced by HDOT activities.

STRATEGIC GOAL (CM): Control and manage invasive species to reduce their harmful impacts along State highways.

Objective CM.1: Improve HDOT Highways Division's capacity to control and manage invasive species to protect priority values.

Implementation Task CM.1.1: Mitigate most important (least acceptable) invasive species impacts along State highways' rights-of-way.

Performance measure CM.1.1.1: Map the distribution of high priority areas and ecological communities and document invasive species threats that should be the focus of control efforts.

Suggested funding: \$300,000 — map, survey and rank sites and invasive species threats statewide to support the implementation of control measures to protect biodiversity values.

Performance measure CM.1.1.2: Within five highest value areas identified in each county in CM.1.1.1, develop a list of priority invasive species for control and management, and determine desired management outcomes and effective control measures.

Performance measure CM.1.1.3: Using sound science and creative solutions develop efficient, innovative and integrated control methods for invasive species that are difficult or expensive to control.

Suggested funding: \$200,000 p.a. — to implement control measures and trials and protect biodiversity values at five priority sites in each county.

Implementation Task 1.2: Support efforts by other organizations and agencies to control invasive species on lands managed by HDOT.

Performance measure 1.2.1: Allow access to external stakeholders for the control and management of invasive species on HDOT lands.

Suggested funding: Should be covered as part of HDOT staff responsibilities.

Performance measure 1.2.2: Support the research, development and implementation of invasive species control using natural enemies (biocontrol) for three priority targets.

Suggested funding: \$150,000 p.a. — to support research and development on three priority targets for biocontrol over the 10-year period of the Strategic Plan.

Objective CM.2: Develop workforce competencies to improve control and management activities along the rights-of-way.

Implementation Task 2.1: Train highways maintenance staff and contractors about invasive species control in highways' rights-of-way.

Performance measure 2.1.: Train HDOT staff and contractors via at least two workshops per year about invasive species control in highways' rights-of-way starting within three years. (annually after three years).

Suggested funding: see P.2.3.2

Objective CM.3: Develop regional partnerships for the effective control and management of priority invasive species.

Implementation task CM.3.1: Identify legal, political and organizational obstacles and constraints inhibiting collaboration with external stakeholders to invasive species control and management.

Performance measure CM.3.1.1: Identify and mitigate obstacles to effective invasive species control and management efforts with at least three major landowners.

Suggested funding: Should be covered as part of HDOT staff responsibilities.

Performance measure CM.3.1.2: Identify and mitigate three major obstacles to effective invasive species control and management efforts as they apply to state and federal agencies.

Suggested funding: Should be covered as part of HDOT staff responsibilities.

Implementation task CM.3.2: Establish working relationship with external stakeholders particularly the neighboring landowners.

Performance measure CM.3.2.1: Develop at least three regional level collaborative control and management programs involving private, county, and/or federal neighboring landowners.

Suggested funding: \$350,000 p.a. — fund effective partnerships or HDOT-managed cooperative invasive species control initiatives.

RESTORATION

Introduction

Restoration is the process of restoring degraded or damaged ecological systems. State roads currently serve as vectors for the spread of weedy plants. In a major paradigm shift, we envision State roads being a place for native plants to grow and flourish. Restoration may also involve planting alien non-invasive plants, if they are the best-suited for a certain area and there are no appropriate native species. Apart from the inherent ecological value of establishing native and non-invasive species, restoring roadside vegetation with native plant species also has economic, safety and aesthetic advantages. The establishment of native plant communities is the best long-term defense against the introduction, establishment and spread of invasive species. Using native species for restoration reduces the maintenance costs associated with the control of problematic invasive species in the rights-of-way. In the absence of restoration, invasive species control can be ineffective because the control activities often cause disturbances that facilitate further invasive species establishment. Restoration of roadsides with native species can enhance roadside safety goals. For instance, hydro-seeding with fast-growing introduced grasses has been the general practice in Hawai'i; however, introduced grasses can have shallow roots and be invasive themselves. In contrast, restoring the roadsides with better adapted native grasses, herbs and shrub species with different root depths could increase slope stability and prevent slumps and debris from flowing onto the roads. Finally, restoration can be visually more appealing and provide a true Hawaiian sense of place that is culturally and ecologically appropriate for our roadsides and sensitive to the local climatic and biological context (e.g., water use may be less in native species).



