What's at Risk?

Tourism

Watersheds

Native species

Horticulture

Agriculture

Our health and lifestyle

Hawaii Interagency Biosecurity Plan

2017–2027

Cover images: watershed, agriculture, horticulture, and our health and lifestyle photographs from Forest and Kim Starr; tourism photograph from Hawaii Division of Aquatic Resources, and native species from Dan Clark, U.S. Fish and Wildlife Service.

Hawaii Interagency Biosecurity Plan 2017–2027

Executive Summary

Hawaii's Interagency Biosecurity Plan

is a coordinated path forward to increase support for local agriculture, protection for our environment, and safeguards for the health and lifestyle of Hawaii's people.

Biosecurity is the set of measures taken to manage the risk from invasive species to the economy, environment, and health and lifestyle of the people.

THREATS

Red Imported Fire Ants are predicted to cost Hawaii **$211 million** per year.

The brown tree snake could cause upward of **$2.14 billion** per year in economic damages.

AN INCLUSIVE PLANNING PROCESS

Identify Biosecurity gaps & best practices → Agency Guidance → Private Industry Input → Agency Review → Public Review → **Final Interagency Biosecurity Plan**

BIOSECURITY IN 2016: Where are we now?

Hawaii's biosecurity comprises many components and is the work of multiple state, federal, and county agencies and partners. Although the Hawaii Department of Agriculture (HDOA) is the only agency with a mandated biosecurity *program*, this biosecurity *plan* recognizes that HDOA is not alone in protecting Hawaii's agriculture, environment, and people from the impacts of invasive species. Key players in Hawaii's biosecurity also include the Hawaii Department of Land and Natural Resources (DLNR), Hawaii Department of Health (DOH), and University of Hawaii (UH).

HDOA regulates domestic import, border inspections, postborder detection, and control of agricultural pests. **Gaps:** lack of data management technology and inspection facilities, not fully equipped biocontrol lab, restrictions on types of commodities inspected, and insufficient staff. (http://hdoa.hawaii.gov)

DLNR detects and controls invasive species in natural areas, controls invasive algae, and regulates ballast water. **Gaps:** lack of authority to regulate invasive organisms attached to ship hulls and lack of capacity to detect and control invasive algae, weeds, and predators in our waters and forests. (http://dlnr.hawaii.gov)

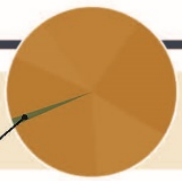
DOH regulates vectors of human diseases, including mosquitoes. **Gaps:** operating at 60% of the capacity needed to fight diseases such as dengue, Zika, and chikungunya. (http://health.hawaii.gov)

UH assists farmers and landowners with pest management through its cooperative extension services, Invasive Species Committees, and Watershed Partnership that control invasive species statewide. **Gaps:** lack of stable funding for agricultural and invasive species programs. (http://hawaii.edu)

Private industry and the public provide expertise to shape policies and are critical in ensuring that best management practices are followed. Farmers, nursery growers, ranchers, members of the airline and shipping industries, and the general public are important biosecurity partners. **Industry gaps:** insufficient infrastructure for handling inspected cargo; lack of a forum for engaging industry in decision making; and insufficient outreach and assistance to farmers, growers, and the public.

Federal agencies such as U.S. Department of Agriculture, U.S. Customs and Border Protection, and U.S. Fish and Wildlife Service play a key role in Hawaii's biosecurity. They regulate foreign imports and provide technical and funding support to state and private landowners to manage invasive species.

HDOA and DLNR, the two primary state agencies responsible for biosecurity, received less than 0.4% and 1%, respectively, of the $13.7 billion state operating budget in FY 16–17.

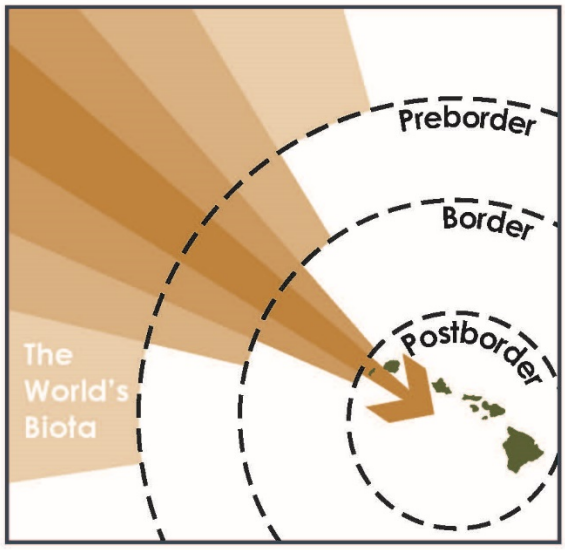


BIOSECURITY IN 2027: Where are we headed?

Effective biosecurity requires a comprehensive approach that includes:

- **Pre-border** policies and processes to prevent invasive species from making their way to Hawaii
- **Border** policies and processes that support inspecting incoming items to ensure minimal risk of pest entry into the state
- **Post-border** policies and processes that support detecting and responding to new incursions of invasive species and controlling established invasive species wherever possible

This plan addresses Hawaii's most critical biosecurity gaps and provides a coordinated, interagency path to a more secure future. It identifies more than 100 policy, process, and infrastructure actions that Hawaii's state, federal, and county agencies and partners can take. The following 10 highlights are key to the success of this plan:



Off-shore compliance: Agreements with other jurisdictions to adopt preshipping inspection and control policies

E-manifest and intelligence gathering: New technology to track what is coming in, what is high risk, and what is low risk (for faster release)

Inspection facilities: Well-lit, secure containment areas for inspection, quarantine, treatment, and pest destruction capabilities, and refrigerated areas for produce

Inspection of nonagricultural items: Provide HDOA the authority and staff to inspect high-risk nonagricultural items

Emergency response capacity: Interagency plans, protocols, and funding in place for timely and effective response to new pest incursions

Better coordination and participation by industries: Expansion of the Hawaii Invasive Species Council (http://hisc.hawaii.gov) into the Invasive Species Authority to provide industry a seat at the table and better interagency coordination to monitor, detect, and control invasive species

Renewed focus on human health: A fully restored DOH Vector Control Branch to detect vectors of dengue, Zika, and more

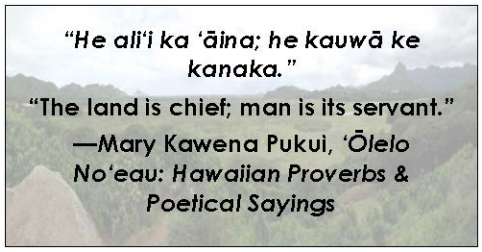
Enhanced control of established pests: Adequate field staff at HDOA, DLNR, DOH, and UH to control established invasive species, improved laboratories to support effective biocontrol

Minimized interisland spread: Increased staff and inspections for interisland goods, support to local farms and nurseries through certification programs and import substitution programs

Engaged and supportive community: Targeted outreach to different stakeholder groups to increase awareness of and engagement in biosecurity programs

Our biosecurity vision is for Hawaii's people, visitors, economy, agriculture, and natural environment to be protected from the impacts of invasive species. Achieving this vision will require hard work, policy development, and financial commitment. This vision is achievable if we work together.

Acknowledgments



Traditionally, native Hawaiians firmly believe that land and ocean are one and that together they provide everything needed for man to survive. Therefore, it is our kuleana (responsibility) to steward the land so that it may provide the necessary resources for generations to come. We would like to start by first acknowledging our kupuna (ancestors), who were the original land stewards and who helped to lay the foundation, teaching us by example to malama (care for) all that sustains life.

We also acknowledge the current land stewards who work tirelessly to continue the work of those who came before us. This group, represented by the many hands in agriculture, ranching, aquaculture, and nurseries and by conservationists throughout the state, is committed to protecting the natural and cultural resources that sustain their industries and our local water and food sources. As a community, we must support these industries and protect them from the harmful effects of invasive species. We believe that the Hawaii Interagency Biosecurity Plan is a necessary tool to support these industries.

This plan was conscientiously developed through extensive participation from members of the public and private sectors and the larger community. They provided invaluable input during development of the Hawaii Interagency Biosecurity Plan. We would like to acknowledge the following public and private sector agencies and organizations that participated in the stakeholder workshops.

Able Freight
Animal Health International
Big Island Invasive Species Committee
Bishop Museum
Commodity Forwarders, Inc.
Coordinating Group on Alien Pest Species
Haleakala Ranch
Hawaii Agriculture Research Center
Hawaiian Air Cargo
Hawaii Cattlemen's Council, Inc.
Hawaii County Research and Development
Hawaii Department of Agriculture
Hawaii Department of Health
Hawaii Department of Land and Natural Resources
Hawaii Department of Transportation
Hawaii Farm Bureau
Hawaii Volcanoes National Park
Hawaii Watershed Partnerships
Kauai Coffee
Kauai Invasive Species Committee
Kona Pacific Farmers Cooperative
Landscape Industry Council of Hawaii
Maui County Council
Maui Invasive Species Committee
Molokai Invasive Species Committee
Naval Facilities Engineering Command Pacific
Oahu Invasive Species Committee
Office of Hawaiian Affairs
The Nature Conservancy
U.S. Department of Agriculture
U.S. Fish and Wildlife Service
U.S. Forest Service
U.S. Geological Survey
University of Hawaii, College of Tropical Agriculture and Human Resources
University of Hawaii, Komohana Research and Extension Center
University of Hawaii, Pacific Cooperative Studies Unit
Young Brothers

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Appendices

Project Team

Hawaii Department of Agriculture

Micah Munekata, M.A., Legislative Coordinator, Office of Chairperson
Darcy Oishi, B.A., Biological Control Section Chief
Jonathan Ho, B.S., Acting Inspection & Compliance Section Chief, Plant Quarantine Branch
Raquel Wong, Ph.D., Administrator, Animal Industry Division

Hawaii Department of Land and Natural Resources

Joshua Atwood, Ph.D., Program Supervisor, Hawaii Invasive Species Council

H. T. Harvey & Associates

Sharon Kramer, Ph.D., Principal/Senior Fish Ecologist
Paul Conry, M.S., Senior Associate/Wildlife Ecologist
Shahin Ansari, Ph.D., Senior Plant Ecologist/Invasive Species Specialist
Lloyd Loope, Ph.D., Senior Advisor/Invasive Species Ecology and Management
Melissa Miyashiro, J.D., Environmental Lawyer
Gregory Spencer, B.S., Senior Wildlife Ecologist
James Merk, M.A., Senior Technical Editor
Joy DeBruyn, B.S., Administrative Assistant
Maureen Marcotte, Administrative Assistant