Once established, strawberry guava quickly invades and eventually dominates native Hawaiian forests. Shown here, is an aerial view of a sea of invasive strawberry guava (dark green) surrounding isolated and dying 'ōhi'a on the Island of Hawai'i at Wao Kele o Puna.

Photo: Carnegie Airborne Observatory

Restoration should be viewed as an integral part of invasive species management. Section 2(a) (2) of EO 13112 charges federal agencies to “provide for restoration of native species and habitat conditions in ecosystems that have been invaded.” Importantly, the recent legislation SAFETEA-LU makes the existing national highway system/surface transportation program funds available for the control of invasive species along the roadsides and for the propagation and establishment of native plant species along the rights-of-way. Hawai‘i’s SNIPP recognizes the importance of restoring with native plants for long-term ecosystem resiliency. For shorter term rehabilitation and site stabilization, both native and site appropriate non-invasive alien species can be used. Evaluation of available techniques and developing new techniques that can successfully suppress invasive species should continue. Documenting a vision of the desired future plant community along the roadside and potential for restoration on a spatial scale will allow the HDOT maintenance staff to strategically control and remove invasive species and restore ROW with appropriate native species.

STRATEGIC GOAL (R): In high priority sites, restore and maintain culturally and ecologically appropriate plant and animal communities along Hawai‘i roads.

Objective R.1: Restore high priority/high value areas along State highways.

Implementation Task R.1.1: Identify high value areas along State highway rights-of-way for restoration.

Performance Measure R.1.1.1: With participation from external stakeholders, develop criteria to prioritize restoration efforts and rank the areas along the rights-of-way based on these criteria within three years.

Suggested funding: \$20,000 for report and workshop.

Performance Measure R.1.1.2: Develop a list of five high priority areas for restoration along the highways’ rights-of-way on each island within three years.

Suggested funding: see R.1.1.1

Performance Measure R.1.1.3: Write and implement restoration plans for priority sites; involve reliable external stakeholders; and document pre-existing conditions, restoration goals, success metrics and monitoring plans. Emphasis will be on low labor, highly efficient native hydro-seeding restoration with aggressive weed control protocols. Total area restored in each county to be greater than five acres.

Suggested funding: \$425,000 p.a. to write and implement restoration plans for five sites in each county.

Performance Measure R.1.1.4: Document successful restoration projects in each county involving recovery from invasive species impacts in the highways’ rights-of-way.

Suggested funding: Incorporate into funding and restoration plans as for R.1.1.3.

Objective R.2: Support and develop cost-effective methods to restore highways' rights-of-way with native plant species.

Implementation Task R.2.1: Develop and implement methods for seeding highways' rights-of-way with native species.

Performance Measure R.2.1.1: Identify or establish seed sources for at least three low-growing native plant species suitable for large-scale reseeding efforts in highways' rights-of-way.

Suggested funding: \$100,000 p.a. — plant large populations of three species along State roads; species should be suited to each county; the plantings can be used as a seed source by native plant nurseries for construction projects.

Performance Measure R.2.1.2: Support the development of cost effectively hydro-seeding techniques using native plant seed mix.

Suggested funding: \$200,000 to develop cost-effective hydro-seeding using native species.

Performance Measure R.2.1.3: Using the previously developed cost-effective hydro-seeding techniques (R.2.1.2), restore at least 10 acres of the clear zones in the rights-of-way with native plants. Monitor and evaluate its success over time as described in R.1.1.3.

Suggested funding: \$100,000 to annually hydro-seed over 10 acres using native species.

Implementation Task R.2.2: Develop and implement cost-effective methods for planting shrubs and trees in the highways' rights-of-way with native species.

Performance Measure R.2.2.1: Identify appropriate native plant species that are suitable for large-scale restoration efforts in the highways' rights-of-way.

Suggested funding: Should be covered as part of a 2009 HDOT contract for services to develop a Sustainable Landscape Master Plan.

Performance Measure R.2.2.2: Conduct experimental restoration effort in at least three different habitat types (e.g., coastal, lowland, dry, mesic and wet areas) on each island.

Suggested funding: see R.2.2.3

Performance Measure R.2.2.3: Restore at least 50 acres within the rights-of-way statewide using native plant species.

Suggested funding: \$1,000,000 — statewide to support prioritized restoration projects.

Objective R.3: Support and enhance the development of an island-based native plant industry.

Implementation Task R.3.1: Support local businesses that propagate native plant species.

Performance Measure R.3.1.1: Communicate the revegetation requirements of HDOT's Highways Division to local native plant growers.

Performance Measure R.3.1.2: Design and plan for the use of 50% native plants on all construction projects implemented along State rights-of-way.

Suggested funding: *Should be covered as part of HDOT staff responsibilities.*

Performance Measure R.3.1.3: Include the requirement to use native plant species in the HDOT specifications for construction and maintenance projects within three years.

Suggested funding: *Should be covered as part of HDOT staff responsibilities.*

Performance Measure R.3.1.4: Ensure that selection criteria for native plant contracts give weight to plants grown on island, rather than imported from other islands as this will decrease the likelihood that pests will be moved interisland.

Suggested funding: *Should be covered as part of HDOT staff responsibilities.*

Performance Measure R.3.1.5: Include appropriate native plant use and selection processes in the Landscape Master Plan within two years.

Suggested funding: *Should be covered as part of HDOT contract for services to develop a Sustainable Landscape Master Plan.*

Objective R.4: Develop partnerships to ensure the long-term success of restoration projects.

Implementation Task R.4.1 Identify and engage relevant external stakeholders in restoration projects in the highways' rights-of-way.

Performance measure R.4.1.1: Develop at least one restoration project of more than an acre on each island that demonstrates successful partnership with reliable government or non-governmental external stakeholder.

Suggested funding: *see R.2.2.3*

COMMUNITY AND ORGANIZATIONAL COLLABORATION

Introduction

Invasive species problems are often exacerbated by people; but with recognition of the problem, people will become part of the solution. Understanding and awareness, based on information and knowledge, are essential for establishing invasive species as a priority issue which can and must be addressed. Better information and education, and improved public awareness of invasive species issues by all sectors of society, are fundamental to preventing or reducing the risk of unintentional or unauthorized introductions and to establishing evaluation and authorization procedures for proposed intentional introductions. Control and eradication of invasive species is more likely to be successful if supported by informed and cooperating local communities, government agencies, appropriate sectors and groups. Sharing of information and research findings is vital to education, understanding and awareness.

HDOT Highways Division is a member of a wider community that can benefit from efforts to protect Hawai'i from the impact of invasive species. Only through a collaborative approach will the problem be effectively addressed. Outreach, training and community and organizational collaboration are required to achieve each of the goals of this strategy. HDOT is not primarily a conservation agency and its

dedicated efforts to invasive species management are second to its primary mission to provide safe, accessible, and efficient transportation for Hawai'i. As such, Hawai'i Department of Transportation seeks to collaborate with government and non-governmental conservation organizations for expert input and support to be successful in preventing the introduction and spread of invasive species along Hawai'i roads.

Effective management of invasive species in these rights-of-way requires HDOT to work with neighboring landowners, accommodating their management objectives and target species for control as well. Developing partnerships and outreach on various invasive species issues are critical to effective invasive species management. HDOT can leverage limited resources to bring about effective and meaningful invasive species management and avoid duplication of effort.



New pests, potential and known pests should be reported to the report-a-pest hotline.

Strategic Goal (OC): Maximize HDOT's collaboration on invasive species issues with federal, state and county agencies, as well as private organizations and individuals, focusing on neighboring landowners.

Objective OC.1: Enhance communication about invasive species issues along State highways.

Implementation Task OC.1.1: Increase communication within HDOT on invasive species issues.

Performance Measure OC.1.1.1: Implement at least three projects within the next five years that involve coordination within various HDOT internal divisions of planning, design, construction, and operations and maintenance.

Suggested funding: Should be covered as part of HDOT staff responsibilities.

Performance Measure OC.1.1.2: Conduct one island-wide internal workshop/meeting or produce educational materials within HDOT among the various divisions to share information on ongoing and upcoming policies and practices on invasive species issues every two years.

Suggested funding: Should be covered as part of SNIPP project and/or HDOT staff responsibilities.



The brown treesnake has caused species extinctions in Guam and continues to disrupt the island's electricity supply system. Hawai'i's trade connection with Guam could inadvertently lead to its introduction. Photo: USGS/BRD

Implementation Task OC.1.2: Increase communication with external stakeholders on invasive species issues.

Performance Measure OC.1.2.1: Share with external stakeholders for review and comment changes to HDOT protocols and procedures on invasive species issues.

Suggested funding: Part of existing functions.

Performance Measure OC.1.2.2: Attend the Hawai'i Conservation Conference annually to network with potential and existing partners.