Kuiwalu, LLC

Dawn Chang, Esq., J.D., Principal/Experienced Facilitator
Shirlyn Hookano, Project Coordinator
Kanani Kealalio, Administrative & Compliance Officer

Richard Hill & Associates

Richard Hill, Ph.D., Principal/Biosecurity Subject Matter Expert

List of Abbreviations

Abbreviation	Definition
AG	Hawaii Department of the Attorney General
AI	Animal Industry [Division]
AIS	Aquatic Invasive Species
APHIS	Animal and Plant Health Inspection Service
ARS	Agricultural Research Service
BorPol	Border Policy
BorPro	Border Process
BorTifs	Border Technology, Infrastructure, Funding, and Staffing
CBP	U.S. Customs and Border Protection
CDC	U.S. Centers for Disease Control and Prevention
CDFA	California Department of Food and Agriculture
CES	Cooperative Extension Services
CGAPS	Coordinating Group on Alien Pest Species
CIP	Capital Improvement Project
CTAHR	College of Tropical Agriculture and Human Resources
DAR	Hawaii Division of Aquatic Resources
DBEDT	Hawaii Department of Business, Economic Development and Tourism
DHS	U.S. Department of Homeland Security
DLNR	Hawaii Department of Land and Natural Resources
DOD	U.S. Department of Defense
DOE	Hawaii Department of Education
DOFAW	Hawaii Division of Forestry and Wildlife
DOH	Hawaii Department of Health
Emanifest	electronic manifest
Emanifesting	electronic manifesting
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ES/EF	Existing Staff or Existing Funds
FAS	Foreign Agricultural Service
FDACS	Florida Department of Agriculture and Consumer Services
FY	Fiscal Year
HAL	Hawaii Ant Lab

Abbreviation	Definition
HAR	Hawaii Administrative Rules
HDOA	Hawaii Department of Agriculture
HDOT	Hawaii Department of Transportation
HEPA	Hawaii Environmental Policy Act
HIBP	Hawaii Interagency Biosecurity Plan
HI-EMA	Hawaii Emergency Management Agency
HISC	Hawaii Invasive Species Council
HRS	Hawaii Revised Statutes
HTA	Hawaii Tourism Authority
IPPC	International Plant Protection Convention
ISC	Invasive Species Committee
MOA	Memoranda of Agreement
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NGO	Nongovernmental Organization
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
OEQC	Office of Environmental Quality Control
OIA	Office of Insular Affairs
OIE	The World Organization for Animal Health
PBARC	Pacific Basin Agricultural Research Center
PCSU	Pacific Cooperative Studies Unit
PI	Plant Industry [Division]
PIERC	Pacific Island Ecosystems Research Center
PosPol	Postborder Policy
PosPro	Postborder Process
PosTifs	Postborder Technology, Infrastructure, Funding, and Staffing
PPC	Plant Pest Control [Branch]
PPQ	Plant Protection and Quarantine [program]
PQ	Plant Quarantine [Branch]
PrePol	Preborder Policy
PrePro	Preborder Process
PreTifs	Preborder Technology, Infrastructure, Funding, and Staffing
PwsPol	Public Awareness and Support Policy
PwsPro	Public Awareness and Support Process

Abbreviation	Definition
PwsTifs	Public Awareness and Support Technology, Infrastructure, Funding, and Staffing
RCUH	Research Corporation of the University of Hawaii
UH	University of Hawaii
U.S.	United States
USC	United States Code
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Definition of Key Terms

Term	Definition
Aquatic invasive species	A nonindigenous aquatic species that, if introduced into an ecosystem, may cause harm to Hawaii's economy, environment, human health, or public safety and welfare.
Biosecurity	The set of measures taken to manage the risk from invasive species to the economy, environment, and health and lifestyle of the people.
Border	Encompasses all the policies, protocols, and processes put in place to detect and respond to the arrival of an invasive species at the ports of entry (into the state) or at the regulated place of entry (into the state). The border is the area bounded either by the inspection areas (inside the walls or inside the fence) at ports of entry from mainland or foreign countries or by the extent of regulations governing importation from mainland or foreign countries. It is a very confined physical area/area of responsibility. Anything that is not covered by import regulations or is found outside the physical boundary of the port is "postborder." "Border" would include facilities that are mandated (by border regulations) to deal with goods as if they are at the border, including off-site inspection facilities, containment facilities, plant quarantine facilities. "Border" is about facilities, regulations and inspection.
Foreign animal disease	An important transmissible livestock or poultry disease believed to be absent from the United States and its territories that has a potential significant health or economic impact. Diseases may be emerging diseases or internationally recognized diseases that are endemic in countries outside the United States.
Interception	The finding of a pest associated with a commodity or a shipping container. A single commodity infested with various species of insects is a single interception, but after it is determined to have multiple species, each species is associated with the interception on which it was originally found. If three different species of insects are found in the shipment, then it is logged as three interceptions. There may be one or many individuals of each of the three species, but they are logged as only three interceptions. These three insect species may be on the same commodity or on different commodities in the same shipment. If the same insect species are found in a different shipment on the same day, they are regarded as three separate interceptions.[i]
Invasive species	An alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health. This is the federal definition of invasive species from Executive Order 13112. Invasive species is a nonregulatory term, and the state has several regulatory designations that are related to but not synonymous with the term, including pest, noxious weed, and injurious wildlife.
Pacific Regional States and Countries	For aquatic invasive species ballast water and hull fouling coordination, Pacific regional states and countries include Alaska, Washington, Oregon, California, Australia, and New Zealand.
Pathway	The means by which an invasive species is transported from one location to another. Movement of species can be via natural pathways, which include wind, water, or attachment to animals, or via pathways enhanced or created by human activity.[ii] Movement of species via human-made pathways can be unintentional (e.g., associated with the importation of fruits

Term	Definition
	and vegetables) and intentional (i.e., the result of deliberate actions to translocate organisms).
Pest	As defined by Hawaii Revised Statutes Chapter 150A, "any animal, insect, disease agent or other organism in any stage of development that is detrimental or potentially harmful to agriculture, or horticulture, or animal or public health, or natural resources including native biota or has an adverse effect on the environment."
Postborder	The area that a pest is found in once it has passed the point or opportunity of border inspection, whether it was or was not detected. Postborder encompasses all the policies, protocols, and processes put in place to eradicate or control an invasive species beyond the ports of entry and inspection process. The issue of interisland biosecurity and transport of species within an island is covered under the theme of postborder security.
Preborder	Encompasses all the policies, processes, and protocols put in place to prevent entry of an invasive species into Hawaii.
Risk	Is discussed in several places in this document in the following contexts: pest risk analysis; pest risk assessment; biosecurity risk; or high-risk pest, species, taxa, commodity, or pathway. Simply put, risk is the chance of an adverse event happening and the consequences if it happens. Risk analysis is a systematic way of gathering, evaluating, and recording information leading to recommendations for a position or action in response to an identified hazard. Pest risk analysis is a form of risk analysis conducted by regulatory plant health authorities like the various countries' national plant protection organizations, U.S. Department of Agriculture Animal and Plant Health Inspection Service, and the International Plant Protection Convention (IPPC) as a systematical approach to decide whether a pest should be allowed to enter (a country, region, or state) or managed using legislation. Pest risk analyses identify appropriate phytosanitary measures to protect plants against new or emerging pests.[iii] IPPC defines Pest risk analysis as "the process of evaluating biological or other scientific and economic evidence to determine whether a pest should be regulated and the strength of any phytosanitary measures to be taken against it."[iv] IPPC's Pest risk analysis is a formal three-step process that involves: 1. hazard identification (what is the adverse event that we are afraid will happen?), 2. risk assessment (what information is available, what is the quality and quantity of information, what is the probability, and what is the magnitude of consequences?), and 3. risk management (what can be done to eliminate the hazard, how feasible and effective are the options, what impacts do the options have, and what is the level or type of uncertainty?). Hawaii Department of Agriculture (HDOA) in general follows the widely accepted science-based international guidelines on risk analysis. There is no state policy that mandates HDOA to adopt a specific pest risk analysis framework. For example, the Kahului Airport Risk Assessment[v] adopted the general guidelines for conducting pest risk assessments in the report titled, *Generic Non-Indigenous Pest Risk Assessment Process*.[vi] Data gathered by HDOA during its regular and heightened inspections relative to which pests are being intercepted, which commodities they are found in, what the port of origin of the commodities in which the pest was intercepted is, and so on are used to analyze the risk associated with an identified hazard, which

Term	Definition
	could be the pest itself, a particular commodity, or a pathway. Determination of whether a species, commodity, or pathway is of high risk could be qualitative or quantitative.

[i] Hawaii Department of Agriculture. 2002. Kahului Airport Pest Risk Assessment. November. Plant Quarantine Branch, Honolulu, Hawaii.

[ii] National Invasive Species Council. 2008. 2008–2012 National Invasive Species Management Plan. August.

[iii] International Plant Protection Convention. n.d. Pest Risk Analysis (PRA) Training [PowerPoint presentation]; International Plant Protection Convention. n.d. Risk Analysis: Fundamentals and Application [PowerPoint presentation]. Prepared by R. L. Griffin.

[iv] U.S. Department of Agriculture, Hawaii Department of Agriculture, Hawaii Invasive Species Council, and Coordinating Group on Alien Pest Species. 2013. State of Hawaii Collaborative Plant Health Emergency Response Plan (PHERP) and Reference Manual. Year 1 Final Version. December 30.

[v] Hawaii Department of Agriculture. 2002. Kahului Airport Pest Risk Assessment. November. Plant Quarantine Branch, Honolulu, Hawaii.

[vi] Orr, R. L., S. D. Cohen, and R. L. Griffin. 1993. Generic Non-Indigenous Pest Risk Assessment Process. U.S. Department of Agriculture, Washington, D.C.

Section 1.0 Vision

Hawaii's people, visitors, economy, agriculture, and natural environment are protected from the impacts of invasive species.