Suggested funding: Part of existing functions.

Performance Measure OC.1.2.3: Coordinate invasive species projects, outreach and SNIPP program through a partnership with the Pacific Cooperative Studies Unit at the University of Hawai'i co-housed with HDOT staff.

Suggested funding: \$100,000 p.a. for coordination.

Performance Measure OC.1.2.4: Play an active role as a member of the Hawai'i Invasive Species Council and implement its (2008) strategy (as required by HRS 194).

Suggested funding: Part of existing functions.

Objective OC.2: Coordinate and expand HDOT's invasive species programs and leverage resources.

Implementation Task OC.2.1: Partner with relevant government or non-governmental agencies on efforts for prevention, early detection and rapid response, and control and management of invasive species.

Performance Measure OC.2.1.1: Demonstrate sharing of resources through partnerships with one governmental and non-governmental agency in each of the invasive species management areas of prevention, early detection and rapid response, and control and management within the next five years.

Suggested funding: Part of existing functions.

Performance Measure OC.2.1.2: Share information and databases about invasive species with governmental and non-governmental agencies within the next two years.

Suggested funding: Part of existing functions.

Objective OC.3: Enhance HDOT's invasive species outreach.

Implementation Task OC.3.1: Promote and build support for HDOT's efforts in invasive species management.

Performance Measure OC.3.1.1: Promote HDOT's efforts on invasive species management through the media and through site signage.

Suggested funding: Part of existing functions.

Implementation Task OC.3.2: Develop invasive species outreach targeting strategic user groups and businesses.

Performance Measure OC.3.2.1: Work with the Hawai'i Invasive Species Council's Public Outreach Working Group to develop public service announcements to raise awareness among motorists about the spread of invasive species via key pathways (within three years).

Suggested funding: \$75,000 annually.

Performance Measure OC.3.2.2: Develop and distribute outreach materials on HDOT's top 10 priority invasive species in the highways' rights-of-way for each county (within five years).

Suggested funding: see OC.1.2.3

Performance measure OC.3.2.3: Communicate key information and research findings that support effective management of invasive species, internally and externally.

Suggested funding: see OC.1.2.3

Implementation Task OC.3.3: Involve community groups in the planning, planting and maintenance of landscape projects.

Performance measure OC.3.3.1: Expand the Adopt-a-Highway program to include native plantings.

Suggested funding: \$100,000 p.a. — grants for community groups statewide.

Objective OC.4: Increase funding for invasive species work along State highways and secure dedicated funding.

Implementation Task OC.4.1: Identify sources of funding for invasive species work in the highways' rights-of-way.

Performance measure OC.4.1.1: Based on this Strategic Plan, identify projects that would address the goals and submit at least one proposal per year for funding.

Suggested funding: See funding levels suggested in this Strategic Plan.

Performance measure OC.4.1.2: Secure at least \$3 million in dedicated annual funding within five years for invasive species programs and/or positions that contribute to the achievement of objectives of this SNIPP Strategic Plan.

Suggested funding: See funding levels suggested in rest of Strategic Plan to be implemented by HDOT staff and collaborators.

Performance measure OC.4.1.3: In cooperation with an external stakeholder, complete at least one invasive species related project in the next five years that is funded partially or completely from external sources.

Suggested funding: See funding levels suggested in rest of Strategic Plan.

FUNDING AN EFFECTIVE RESPONSE TO INVASIVE SPECIES

The goals and objectives in this report are listed in order of priority in terms of their perceived effectiveness in addressing the invasive species threat. Ideal funding levels to fully implement this Strategic Plan are given in the table below. An estimated \$2.8 million in dedicated annual funding would allow implementation of high priority ongoing tasks (see table below). An additional \$2 million over the 10-year life of the SNIPP Strategic Plan would allow implementation of other high priority one-time projects. It is important to note that the HDOT staff is already implementing some of the tasks detailed in this Strategic Plan and has modified current practices. Funding will be in various relevant HDOT projects and programs and a portion will be in the Statewide Transportation Improvement Program (STIP) as SNIPP. In addition, some costs described in this plan could be included as part of construction projects (e.g., some restoration efforts could be included in construction projects rather than a separate restoration project). SAFETEA-LU federal funds at 80:20 match are available for the annual SNIPP budget. Finally, all funding suggestions in this Strategic Plan may be subject to change in the future. Suggested funding levels should accommodate possible changes.

Estimated funding levels required to perform the implementation tasks in this 10-year SNIPP Strategic Plan 2012-2022.

<i>SNIPP Program Component</i>	<i>Other projects one-time cost</i>	<i>Annual On-going projects Estimated \$/year</i>
<i>Prevention</i>	\$410,000	\$113,000
<i>Early Detection and Rapid Response</i>	\$0	\$1,095,000
<i>Control and Management</i>	\$300,000	\$700,000
<i>Restoration</i>	\$1,220,000	\$625,000
<i>Community and Organizational Collaboration</i>	\$0	\$275,000
TOTAL	\$1,930,000	\$2,808,000
<i>Federal Match 80%</i>	\$1,544,000	\$2,246,400
<i>State Funds 20%</i>	\$386,000	\$561,600

KEY INVASIVE SPECIES MANAGEMENT STAKEHOLDERS

Internal and external stakeholders who may be involved in implementation of this SNIPP Strategic Plan include:

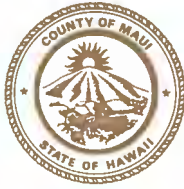
- HDOT Highways Division
- Contractors to HDOT for construction and maintenance activities
- The public
- The Coordinating Group on Alien Species—<http://www.hawaiiinvasivespecies.org/cgaps/>
- The Hawai'i Invasive Species Council—<http://www.hawaiiinvasivespecies.org/hisc/>
- Invasive Species Committees—<http://www.hawaiiinvasivespecies.org/iscs/>
- Hawai'i Ecosystems at Risk—<http://www.hear.org>
- Hawai'i Department of Land and Natural Resources—<http://hawaii.gov/dlnr/>
- Hawai'i Department of Agriculture—<http://hawaii.gov/hdoa/>
- University of Hawai'i—<http://www.hawaii.edu>
- CTAHR Cooperative Extension Service—<http://www.ctahr.hawaii.edu/site/extprograms.aspx>
- USDA—<http://www.invasivespeciesinfo.gov/unitedstates/hi.shtml>
- U.S. Fish and Wildlife Service—<http://www.fws.gov/pacificislands/invasives.html>
- The Nature Conservancy—<http://www.nature.org/>
- The Sierra Club—<http://www.sierraclub.org/>
- The Outdoor Circle—http://www.outdoorcircle.org/protecting_hawaii

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APPENDIX: Letters of Support

CHARMAINE TAVARES
MAYOR



200 South High Street
Wailuku, Hawaii 96793-2155
Telephone (808) 270-7855
Fax (808) 270-7870
e-mail: mayors.office@mauicounty.gov

OFFICE OF THE MAYOR
County of Maui

April 13, 2010

Mr. Glenn M. Yasui
Highways Administrator
Hawaii Department of Transportation
869 Punchbowl Street, Room 513
Honolulu, Hawaii 96813

Dear Mr. Yasui:

RE: SUPPORT OF 2010-2020 STATEWIDE NOXIOUS AND INVASIVE PEST PROGRAM (SNIPP)

I am writing in support of the Hawaii Department of Transportation's (HDOT) 2010-2020 Statewide Noxious and Invasive Pest Program (SNIPP) plan. I applaud your decision to raise the standards by which your department will be held in terms of invasive species management. It is through our individual and collective efforts that we can ensure a better future for both our environment and our economy.

The plan laid out for SNIPP is multi-faceted and seeks to work in a collaborative fashion with government agencies, community organizations, and the public-at-large. I appreciate this holistic approach and effort to be inclusive. The most important component of the plan, in my view, is preventing the introduction and establishment of invasive species along state roads. This approach will likely save valuable time and conserve limited resources, which is ultimately more cost-effective than attempting to control or eradicate established invasive pests.

My administration has been very proactive in invasive species issues and prevention as well, including facilitating public outreach and education. We have dedicated significant funding to on-the-ground management of Miconia, Banana Bunchy-top Virus, Little Fire Ants, Coqui Frogs and more. In 2009, I sponsored a resolution supporting the research and safe application of biological control agents for the management of Maui County's most harmful invasive forest pests, which was passed unanimously by the County Council.

I would be pleased to offer any assistance that you may need in carrying out the SNIPP plan in Maui County. You may contact my Environmental Coordinator, Kuhea Paracuelles, at (808)270-8299 or Kuhea.Paracuelles@mauicounty.gov.

Thank you for your good work and I look forward to collaborating with you in the future!