With strong leadership across all partner agencies, legislative support, and a commitment to fund the implementation tasks identified in this Hawaii Interagency Biosecurity Plan (HIBP), biosecurity by 2027 is envisioned to contribute to a wide range of positive outcomes for Hawaii's economy, its environment, and the health and lifestyle of its people. We will know biosecurity is working when:

1. Farmers, ranchers, aquaculturists, and plant nursery growers experience reduced risk to production, broaden local and export markets, and receive effective support to detect and control pests.
2. Commodities shipped to Hawaii are cleaner, with less pest contamination, because agreements with other state, federal, and international authorities have produced better prevention strategies, such as offshore screening and certification of commodities.
3. Border inspection of higher-risk items is more efficient and lower-risk items are released more quickly because the Hawaii Department of Agriculture (HDOA) uses state-of-the-art data management systems, electronic manifesting (emanifesting), and enhanced intelligence gathering.
4. The chance of pests entering Hawaii is reduced because HDOA has the authority to inspect nonagricultural commodities it determines to be of higher risk.
5. Hawaii's primary industries are more secure because an increase in HDOA staffing allows for increased border inspection; more data gathering to inform risk assessments; and increased postborder support to local agricultural, aquaculture, and landscape industries to manage risks from invasive species.
6. Inspection efficiency improves because HDOA has inspection facilities that are secured, well lit, and equipped with the tools to detect, contain, treat, and destroy infected materials.
7. Human diseases, such as dengue, Zika, and rat lungworm disease, pose a lower risk because the fully restored Vector Control Branch of the Hawaii Department of Health (DOH) is better able to detect vectors of disease before they become a human health hazard.
8. Aquatic Invasive Species (AIS) are less likely to arrive and spread by means of ballast water or by attaching to the hull of vessels because specific regulations and best management practices are in place to protect Hawaii's waters.
9. Invasive algae and other established AIS are effectively contained and controlled by applying improved control technologies and enhanced efforts to control and monitor their distribution.

10. HDOA's biocontrol program has adequate resources, including state-of-the-art biocontrol facilities, and is equipped to develop effective biocontrol for some of Hawaii's high-impact and widespread invasive species that are difficult to control through conventional methods.
11. Natural resources, including native biodiversity, are better protected on public and private lands because established invasive species are effectively controlled and reduced.
12. Incipient invasive species are detected and eradicated in a timely manner on public and private lands because the capacity for early detection and rapid response has increased.
13. Invasive species are less likely to spread from one island to another because multiple mechanisms are in place, such as monitoring for early detection, adequate rapid response capacity, keeping better records, increasing the number of inspections, and implementing interisland nursery certification and pest treatment programs.
14. Hawaii's residents take pride in our biosecurity system, recognize it as an essential service, are more knowledgeable about the islands' biosecurity system, and support and engage in activities that improve it.

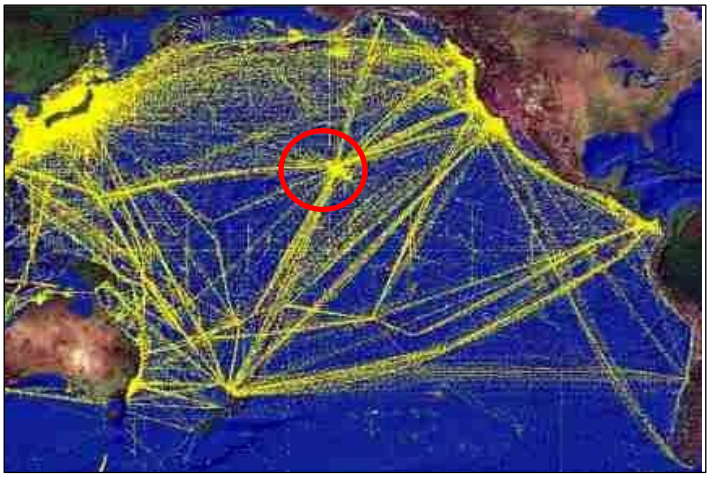
Expected Overall Changes:

1. Hawaii's unique biosecurity needs are addressed at the local, national, and international level.
2. Federal agencies recognize Hawaii's unique biosecurity challenges and take specific actions to implement more protective federal biosecurity program measures and assist with federal preemption issues.
3. Biosecurity is better understood as the shared responsibility of many agencies and partners coordinating their work on preborder, border, and postborder issues across multiple sectors.
4. Agencies are aligned with the biosecurity vision, they are fully committed to and accountable for delivering on their tasks, and efforts to manage invasive species from preborder to postborder are well coordinated and effective.
5. Hawaii's current and emerging biosecurity risks are better understood by private industry stakeholders and the public, and both of these groups are engaged in developing solutions to biosecurity threats to the islands
6. Agencies have the necessary policy, funding, expertise, and staffing to deliver on their biosecurity responsibilities.
7. State-of-the-art technology and infrastructure are available to protect Hawaii from the impact of invasive species.

Section 2.0 Introduction

2.1 Need for and Purpose of the Hawaii Interagency Biosecurity Plan

In 2001, the Hawaii legislature found that "the silent invasion of Hawaii by alien invasive species is the single greatest threat to Hawaii's economy, natural environment, and the health and lifestyle of Hawaii's people and visitors" (Senate Concurrent Resolution 45, H.D. 1 [2001]). Although many governmental organizations and Nongovernmental Organizations (NGOs) implement components of biosecurity through several invasive species management and research programs, Hawaii has not addressed its unique biosecurity needs in a coordinated and comprehensive manner. Three primary factors are highly relevant here: (1) Hawaii is extremely vulnerable to biological invasions; (2) the spectrum of dominant endemic/native plant species in Hawaii differs from that found in the rest of the United States; and (3) Hawaii imports more than 80% of all its goods and approximately 90% of its food (HDOT 1997, Lueng and Loke 2008).



Shipping routes (yellow lines) highlight that Hawaii (circled in red) is a major transportation hub in the Pacific. Incoming ships bring not only goods we depend on but also harmful pests from all over the world. Faster and larger means of transportation over the years have dramatically increased the rate of nonnative species reaching Hawaii. (Map credit: T Gilbert, World Meteorological Organization, and NOAA)

Hawaii's susceptibility to invasions is dramatically illustrated by the fact that nearly as many nonnative terrestrial arthropod species are established in Hawaii as in the other 49 states of the United States combined. How can this be possible, and why is it the case? A consultant's report to the U.S. Department of Agriculture (USDA) (McGregor 1973) recognized that innate characteristics of Hawaii seem to make agricultural quarantine more difficult: "[For insects and mites] in the period 1942–72 the rate of colonization per thousand square miles was 40 species, 500 times the rate of continental United States," in spite of a larger quarantine force in relation to volume of commerce. He speculated on possible reasons: "Although there is much greater diversity of crops and habitats within the continental United States, these are dispersed over a vastly larger land area. In Hawaii . . . the various habitats are more readily accessible from the principal port of entry. The more moderate and stable climate is also more favorable for an invading species than is the climate over much of the United States."

The U.S. Forest Service (USFS) (DeNitto et al. 2015) spent 4 years responding admirably to the Hawaii Division of Forestry and Wildlife's (DOFAW's) request to analyze the risk to 13 Hawaiian species/genera that dominate our ecosystems and provide habitat for the rest of Hawaii's biota, including most threatened and endangered species. The agency documented many threats to those species/genera from invasive species not yet present in

Hawaii. With the combination of such impending threats and the islands' extreme vulnerability to biological invasions (discussed above), Hawaii needs to actively pursue more protection from interstate and international threats.

Hawaii should protect itself much better than it currently does. It is common practice to import propagative plant material to Hawaii for finishing and resale because it is much cheaper than self-propagation. At the same time, importation of propagative plant material is recognized as one of the main pathways for the introduction of pests such as coqui frogs (*Eleutherodactylus coqui*), nettle caterpillar (*Darna pallivitta*), ohia rust (*Puccinai psidii*) and Rapid Ohia Death (*Ceratocystis fimbriata*) (Burnett and Coffman 2015, DeNitto et al. 2015, Rago and Sugano 2015). To mitigate the risk associated with importing propagative plant materials, HDOA could enhance import requirements by requiring phytosanitary certificates for host plants.

Agricultural inspectors examine imported cut flowers. Importation of plant material is one of the main pathways for the introduction of harmful pests and diseases. (Source: HDOA)

USDA's Animal and Plant Health Inspection Service (APHIS) and the U.S. Department of Homeland Security (DHS), Customs and Border Protection (CBP), are primarily responsible for intercepting pests from foreign points of origin. HDOA is the first line of defense against invasive species entering our state from domestic points of origin, and as discussed in Section 2.2, it is the only state agency mandated to implement a biosecurity program. However, the impact of invasive species in Hawaii is wide ranging, so in addition to HDOA, several federal, state, and county agencies and nonprofit organizations are working to prevent the entry of invasive species into Hawaii and the spread of these species in the state.

The following agencies and organizations are among those focused primarily on biosecurity issues in Hawaii:

The **Hawaii Department of Agriculture (HDOA)** is mandated to implement Hawaii's biosecurity program. The Plant Industry (PI) and Animal Industry (AI) Divisions are primarily involved in implementing this program. The PI Division plays an important role in inspecting cargo and passengers at all ports of entry for the importation of potentially harmful pests and regulates the importation and possession of nondomestic animals and microorganisms. Through its Plant Quarantine (PQ) Branch, Plant Pest Control (PPC) Branch, and Pesticides Branch, the PI Division also protects Hawaii's agricultural industries, natural resources, and the public from the entry and establishment of detrimental plants, animals, insects, weeds, plant diseases, and other pests. In addition, it ensures the safe and efficient use of pesticides in Hawaii. The PI

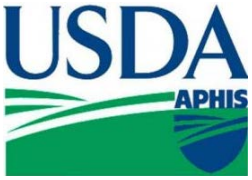
Division also promotes expansion of Hawaii's agriculture and horticulture by overcoming quarantine restrictions. The AI Division safeguards the state's livestock and poultry industries by controlling and preventing the entry and spread of livestock pests and diseases; operating the rabies quarantine program and the airport holding facility; conducting investigations into violations of animal quarantine or animal importation statutes; and providing veterinary laboratory support for diagnosing animal diseases.

The **Hawaii Department of Land and Natural Resources (DLNR)** is the state agency mandated to enhance, protect, conserve, and manage Hawaii's unique and limited natural, cultural, and historic resources held in public trust. DLNR, primarily through DOFAW and the Division of Aquatic Resources (DAR), administers various programs for the management of established invasive species in Hawaii's natural areas.

The **Hawaii Department of Health (DOH)** is the state agency with the mission to protect and improve the health and environment for all the people in Hawaii. DOH through its Vector Control Branch works with other state and federal partners to ensure that human diseases and vectors of those diseases do not become established in the islands.

The **University of Hawaii** (UH) supports biosecurity primarily through academic research and cooperative extension services. UH's College of Tropical Agriculture and Human Resources (CTAHR) Cooperative Extension Services (CES) is a partnership among federal, state, and local governments and has responsibility for providing science-based information and educational programs in agriculture, natural resources, and human resources. CTAHR CES programs address home and garden projects, commercial agriculture, natural resources, soils, and invasive species and pest control. Extension agents and specialists directly support local farmers, aquaculturists, floriculturists, and others with research, survey, detection, and management of pest infestations. CES programs also provide agricultural diagnostic services, which include insect identification; disease diagnosis; soil, plant, water, and feed analysis; and support of local production through sales of seeds of vegetable and fruit cultivars developed by the college.

UH's Pacific Cooperative Studies Unit (PCSU) also works cooperatively with private and state and federal land organizations, including The Nature Conservancy, Kamehameha Schools, and DLNR. Its projects range from finding ways to eradicate miconia (*Miconia calvescens*) and other alien invasive weeds to managing watersheds on Maui and Oahu. Often, PCSU works as an intermediary, allowing agencies to pool and coordinate their efforts so that they can attack problems such as invasive species across the landscape at an appropriate scale. For example, PCSU administers the various island-based Invasive Species Committees (ISCs) and the Hawaii Ant Lab (HAL), discussed below.



The mission of the **U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS),** is to promote and protect the health and value of American agriculture and natural resources. The broad mission involves managing wildlife damage; regulating genetically engineered organisms; and conducting plant and animal inspection, certification, diagnosis, research, regulation (foreign trade and nationally critical domestic quarantine), national control and eradication, and international representation and leadership. APHIS Plant Protection and Quarantine (PPQ) is the national plant protection organization member for the IPPC that establishes international standards for pest-free export, import, and shipment of materials (e.g., solid wood packaging standards were an IPPC initiative). APHIS's Veterinary Services represent U.S. interests at the World Organization for Animal Health (OIE), an organization that facilitates reporting of animal diseases; assists with execution of emergency exercises; and provides aid to poorer countries to prevent the spread of highly pathogenic animal diseases, such as avian influenza.

APHIS seeks nominations from states, counties, local groups, and individuals for plant genera to become Not Authorized Pending Pest Risk Analysis in order to reduce the pest risk of imported foreign plants. It networks with foreign offices to report pest information and reviews publications to identify emerging and encroaching pests and their new hosts. APHIS also works with the National Plant Board through various state pest regulatory agencies to:

- Ensure that international pest regulation standards are met, including criteria for individual states to retain actionable status locally even when pests are deregulated nationally or internationally
- Promote and train federal and state officers to support the system wide approach to nursery certification in order to reduce the number of pests transported during interstate trade
- Continue implementing best practices to address federal and state regulatory issues and concerns

PPQ works with each state to encourage adoption of a written plant emergency response plan. Along with other USDA operations, PPQ serves many of the Emergency Support Function #11 roles and functions regarding agriculture and natural resources to support state, local, and tribal authorities and other federal agency efforts.

Since 2003, 2,417 APHIS inspector positions, along with others, including port of entry positions, have been transferred into the DHS CBP to help enforce compliance of conveyances, foreign garbage, military and civilian movement (including preclearance of military equipment), and transit shipments with APHIS. CBP continues to collect data from these activities for analysis, pathway monitoring, and risk forecasting. A Memorandum of Understanding (MOU) between DHS CBP and APHIS explains the work agreement. APHIS operates the plant inspection stations, diagnoses CBP interceptions, and inspects most plant shipments. Shipments, conveyances (including containers), packing material, and foreign garbage that are found to have actionable pests or that otherwise fail to meet regulations are acted on according to the responsibilities of CBP and APHIS.

States in cooperation with PPQ perform postentry quarantine of certain plants at risk of carrying diseases and other pests that may become apparent later after entry. PPQ works with HDOA, other state partners, groups, industry, and universities to provide training, public awareness, programs to promote careers in agriculture, support for local farmers to expand markets and contain pests, and preparation and administration of farm bill funding. The federal pest survey program funds and participates in pest detection. Local trapping surveillance is done by PPQ at work locations and in tandem with state personnel as needed. Fruit fly trapping personnel survey a network of traps for early detection of exotic fruit flies not known to occur in Hawaii. Export certification provides a system of trade information and certification to export local goods to foreign countries, and PPQ aids farmers through HDOA in requests for approval of new commodities to U.S. mainland markets. The PPQ biological control permitting branch recognizes Hawaii's ecological uniqueness by requiring separate processes for approving biological control organisms for Hawaii and analysis of HDOA input.

The **U.S. Department of Agriculture (USDA), Agricultural Research Service, Pacific Basin Agricultural Research Center (PBARC),** in Hilo, Hawaii, has the mission of developing basic and applied information to strengthen agriculture in Hawaii and the Pacific Basin in an environmentally acceptable and sustainable manner, including demonstrating appropriate strategies for managing crop pests and providing economically viable technologies for controlling quarantine pests. PBARC entomologists and plant pathologists can assist in identifying, detecting, and mitigating invasive species. PBARC scientists also have expertise in quarantine treatments. The agency is making a major contribution to the response to Rapid Ohia Death.

The U.S. Department of Homeland Security (DHS), Customs and Border Protection (CBP), functions at the international ports of entry in Hawaii, screening and inspecting people and commodities for targeted pests in the United States. CBP enforces a wide range of biosecurity issues; it enforces mandates from other agencies, including APHIS, the Center for Disease Control (CDC), and the Food and Drug Administration, specifically addressing domestic and nondomestic animals, produce, plants and plant parts, animal products, and foreign garbage. CBP is responsible for air/sea/military passengers/cargo and air and sea conveyance entering the United States from foreign countries. It conducts inspections and retains information relating to the entry of passengers and cargo.

The **U.S. Department of Agriculture, Forest Service (USFS),** in Hawaii consists of the **Institute of Pacific Islands Forestry** (an institute devoted to biodiversity and forestry research) and the Pacific Southwest Region's State and Private Forestry programs. It is based at a facility in Hilo, Hawaii. Although USFS has no national forest land in Hawaii, it conducts research on Pacific island forest management and ecology and provides funding, technical advice, and training to Hawaii and other island forestry programs through its State and Private Forestry programs, such as Forest Health Protection and Forest Stewardship. It also supports a major biological control effort for seriously invasive weeds (including strawberry guava [*Psidium cattleianum*] and miconia) in Hawaii and assists state forestry programs addressing plant pests and pest plants by providing forest

health evaluations and funding in certain circumstances. USFS is heavily involved with the response to Rapid Ohia Death, caused by the pathogen *Ceratocystis fimbriata*.

The **U.S. Department of the Interior, Fish and Wildlife Service (USFWS)**, is responsible for protecting species federally listed as endangered, migratory birds, and national wildlife refuges, which in Hawaii are threatened primarily by biological invasions. USFWS Ecological Services maintains an Invasive Species Coordinator at the Pacific Islands Field Office in Honolulu and other Hawaii-based staff members who work on invasive species issues. National wildlife refuges in Hawaii support invasive species control programs as part of their overall habitat restoration activities. USFWS has played a tremendous role in keeping the brown tree snake (*Boiga irregularis*) out of Hawaii by working to keep eradication and detection efforts around the airport in Guam funded.

The USFWS Office of Law Enforcement administers the Lacey Act, which prohibits the importation and interstate movement of listed injurious species. USFWS is also responsible for monitoring the import, export, transport, sale, receipt, acquisition, or purchase of any fish or wildlife, including regulated wildlife products, or plant possessed, transported, or sold in violation of any law, treaty, or regulation of the United States, as well as interstate or foreign commerce of any fish or wildlife taken, possessed, transported, or sold in violation of any law or regulation of any state or foreign law, or plants in violation of any law or regulation of any state.

The **U.S. Department of the Interior, National Park Service (NPS),** manages nine parks in Hawaii, with protection of biodiversity as a primary goal. Major program components, especially of the larger parks—Hawaii Volcanoes National Park (323,000 acres) and Haleakala National Park (33,000 acres)—address invasive species issues within and outside park boundaries. NPS also has an Exotic Plant Management Team that focuses on the control of invasive species on Park Service Refuge properties in Hawaii and U.S. Territories and Possessions in the Tropical Pacific. NPS conducts, collaborates on, and financially supports research, management, and outreach related to invasive species both within and outside parks' terrestrial and marine boundaries.

The **U.S. Department of the Interior, Geological Survey (USGS), Pacific Island Ecosystems Research Center (PIERC)**, provides scientific leadership in support of national, regional, and local needs to understand, conserve, and manage natural resources in Hawaii and other Pacific island ecosystems. PIERC strives to help resource managers tackle current and emerging critical conservation issues, primarily issues related to invasive species.

The **Coordinating Group on Alien Pest Species (CGAPS)** is a statewide coalition of agencies and NGOs working together to protect Hawaii from invasive species. CGAPS was formed in 1995 to bring agencies and organizations together to close the gaps in Hawaii's invasive species programs in the areas of prevention, early detection/rapid response, and long-term control of harmful terrestrial species and AIS.

The **Hawaii Invasive Species Council (HISC)** was established in 2003 for the special purpose of providing policy-level direction, coordination, and planning among state departments, federal agencies, and international and local initiatives for the control and eradication of harmful invasive species infestations throughout the state and for preventing the introduction of other invasive species that may be potentially harmful. It is an interdepartmental collaboration composed of DLNR; DOH; HDOA; the Hawaii Department of Transportation (HDOT); the Hawaii Department of Business, Economic Development and Tourism (DBEDT); and UH.

Invasive Species Committees (ISCs) are island-based coalitions of government and nongovernment entities organized under UH's PCSU. They include the Kauai Invasive Species Committee, Oahu Invasive Species Committee, Maui Invasive Species Committee (MISC), Molokai Invasive Species Committee, and Big Island Invasive Species Committee. They provide early detection and rapid response programs to eradicate or contain newly detected invasive species before they become irreversibly established. The ISCs are well known for their strong public outreach and educate programs tailored to island issues and communities.