Sincerely,

A handwritten signature in cursive script that reads "Charmaine Tavares".

CHARMAINE TAVARES
Mayor

CT:kp



April 7, 2010

Jamie Ho
Highways Administrator
Hawaii Department of Transportation
869 Punchbowl Street, Room 513
Honolulu, HI 96813

Aloha Ms. Ho,

On behalf of the Coordinating Group on Alien Pest Species (CGAPS) I congratulate you and your department on its work to mitigate invasive species via the Highways Division's SNIPP project and proposed Strategic Plan. As you are aware, invasive species pose one of the greatest threats to Hawaii's economy, environment, and quality of life, with economic impacts alone in Hawaii estimated to be in the hundreds of millions of dollars per year. The SNIPP project and proposed Strategic Plan will both improve HDOT's stewardship of the lands it manages and its important mission to provide a reliable transportation network while preserving economic prosperity and quality of life. Because invasive species pose such an incalculable threat to our state's economy, built infrastructure, natural resources and public health, having each agency review its policies and make necessary changes to prevent further costly infestations is extremely important for statewide biosecurity. When implemented, the SNIPP Strategic Plan will be a significant step toward protecting Hawaii's environment, economy, and quality of life.

CGAPS' participating agencies and personnel look forward to cooperating with HDOT to implement the SNIPP Strategic Plan. If there is anything we can do to assist, please don't hesitate to contact me at (808) 848-4118 or fkraus@hawaii.edu, or Dan Clark, CGAPS Deputy Chair, at (808) 388-3160 or Daniel_Clark@fws.gov.

Sincerely,

A handwritten signature in cursive script that reads 'Fred Kraus'.

Fred Kraus
2009-2010 CGAPS Chair

cc: Chris Dacus
Dan Clark



April 15, 2010

Mr. Glenn M. Yasui
Highways Administrator
Hawai'i Department of Transportation
869 Punchbowl Street, Room 513
Honolulu, Hawai'i 96813

Dear Mr. Yasui,

I am writing on behalf of the Maui Conservation Alliance (MCA), a group made up of natural resource professionals representing all levels of government as well as some non-profit organizations, who meet regularly to collaborate on conservation issues affecting our county.

At a recent meeting, the Hawai'i Department of Transportation-Highway's 2010-2020 Statewide Noxious and Invasive Pest Program (SNIPP) was brought to our attention. Our members noted that this plan is very well done and includes an excellent balance of important elements. We were especially elated that the plan has a broad vision beyond simply (and importantly) addressing the facets most obviously related to highways, preventing and controlling invasive species along state highways and adjacent rights of way. We are hopeful that the state and federal administrations will be fully committed to making this happen.

As you well know, Hawai'i suffers more from biological invasions than any place in the country. Invasive species issues are certainly central to the concerns of all conservation agencies and organizations on Maui. Virtually all sectors of society share responsibility for the problem and are affected by it to some degree, some worse than others. Watersheds, natural areas, agriculture and the quality-of-life of ordinary people are placed at risk. By serving the transportation needs of local society, HDOT unavoidably contributes in a major way to the problem. It is so heartening that HDOT is recognizing this fact and contributing in a very significant way toward solutions with help from its federal counterpart.

We particularly appreciate HDOT's commitment for its support of biological control of Hawai'i's worst invaders related to highways, such as the notorious *albizzia*.

There are many invasive species that we're concerned about, however, Little Fire Ant (LFA) is on Maui's front burner. LFA is easily one of the world's worst invasive ants. One concern is that cats, dogs and other domestic and wild animals in West Africa, some Pacific islands, and Hawai'i Island have suffered partial blindness

Mr. Glenn M. Yasui
April 15, 2010
Page 2

from corneal clouding due to LFA stings of their eyes. LFA has already been in the State for over a decade, and a small population suddenly turned up in Waihe'e, Maui, last September. That population may be nearly eradicated but we're determined to keep up early detection efforts to do what we can to avoid a repeat of what is happening on Hawai'i Island.

From its discovery in the state in a single nursery near Hilo in 1999, LFA has spread gradually in the Hilo-Puna area to cover an immense area. Once small LFA populations are now coalescing throughout Hilo, much as is also happening with coqui frogs. Maui can avoid that fate (as it is in the process of doing with coqui frogs) if it can get indispensable help from state government. Hawai'i Department of Agriculture's Plant Pest Control branch is taking leadership, but has been handicapped by the fact that both of Maui's staff were laid off late last year.