Hawaii Ant Lab (HAL) is a specialized invasive ant management unit attached to UH's PCSU. HAL's charter is to develop new ant treatment methodologies, assist affected businesses and residents, and take an operational lead in eradicating invasive ants on all Hawaii's islands. HAL's current focus is preventing the spread of little fire ants (*Wasmannia auropunctata*) and eradicating incipient populations as they are detected.

Hawaii Association of Watershed Partnerships are voluntary alliances of both public and private landowners committed to the common value of protecting forested watersheds for water recharge, conservation, and other ecosystem services through collaborative management. Controlling the introduction and spread of invasive species in Hawaii's watersheds is a core function of the Watershed Partnerships.

What's at Risk?

Hawaii's **agricultural production** totals **$680 million**[1] annually. The agricultural sector in Hawaii loses approximately **$300 million**[2] each year in revenue from **alien fruit fly infestations** alone. Another such pest could inflict similar losses.

The value of the **Koolau Mountain forest watershed** alone is estimated at **$14 billion**[3] in combined economic and ecosystem services. A disease like **Rapid Ohia Death** could wipe out Hawaii's ohia trees, which are a dominant component of our native forests, thereby affecting their capacity to recharge water.

Hawaii's annual **horticultural production** is estimated at **$69 million**[1]. The spread of pests, such as the **chrysanthemum white rust**, could result in further quarantine restrictions on exports and the in-state sale of locally produced flowers and foliage.

Visitors spend **$14.9 billion**[4] per year in Hawaii. The outbreak of a human-health disease, such as the **Zika virus**, or the introduction of a nuisance pest, such as biting midges (sandflies), could devastate Hawaii's **tourism economy**.

Little fire ant is estimated to cost **Hawaii County** alone **$174 million**[5] per year in management costs and economic damage to agriculture, nurseries, residents, and other sectors.

The economic cost of inaction is great, but the potential reduction in quality of life and the potential loss of cultural and environmental resources are unthinkable.

[1] Department of Business, Economic Development & Tourism. 2014. 2014 State of Hawaii Data Book. DBEDT webpage on research and economic analysis. <http://dbedt.hawaii.gov/economic/databook/db2014/>. Accessed July 20, 2016.

[2] U.S. Department of Agriculture. 2016. Hawaii Area Wide Fruit Fly Integrated Pest Management Program: A Model System. <https://www.ars.usda.gov/SP2UserFiles/Place/20400000/AreaWideBrochure.pdf>. Accessed August 5, 2016.

[3] Kaiser, B., N. Krause, D. Mecham, J. Wooley, and J. Roumasset. 1999. Environmental Valuation and the Hawaiian Economy. Draft. <http://www.uhero.hawaii.edu/assets/HawaiiEnviroEvaluation.pdf>. Accessed July 28, 2016.

[4] Hawaii Tourism Authority. 2014. 2014 Annual Visitor Research Report. Available on HTA website on annual visitor research and statistics. Prepared by D. Nahoopii, L. Liu, J. Chun, and M. Chun. <www.hawaiitourismauthority.org /research/reports/annual-visitor-research>. Accessed July 22, 2016.

[5] Motoki, M., D. J. Lee, C. Vanderwoude, S. T. Nakamoto, and P. S. Leung. 2013. A Bioeconomic Model of Little Fire Ant (*Wasmannia auropunctata*) in Hawaii. Technical Report No. 186. Pacific Cooperative Studies Unit, University of Hawaii, Honolulu.

The capacity of individual agencies and organizations to prevent and control invasive species is limited by their regulatory statutes, funds, staffing, expertise, and infrastructure. In spite of efforts by passionate professionals and dedicated staff members to share resources and work collaboratively, actions to solve invasive species problems in Hawaii are often delayed and inadequate, costing Hawaii taxpayers millions of dollars in otherwise preventable control work. Decades of experience with invasive species management and research in the islands, together with lessons learned from New Zealand and Australia (which already have comprehensive nationwide biosecurity systems in place), have highlighted the fact that biosecurity inherently requires the ongoing collaboration of multiple organizations working to protect agriculture, natural environment, and the health and lifestyle of the people. Lack of a cohesive interagency biosecurity plan with clearly mandated agency roles and responsibilities, and dedicated funding to effectively prevent the introduction and spread of invasive species has been identified as a critical programmatic gap in Hawaii's efforts (TNC and NRDC 1992, Warren 2006, HISC 2015).

HDOA has taken the lead to develop this HIBP, but this *plan* does not recreate or revise HDOA's existing biosecurity *program* delivered through its PQ Branch and described by Hawaii Revised Statutes Chapter 150A. This HIBP is a 10-year road map for implementing the infrastructure and capacity needed to support biosecurity *programs* at multiple agencies, including HDOA. A comprehensive perspective on biosecurity in Hawaii certainly includes the PQ Biosecurity Program, but it also recognizes the broader context of preborder, border, and postborder biosecurity measures collaboratively addressed by other federal, state, and county agencies, as well as the private industry and the public.

The goal of this HIBP is to ensure that existing and future biosecurity programs at multiple agencies are well supported, aligned to protect Hawaii from the impacts of invasive species, and effectively implemented by the respective organizations in a synergistic and coordinated manner.

2.2 HDOA Biosecurity Program

This section describes HDOA's current biosecurity program. Act 236 of the Session Laws of Hawaii 2008, created a Biosecurity Program in the HDOA to support the department's efforts in combating invasive species. The objectives of the Biosecurity Program are to (1) establish a multidimensional system to prevent the entry into the state and interisland movement of pests and prohibited or restricted organisms without a permit and (2) respond effectively to eradicate, control, reduce, and suppress incipient pest populations and established pests and seize and dispose of prohibited or restricted organisms without a permit. Actions identified in the statute include establishing preentry inspection programs, operating inspection facilities at ports of entry, controlling pests that have entered the state, providing greater collaboration regarding biosecurity among governmental agencies and industry, developing new tools to collect information on cargo being shipped, supporting local agricultural products to replace imports, and providing public outreach. The statute also established authority for HDOA to set and impose charges for inspection, quarantine, and eradication of pests, with the proceeds deposited into the pest inspection, quarantine, and eradication special fund.

Some of the challenges that HDOA faced in developing its Biosecurity Program were:

- more than 80% of all goods used in Hawaii are imported, and as long as people and cargo are imported, invasive species will be brought into the state through accidental transport;
- invasive species affect all aspects of society, including public health, agriculture, environment, and the economy;
- controlling and eradicating invasive species after establishment can be much more difficult and costly than prevention; and
- invasive species brought in on imported food products affects local agriculture and farmers.

High-volume on-time delivery of parcels and perishable goods coupled with the lack of adequate inspection areas makes inspection difficult at Hawaii's ports and harbors. (Source: HDOA)

To meet these challenges, HDOA developed a broad strategy that included a focus on preventing the movement of pests into the state and between islands, the early detection and rapid control of invasive species if they are introduced, and the control and eradication of those pests causing the greatest harm to the state and its resources. An important initiative of the Biosecurity Program is to promote and encourage local agriculture so as to reduce dependency on imports, which have the potential to introduce new invasive species. HDOA has been working on developing the following capacities for its biosecurity program (HDOA 2007, 2015):

- **Prevention**—inspections at ports of entry and development of origin certification programs for high-risk commodities
- **Diagnostics**—identification of invasive insects, plant pathogens, and weeds
- **Detection**—surveillance for the existence and location of an invasive species that have invaded or been introduced
- **Rapid response**—quick control measures to eliminate individual pest incursions (e.g., snakes), as well as incipient population of an invasive species

- **Monitoring**—surveys to track the presence and status of introduced invasive species over time and also evaluate efficacy of control programs
- **Biological sampling**—surveys to track the presence and status of species over time
- **Research and development**—development of scientific knowledge, methods, and technologies to prevent, detect, control, and monitor invasive species and assist in implementing learned technologies to control invasive species effects on agricultural production and native ecosystems
- **Education outreach**—actions taken to support public education programs
- **Partnerships and cooperative activities**—with stakeholders (agricultural industries, conservation groups, the transportation industry) and federal, state, county, and private partners
- **Information management**—storing and sharing data and databases
- **Quality control programs**—activities to measure levels of effectiveness
- **Quarantine treatment facilities**—facilities to conduct disinfestation treatments
- **Permitting**—issuing permits based on statutes, regulations, and prior board (Board of Agriculture) decisions
- **Compliance and enforcement**—program to compel compliance with quarantine laws and regulations
- **Import substitution and Hawaii export programs**—substitution of risky imports with locally produced products and promoting export of Hawaii-grown agricultural goods
- **Management of high-impact animal diseases**—activities to detect and minimize the impact of animal diseases
- **Pesticide regulation and use**—activities to regulate the manufacture, sale, and use of pesticides

Through its Biosecurity Program, HDOA collaborates with the Oregon Department of Agriculture to oversee the inspection of Christmas trees before they are shipped to Hawaii. This practice reduces the number of pests reaching Hawaii and facilitates border inspections. (Source: HDOA)

Some of the projects that have been developed and implemented by HDOA and partners under HDOA's biosecurity program include:

- **Pilot transitional inspection facilities**—a pilot program that demonstrated the usefulness and effectiveness of conducting inspections at an off-port site owned and operated by private produce distributors

- **Emanifesting pilot project**—to allow importers to send an electronic manifest (emanifest) of items being shipped to Hawaii in advance of arrival and enable HDOA to schedule inspections based on the commodity and the level of risk
- **Christmas tree inspection project**—increase in the duration of inspectors overseeing the project to establish best management practices and preshipment inspection protocols for Christmas trees shipped to Hawaii annually
- **Nursery certification and compliance project**—a pilot program for interisland shipments of commodities without inspection if the nursery follows best management practices to reduce risk or eliminate pest infestation
- **Survey, early detection, and rapid response projects**—survey, early detection, and rapid response for introduced pests and disease, including Rapid Ohia Death, little fire ant, coqui frog, and Africanized honey bee (*Apis mellifera scutellata*)
- **Control projects**—control via chemical, mechanical, or biological means of high-priority pests such as coqui frog, little fire ant, erythrina gall wasp (*Quadrastichus erythrinae* Kim), and fireweed (*Senecio madagascariensis*) to mitigate their impacts

In 2008, when the Biosecurity Program was implemented, HDOA had 147 positions and a budget of $10,019,000 for its PQ and PPC programs (SOH 2008). Over the past 8 years, the state has experienced the 2008 recession, a reduction in force, and elimination of vacant positions. The vital PQ and PPC programs were no exception and suffered a loss of 29 positions (26 permanent and three temporary positions): 13 in 2009 (SOH 2009) and another 16 in 2010 (SOH 2010). Since 2010, funding has increased with the establishment of inspection fees in the pest inspection, quarantine, and eradication special fund, and some positions have been restored. However, as of 2016, the PQ and PPC program budget has increased to $15,404,657, including $8,428,040 in special funds, but there are still only 121 permanent staff members—a net loss of 26 permanent staff positions from 2008. Over this same period, when HDOA's biosecurity program staff has decreased by 18%, tonnage of incoming air cargo has increased by 34% (1989–2013), and tonnage of cargo moving through Honolulu Harbor has increased by 21% (1988–2014) (DBEDT 2014).