Fortunately, though not easily eradicated, LFA is more susceptible to eradication efforts than many insect pests because queens do not fly and move on the ground only several dozen to several hundred meters per year. It is conceivable that we may need to seek help from the transportation sector in the future if the situation should take a negative turn, for example if a population is discovered in a source area for road-building materials. In the meantime, members of the MCA are working together to combat LFA and encourage awareness and reporting of suspected sightings from the public.

The MCA looks forward to interacting positively with HDOT as this Strategic Plan is implemented. Please let us know how we may be of assistance. I can be contacted at (808)270-8299 or Kuhea.Paracuelles@mauicounty.gov.

Sincerely,



KŪHEA PARACUELLES
Chairperson, Maui Conservation Alliance



United States
Department of
Agriculture

Forest
Service

Pacific
Southwest
Region

Regional Office, R5
1323 Club Drive
Vallejo, CA 94592
(707) 562-8737 Voice
(707) 562-9240 Text (TDD)

File Code: 3400

Date: April 22, 2010

Jamie Ho
Acting Highways Administrator
Hawaii Department of Transportation
869 Punchbowl St, Room 513
Honolulu, HI 96813

Dear Ms. Ho,

I would like to take this opportunity to applaud the Hawaii Department of Transportation on their leadership in preparing a strategic plan for invasive species management along Hawaii's highways. Invasive species pose one of the greatest threats to the economy, environment and quality of life in Hawaii. A proactive plan to control invasive species along major corridors, such as highways, is a critical part of the on-going interagency coordinated effort to manage invasive species in our islands and to prevent their spread. The comprehensive invasive species management program that is outlined in the Statewide Noxious and Invasive Pest Program indicates a commitment to land stewardship by HDOT and these actions, when implemented, will help to support the state's biosecurity plan.

The USDA Forest Service provides technical assistance on forest health issues and works through our partners at the Department of Land and Natural Resources, Division of Forestry to provide financial assistance to manage invasive plants, insects and diseases on state and private lands in Hawaii. We look forward to future collaborations, through the Coordinating Group on Alien Pest Species (GCAPS) and other means, to protect Hawaii from the impacts of invasive species. If there is anything we can do to assist please contact Anne Marie LaRosa, our Forest Health Coordinator in Hilo, at (808) 933-8121 X 115 or alarosa@fs.fed.us.

Sincerely,

Anne Marie LaRosa
Forest Health Coordinator
Forest Health Protection, State and Private Forestry





April 16, 2010

Glenn M. Yasui
Highways Administrator
Hawai'i Department of Transportation
869 Punchbowl Street, Room 513
Honolulu, HI 96813

Dear Administrator Yasui:

The Maui Invasive Species Committee (MISC) is pleased to voice its support for the Hawai'i Department of Transportation's Statewide Noxious and Invasive Pest Program (SNIPP). Addressing the potential movement of harmful invasive species via our state highways and adjacent rights of way must be an important component of the state's comprehensive strategy on invasive species. This visionary yet highly detailed and comprehensive plan is a model for other state agencies in addressing the problems caused by invasive species. The mandate to address invasive species is clear for Departments such as Land and Natural Resources, and Agriculture, but perhaps less obvious for others, even though they are statutorily established members of the Hawai'i Invasive Species Council. If the SNIPP plan is implemented, and we sincerely hope it is, the Hawai'i Department of Transportation will have assumed a leadership role among the state's agencies in combating invasive species.

The plan is logically focused on the core areas established by the HISC. The goals and objectives are specific and meaningful and the plan does an excellent job of justifying both the need for action and proposing measurable actions. It is an ambitious plan, but one well worth pursuing.

MISC looks forward to working collaboratively with HDOT to achieve the specific goals set forth in the document, especially in the areas of Early Detection & Rapid Response, Control & Management, and Organizational Collaboration. We already have an excellent working relationship with HDOT via the Working Group structure of HISC and expect to further strengthen that partnership via this plan.

Sincerely,


Teya M. Penniman, Esq.
Manager

2012-2022
Statewide Noxious Invasive Pest Program (SNIPP)
Strategic Plan

Issued by
State of Hawai'i
Department of Transportation
Highways Division



Product of
Statewide Noxious Invasive Pest Program (SNIPP)
HDOT Project Manager: Chris Dacus

Prepared by
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Photo by Jaap Eijzenga/SWCA