Staff shortages can hinder HDOA's ability to provide systematic scrutiny of all high-risk pathways; spot-check of low-risk pathways; quarterly risk assessments; compliance agreements; rule changes; mitigation programs for the coqui frog, little fire ant, and nettle caterpillar; inspections of military and private jets and boats; interisland inspections; shared data management; nursery monitoring and assistance; monitoring ports for red imported fire ant (HDOA 2007); and additional needed actions, such as interdiction programs for the brown tree snake, canine detection programs, and investigation of violations of quarantine laws and regulations. Adding state staff capacity is essential if HDOA is expected to fully meet its obligations to protect Hawaii from invasive species. This HIBP identifies needed increases in staffing to accomplish these responsibilities, as well as additional implementation tasks identified in this plan. It also identifies the policy changes, resource increases, and

implementation tasks that should be undertaken by other agencies to support and complement the work done for HDOA's Biosecurity Program.

2.3 The Planning Process

As discussed above, components of biosecurity already exist in Hawaii. There is a great deal of literature related to pest risk assessments, invasion pathways, gap analysis and recommendations related to Hawaii's biosecurity measures, and administrative rules and regulations related to biosecurity. Therefore, the first step in the planning process was to conduct a thorough review of the literature pertaining to Hawaii's biosecurity. In addition, information on the well-known and well-established biosecurity systems of New Zealand and Australia, as well as those of other island jurisdictions, such as that for Galapagos Islands, was reviewed. A summary of the compiled literature on Hawaii's biosecurity gaps and recommendations was developed to provide the foundation and framework for this HIBP.

Invasive species affect the entire community. Thus, one of HDOA's most critical considerations during the development of this HIBP was to ensure that the community engagement process was extensive, inclusive, and comprehensive. This process included the following events:

- A **public (government) sector workshop** was organized to gather firsthand information about on-the-ground, procedural, regulatory, and funding challenges and opportunities from agencies such as HDOA, DLNR, APHIS, and HDOT that regulate or are deeply involved in biosecurity issues in Hawaii. The framework developed for this HIBP (and based on a summary of compiled literature on Hawaii biosecurity) was used to solicit input from the agency representatives during a 1-day-long professionally facilitated workshop.

During the planning process, a 1-day-long professionally facilitated workshop was held on April 14, 2016, to gather firsthand information from agencies and organizations involved in Hawaii's biosecurity. (Source: H. T. Harvey & Associates)

- **Private industry workshops and teleconferences** were organized to gather input from the private industry stakeholders, such as the farmers, ranchers, nursery growers, and freight forwarders who are likely to be directly affected by invasive species and biosecurity measures. The input gathered from

the public sector workshop was incorporated into the framework of the developing plan before input from the private industry stakeholders was solicited through two 2-day-long workshops organized in Honolulu and Hilo.

The public review process was organized in September and October 2016. The draft HIBP, which incorporated input received from the public and private-sector stakeholders, was thoroughly reviewed by the lead agencies implementing this plan. Following their approval and a briefing with pertinent legislators and the governor's office, the draft HIBP was released for public review on September 5, 2016. The draft HIBP was posted on HDOA's website and was available to the general public to download. The public comment period, which ran from September 5 through October 19, 2016, was announced with a public notice in the local newspaper. Written comments were solicited from the public and received by email and mail during the public review period. In addition, a series of statewide public meetings were organized during the public review period to provide all stakeholders, including the general public, with an opportunity to provide both verbal and written testimonies. Public comments were incorporated into the draft HIBP wherever appropriate to produce this final HIBP.

2.4 Biosecurity Plan Structure, Organization, and Implementation

To meet the biosecurity challenges facing the state and effectively address this complex problem, this HIBP is designed to be comprehensive in scope (e.g., preborder, border, postborder) and interagency in nature. The objectives and implementation tasks identified in this HIBP are consistent with the existing government agencies' and partner organizations' strategic plans to address invasive species issues. This HIBP is also structured to be consistent with the programs of the various county, state, and federal agencies responsible for providing biosecurity protection in the state and nation. It is organized to implement HDOA's and other state agencies' programs that focus on one or more of the following four program areas:

- Preborder (Pre)
- Border (Bor)
- Postborder (Pos)
- Public Awareness and Support (Pws)

The goals for each of these program areas serve as guideposts to manage new and existing biosecurity risks. Each strategic goal is associated with long-term objectives and shorter-term implementation tasks. Within each program area, the objectives and implementation tasks are grouped according to the type of action they involve:

- Policy Action (Pol)
- Process or Program Action (Pro)
- Technology, Infrastructure, Funding, or Staffing (Tifs)

Accordingly, the implementation tasks related to one issue sometimes are discussed separately depending on whether it is about policy, process, or resource (technology, infrastructure, funding, or staffing). For instance, to implement a new emanifest system to collect information on incoming imports for screening and inspection purposes (process action), will require a change in statutes and rules (policy action) to authorize HDOA to identify commodities to inspect, prescreen, and release electronically. This action will also require HDOA to secure funds for equipment and increase staffing (technology, infrastructure, funding and staffing action) to implement the emanifest system. Therefore, there are three implementation tasks regarding emanifest system: one policy related; one process related; and one related to technology, infrastructure, funding, and staffing. This HIBP identifies these separate types of actions needed under each program area (preborder, border, and postborder).

Objectives outline general ideas that contribute to achieving the goal over the medium and long term. Implementation tasks are specific actions that will need to be taken to achieve each objective. Each implementation task is associated with a timeline, funds needed, lead agency, partners, and a priority ranking. This HIBP addresses both terrestrial and aquatic biosecurity issues, which are often addressed together under an overarching objective. Sometimes, they are addressed under a specific terrestrial or aquatic objective.

The goals, objectives, and implementation tasks discussed in this HIBP are presented as follows:

Goal (Preborder, Border, or Postborder)

This section is not meant to provide *general* information on preborder, border, postborder, or public awareness and support efforts in Hawaii. Rather, it provides specific background information, mostly from the state's perspective, that is necessary to put the HIBP objectives in each program area in context with the need or gaps identified during the planning process.

Policy-Related Objectives (PrePol, BorPol, PosPol, or PwsPol)

Objective (PrePol1, BorPol1, PosPol1 or PwsPol1)						
PrePol1/BorPol1/PosPol1/PwsPol1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PrePol.1/BorPol1.1/PosPol1.1/PwsPol1.1						
PrePol1.2 …						

2.4.1 Plan Implementation

The HIBP is an interagency plan; however, the responsibility of executing the plan lies with the lead agencies (see Section 2.4.4) listed in the plan—largely, HDOA and DLNR and, to a lesser degree, DOH, UH, and the counties. Implementation of tasks is expected to depend on the availability of time and funds, regulatory mandates, and the institutional support and commitment of the agencies involved. As the HIBP is implemented over the next 10 years, it will be incumbent on these individual lead agencies to include biosecurity implementation tasks in their annual budgets submitted to the legislature for each upcoming fiscal year. The specific amount requested may differ from those presented in the plan because information or requirements may have changed over time. In this scenario, in the absence of one coordinating body, each lead agency is responsible for overseeing the execution of tasks on which they are the lead, successfully completing their tasks, and reporting annually on the implementation progress.

An alternate scenario, where one coordinating body would be responsible for HIBP oversight and reporting is the potential Hawaii Invasive Species Authority (HISA). One of the tasks in the HIBP, scheduled for 2017-2019, is to restructure the existing HISC as the Hawaii Invasive Species Authority (HISA), an autonomous interagency body to coordinate interagency biosecurity programs and policy initiatives, provide oversight and reporting on biosecurity program implementation, and administer a grant program to fill gaps in agencies and partners programs (also see Section 3.3, "Postborder"). If formation of HISA is successful, then it will provide interagency oversight for implementation of the HIBP. Individual agencies would still be responsible for implementing their action items, but HISA would assist where necessary and would track and report progress on the HIBP to the legislature and public annually. Rather than administratively being hosted by an agency (e.g., HISC being hosted by DLNR), HISA would function as an autonomous interagency body administratively attached to HDOA. Because HDOA has broad mandates regarding biosecurity, it would be the most appropriate agency to which HISA could be attached. However, it should be noted that all HDOA regulatory authorities and all HDOA special funds would remain under the control of HDOA. HISA's role would be that of a coordinating body similar to the existing HISC but, with ability to hire staff and additional board seats (voting members) representing agriculture, industry, conservation, and cultural perspectives.

2.4.2 Timeline

This HIBP is designed to be implemented over a period of 10 fiscal years, from July 2017 through June 2027 (Fiscal Year 2018 [FY2018] through FY2027). Work on implementation tasks may start as soon as January 2017, as staff and resources are available. The timeline includes the proposed start and completion dates for each implementation task in calendar years, beginning with 2017 for tasks that can be started immediately. Many tasks are envisioned to require new staffing or funding and are scheduled to be started at the beginning of a given fiscal year. The first fiscal year identified in the plan is FY2018 and is denoted as 2018 in the timeline.

2.4.3 Funding

This HIBP identifies the estimated amounts of funds needed to implement given tasks. The "Funds Needed" column identifies the total amount needed to implement a task over the duration identified in the "Timeline"

column. These estimates are based on the best information available when this HIBP was drafted. As mentioned above, over the next 10 years, it will be incumbent on the individual lead agencies to prepare specific funding requests for each upcoming fiscal year, and these amounts may differ from those presented here because information or requirements may change over time. The designation "ES/EF" (Existing Staff or Existing Funds) is used in this column when the task is intended to be performed by the lead agency or partnering organization staff members using existing staff and resources.

Appendix A presents additional details on the HIBP budget that, for purposes of brevity, are not included in the plan implementation task tables. These details include an explanation of how the funding was estimated, the type of funds (Capital Improvement Project [CIP] budget versus operating cost budget), subtotals for each implementation task for each fiscal biennium, total HIBP implementation cost, and the average annual costs. The HIBP does not identify the sources of funding, such as general funds, special funds, or federal funds but rather the general type of funds that could be used (i.e., funds from the CIP budget or operating cost budget).

2.4.4 Lead Agency

The "Lead Agency" column identifies which agency or organization is responsible for implementing, coordinating, and completing the task. Typically, a single entity is identified in this column. If two or more lead agencies are identified, these agencies will implement the same task simultaneously. Existing and/or new staff members budgeted for the lead agency are expected to implement that task. The lead agency is responsible for requesting the allocated funds for implementing a task from the legislature in its biennium budget.

2.4.5 Partnering Organization

The partnering organization identified in the "Partners" column can be another state or federal agency; UH; the county government; a private industry or landowner; or a quasi-government organization, such as CGAPS. Partnering organizations are expected to contribute to implementing that task with their existing staff and resources. Their contributions could include providing information, review of task products, approval of permits, access or use of their land, or support and advocacy during the legislative process.

2.4.6 Priority Ranking

Each lead agency prioritized the implementation tasks for which it is designated as the lead. In DLNR, DAR prioritized tasks pertaining to aquatic issues, and DOFAW prioritized tasks pertaining to terrestrial issues for which DLNR is the lead. The focus during prioritization was on the importance of the implementation task rather than the timeline and funding. Priority rankings are presented in the last column. The process of prioritization was subjective, based on the following criteria:

1 = critical for effective biosecurity
2 = strongly beneficial for effective biosecurity
3 = generally beneficial for effective biosecurity

In general, tasks that involve prevention activities, such as risk assessments, emergency response, and early detection and response, and those that involve increasing staff size to support core biosecurity functions are given a priority ranking of 1. When specific funding requests are prepared for each upcoming fiscal year, it is expected that agencies will select biosecurity tasks for inclusion in their budgets based on the HIBP timeline and the priority ranking allocated to the tasks.

Section 3.0 Goals, Objectives, and Implementation Tasks

3.1 Preborder

Goal: Prevent the Transport of Invasive Species to Hawaii

3.1.1 Background

Preventing invasive alien species from reaching Hawaii's borders is the most cost-effective strategy to manage threats from invasive species. The implementation tasks and objectives presented in this section are aligned to address the goal of preventing the entry of an invasive species into Hawaii.

Pests like red imported fire ant (*Solenopsis invicta*) can easily arrive in Hawaii via nonagricultural commodities, including packaging materials. However, HDOA does not have the authority to inspect nonagricultural commodities and will need to pursue legislative amendment to do so. (Source: HISC)

Federal agencies like APHIS, CBP, USFWS, the U.S. Coast Guard (USCG), and CDC and the two state biosecurity agencies of HDOA and DLNR primarily regulate or enforce regulation relative to the entry of organisms into Hawaii. From a regulatory viewpoint, the federal government is responsible for preventing foreign plant and animal diseases and pests from entering the United States. In general, state agencies are responsible for regulating domestic commodities originating elsewhere in the United States. In Hawaii, HDOA's inspection authority, with a few exceptions (quarantine periods, permits, and/or treatment for coffee, bromeliads, banana, grasses etc.), extends mostly to agricultural and high-risk materials coming from the continental United States. HDOA inspects for a range of organisms and can take action on those that are prohibited, those that are restricted, and also those not known to occur in Hawaii. Under the Plant Protection Act (7 United States Code [USC] Section 7701 et seq.), states are expressly prevented from regulating foreign commerce to control, eradicate, or prevent the introduction or dissemination of plant pests or noxious weeds (7 USC Section 7756[a]). The Plant Protection Act also preempts states from regulating domestic commerce if the federal government has already issued such a regulation for those purposes, unless the regulation is consistent with but does not exceed the federal regulation (7 USC Section 7756[b]). With a few exceptions, HDOA is prevented from inspecting foreign commerce or taking any quarantine action on foreign commerce at ports of entry. In certain instances, federal law also bans HDOA inspection of some domestic cargo (e.g., first-class mail). Therefore, federal inspectors in Hawaii have a critical role to prevent pests of foreign origin from entering the state (HDOA 2007, Loope and Kraus 2009, Rago and Sugano 2015). The state also can play a critical role by working with federal agencies on

solutions to federal preemption of state quarantine needs relative to the Plant Protection Act, determining whether insular areas such as Hawaii can obtain special recognition in the United States from a biosecurity perspective, and strengthening federal quarantine laws dealing with nonagricultural products.

USDA can take action on organisms that pose a documented threat to U.S. agriculture, forestry, or environment and those that are on lists of federally regulated organisms, such as the Federal Noxious Weed List. However, species that may not pose a risk to the temperate crops and forests of the continental United States could pose a risk in Hawaii's year-round optimal climate. In fact, many organisms that are of greatest risk to Hawaii, such as little fire ant, myoporum (naio) thrips (*Klambothrips myopori*), and nettle caterpillar, are not among the federally regulated organisms. Hawaii has unique biosecurity needs (see Section 2.0, "Introduction"):

- Hawaii is extremely vulnerable to biological invasions (McGregor 1973, HDOA 2002).
- The spectrum of dominant endemic/native plant species in Hawaii differs from that found in the rest of the United States and provides habitat for the rest of Hawaii's biota, including many endangered species and a largely endemic (found nowhere else in the world) biota (DeNitto et al. 2015).
- Hawaii imports more than 80% of all its goods and approximately 90% of its food (HDOT 1997, Lueng and Loke 2008).

To prevent the entry of invasive species via foreign pathways, Hawaii needs to continue to emphasize its unique biosecurity needs and receive better federal protection. A thorough analysis of international, federal, and state policy gaps with recommendations to close such loopholes is warranted (PrePol3). There are relatively new programs that allow states to petition for federal action on a state concern. HDOA should leverage such programs and work with APHIS to develop quarantine regulations specific to Hawaii. Whenever APHIS announces draft regulations on potential quarantines for proposed imports to the United States, HDOA should provide a response with information that supports the need for specific restrictions on such importation to Hawaii. However, HDOA has few resources to put together and track petition packages, and the scope of the state Attorney General (AG) office's role is so broad that focused response and active involvement with APHIS's commenting processes can be a challenge. A policy analyst housed in HDOA could help fill this gap (PreTifs2).

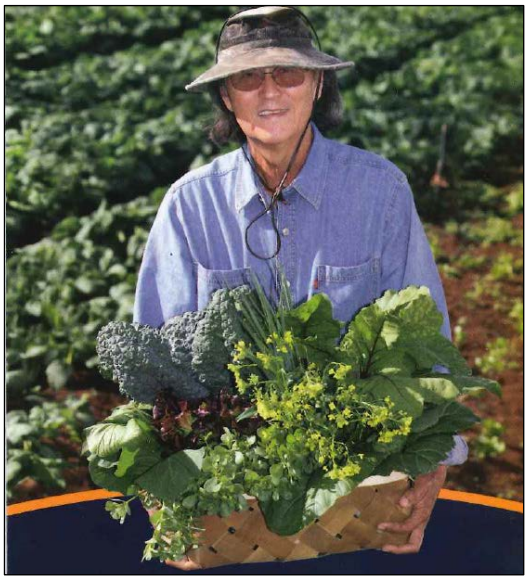
As mentioned above, HDOA's inspection authority extends largely to agricultural or high-risk materials (e.g. coffee, banana, grasses, bromeliads) coming from the continental United States. However, nonagricultural commodities and packaging material have been identified as important pathways for the entry of invasive species into Hawaii (DeNitto et al. 2015, USN 2015). Intercepting pests entering the state via these pathways would require legislative amendments that give HDOA the authority to inspect and quarantine high-risk nonagricultural commodities (PrePol2).

Preventing pests from entering Hawaii will require not only more comprehensive and cohesive authorities but also available technology and processes to improve efficiency. More than 80% of all goods used in Hawaii are

imported (HDOA 2007). Inspecting all imports is impossible, but risk assessment would allow HDOA to determine which commodities and pathways pose a higher risk for the entry of pests (PreProl, PreTifs2). The HDOA PQ Branch maintains a database called INVICTA to record inspection, permitting, and pest reporting activities. This type of database is an essential tool for storing information and is used extensively to determine the effectiveness of operations and analyze the risks associated with pathways and commodities (HDOA 2015). However, this database lacks the ability to perform other important HDOA functions, such as house important taxonomic data and communicate with other databases. An important feature of emanifest was integrated into this database system but was not fully implemented because of the associated costs.

Implementing an emanifest system would allow importers to send relevant information about the shipment (e.g., what is being shipped, where the shipment originated) to HDOA before the commodities arrive. This system will allow HDOA to schedule inspections based on the risk of the arriving commodities; release low-risk commodities electronically, thereby allowing for more efficient use of the limited workforce; and in general help prevent the arrival of unwanted organisms in Hawaii. HDOA is in critical need of a regulatory framework, processes, and technology to launch a sophisticated biosecurity database that can support an emanifest system, allow for efficient data gathering and sharing, and facilitate risk assessments and a full-time staff member to support this key component for biosecurity (PrePol2, PrePro1, PreTifs1, PreTifs2).

Invasive species that are affecting Hawaii forestry and agriculture, such as little fire ant, nettle caterpillar, ohia rust, and the fungus strain causing Rapid Ohia Death, likely arrived via plants. The import of plants for landscaping, sale or propagation, cut flowers, and foliage is considered a high-risk pathway for pests (Loope and Uchida 2012, DeNitto et al. 2015). HDOA is dedicated to enhance Hawaii's economy by promoting local agriculture, aquaculture, and landscape industries and by minimizing the impacts of invasive species. Key strategies identified during the planning process to protect these industries include requiring agreements for imported high-risk plant products to have phytosanitary certificates (PrePol2), reducing the importation of plant and animal species that are already available in Hawaii and boosting their local propagation or production, and substituting the importation of invasive plant and animal species with local production of noninvasive alternatives (PrePro2, PreTifs2).



Boosting the production of locally grown food is a key biosecurity strategy to reduce dependence on imported produce and therefore minimize the risk of pests entering Hawaii via this pathway. (Source: HDOA)

Another important strategy to prevent pests from entering Hawaii is to move the greatest incursion risks as far offshore as possible and require, where possible, offshore inspection, treatment (with certification), or other actions. APHIS does this by collaborating with foreign partners to control pests and diseases before they can

enter the transport system. For example, APHIS Wildlife Services in Guam takes numerous measures, such trapping and using trained snake-detector dogs in cargo, to keep brown tree snakes from reaching Hawaii and other destinations. Hawaii has also taken this approach when screening Christmas trees. Before they are shipped to Hawaii, Christmas trees and wreaths are inspected and reconditioned (mostly through mechanical shaking) in Oregon by the Oregon Department of Agriculture (HDOA 2015). This approach has significantly reduced the number of pests that arrive through this pathway. More goods being exported to Hawaii can be inspected offshore at transitional facilities owned and operated by private industries that meet Hawaii-specific standards for the building structure, as well as for screening protocols (PrePol2, PrePro1, PrePro4).

The illegal importation of regulated plants and animals remains an important pathway for pests entering Hawaii (HISC 2014, Rago and Sugano 2015, USN 2015). For example, seeds of plants that are restricted or prohibited in Hawaii can be purchased online and shipped here, without properly labeling the parcel or presenting the material to HDOA for inspection. Gathering information and working with online plant nurseries and pet stores so they understand Hawaii's biosecurity needs would reduce the illegal importation of plants and animals and their associated pests into Hawaii (PrePro3).

Ballast water is a high-risk pathway for the entry of Aquatic Invasive Species into Hawaii. Current regulations regarding exchange of ballast water and processes to report and document it do not provide adequate biosecurity protection for Hawaii. (Source: CGAPS)

In general, Hawaii does not have the authority to inspect or quarantine commodities transported by the U.S. Department of Defense (DOD) from foreign ports to the islands. DOD is also exempt from the state's ballast water rules. However, DOD is a large stakeholder in Hawaii's biosecurity. The five armed forces of DOD are represented in a total of 19 military bases and compounds in Hawaii. Section 7 of the Endangered Species Act (ESA) requires that DOD (along with all other federal agencies) consult with USFWS on any actions that may affect species listed under the ESA. Section 7 consultation includes an analysis of the effects of the introduction or spread of invasive species by the federal action on listed species. These consultations often focus on the transport of supplies or equipment (e.g., from Guam to Hawaii or within Hawaii). If the consultation determines that the spread of invasive species is likely, USFWS works with DOD (or other federal action agencies) to develop avoidance and minimization measures to reduce the likelihood that the invasive species will spread. Therefore, provisions in completed Section 7 consultations are one type of federal regulatory driver supporting DOD biosecurity protocols regarding transport of equipment from Guam to Hawaii. The state needs to enhance its partnership with DOD and federal quarantine and regulatory agencies through formal mechanisms, such as the ESA and Memoranda of Agreement (MOAs), to adopt stricter biosecurity measures that would provide increased protection to Hawaii (PrePol1, PrePro3).

Hawaii's role in safeguarding livestock and poultry industries against animal diseases of high concern is important because it affects the ability of the United States to trade agriculture products on the global market. HDOA's AI Division issues import permits and enforces prearrival requirements to ensure that newly imported animals have been properly identified, examined, and tested for disease before transport. The AI Division identified a need for more efficient use of technology and better coordination with federal and international partners to identify and screen for high-impact animal diseases. In particular, there is the need to align the list of notifiable diseases with internationally and nationally recognized lists of existing threats to domestic livestock, identify new threats and ensure that adequate biosecurity measures are taken, and fund equipment and licensing that will better record the movement of livestock animals to maintain database on arriving animals and align with federal data (PrePol3, PrePro1, PreTifs1).

With regard to aquatic organisms, USCG, the U.S. Environmental Protection Agency (EPA), DAR, and DOH share regulatory authority to prevent the entry of AIS via ballast water. In this case, unlike under the Plant Protection Act, the state has greater freedom to regulate. It can regulate ballast water discharged in state waters irrespective of whether the vessel originates from a foreign or domestic (U.S. mainland) port, with some exceptions, such as DOD vessels. However, there is insufficient coordination with national and international port authorities, the DOD, and shipping companies to ensure that ballast water procedures are being implemented consistently (DLNR 2003, Davidson et al. 2014, USN 2015) (PrePol1). Furthermore, current regulation regarding the exchange of ballast water and reporting/documenting systems does not provide adequate protection and needs to be updated to, at a minimum, meet more protective USCG national standards (PrePol1). Unlike ballast water, the USCG does not regulate and the state does not have the authority to regulate hull biofouling as an invasive species risk; this issue is addressed in Section 3.2, "Border."

Specific objectives and implementation tasks related to policy, process, and infrastructure and funding resources needed to enhance preborder security in Hawaii are listed below.

3.1.2 Policy-Related Objectives and Implementation Tasks for Preborder

Objective—PrePol1. Enact or Reform Policies Governing Importation of Commodities or Introduction of Organisms to Provide Additional Protection for Hawaii						
PrePol1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PrePol1.1	Propose for enactment the necessary legislative amendments to HRS §150A-5 (and other related sections) to enable HDOA to screen and **inspect nonagricultural commodities** and amend or promulgate corresponding administrative rules, as needed.	2017–2019	ES/EF	HDOA	AG HDOT	1
PrePol1.2	Propose for enactment the **necessary legislative amendments** (e.g., an amendment to the list of commodities regulated by statute, as proposed in Prepol2.1), and **promulgate administrative**	2017–2019	ES/EF	HDOA	AG	1

Objective—PrePol1. Enact or Reform Policies Governing Importation of Commodities or Introduction of Organisms to Provide Additional Protection for Hawaii						
PrePol1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
	rules in accordance with HRS §§ 150A-9 and -53 to implement a **comprehensive emanifest system.** Examples include redefine "inspect" to include electronic release, authorize HDOA to prescreen and release commodities electronically, and require manifests to indicate whether the goods are of foreign or domestic origin and the port of origin.					
PrePol1.3	Amend HAR Chapter 4-70 to enable HDOA to **require importers to treat/fumigate commodities** identified by HDOA as a high biosecurity risk. Use fumigation of coffee imports as a successful model system.	2020–2021	ES/EF	HDOA	AG	2
PrePol1.4	Require **declaration of high-risk packaging materials** in shipments to Hawaii regardless of commodity.	2022–2023	ES/EF	HDOA	HDOT	3
PrePol1.5	Amend HAR Chapter 4-70 to update quarantine requirements for **tissue-cultured plants.** Certified tissue-cultured plants indexed for targeted pests and pathogens by a qualified lab independent of the exporter and imported in sealed vials and in sterile media should not be quarantined as long as these plants are of species, subspecies, variety, or type that can otherwise be permitted for importation.	2020–2021	ES/EF	HDOA	UH	3
PrePol1.6	Amend HAR Chapter 13-76 to make it consistent with **USCG ballast water regulations.** For example, develop and implement minimum ballast water discharge standards for organisms and certain indicator microorganisms.	2017–2021	ES/EF	DLNR	DOH HDOT USCG	1
PrePol1.7	Obtain an **MOA between the Office of the Governor of Hawaii, DOD, and other federal quarantine and regulatory agencies** to require that military vessels (including those participating in Rim of the Pacific Exercise) entering Hawaii meet state standards regarding ballast water treatment and hull cleaning.	2020–2021	ES/EF	DLNR	DOD APHIS USCG	3
PrePol1.8	Submit petitions to HDOA to either add unlisted **high-risk AIS organisms** to the list of prohibited species or change list placement (e.g., from conditionally approved to restricted or prohibited list) to allow for **more stringent regulation**.	2022–2023	ES/EF	DLNR	AG HDOT	2

Objective—PrePol2. Develop Regulatory Framework for Offshore (Preborder) Screening and Certification of Commodities						
PrePol2.	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PrePol2.1	Enter into cooperative agreements with other state departments of agriculture or with private industries to establish **offshore screening** programs (similar to HDOA's current Christmas tree screening program in Oregon) for high-risk commodities being shipped to Hawaii.	2020–2021	ES/EF	HDOA	AG HDOT	1
PrePol2.2	Amend HRS Chapter 4-70 to require **phytosanitary certificates** for high-risk plant materials imported from domestic sources, and identify needed federal actions or enter into cooperative agreements to obtain phytosanitary certificates for imports of high-risk plant materials from foreign sources (also see PrePol1.1).	2020–2021	ES/EF	HDOA	AG APHIS	1

Objective—PrePol3. Address International, Federal, and State Policy Gaps in Prevention to Reflect Hawaii's Unique Biosecurity Challenges Relative to Geography and Climate						
PrePol3	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PrePol3.1	Complete an analysis of **international and federal laws and regulations** that currently preclude the state from taking effective action to prevent the introduction of invasive species to Hawaii, and list amendments and recommendations to better protect Hawaii (also see PreTifs2.1). Key Issues include working with APHIS on solutions to state quarantine needs relative to the Plant Protection Act, determining whether insular areas can get special recognition in the United States from a biosecurity perspective, and strengthening federal quarantine laws dealing with nonagricultural products.	2018–2019	ES/EF	HDOA	AG DOH HISC DLNR (for aquatics) HDOT APHIS USFWS CBP DOD	2
PrePol3.2	Consult with the California and Florida Departments of Agriculture regarding what state and federal laws, regulations, and policies have been enacted to give them **special protection at the state level, and produce recommendations** to enact comparable protection for Hawaii.	2017–2019	ES/EF	HDOA	AG CDFA FDACS	2
PrePol3.3	**Align the notifiable disease list** with internationally and nationally recognized lists of existing threats to domestic livestock (terrestrial and aquatic).	2017–2020	ES/EF	HDOA	USDA OIE	1

3.1.3 Process-Related Objectives and Implementation Tasks for Preborder

Objective—PrePro1. Improve Systems to Collect and Share Data and Conduct Regular Risk Assessments to Identify Pests, Diseases, Commodities, and Pathways of High Risk to Hawaii						
PrePro1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PrePro1.1	**Implement a comprehensive emanifest system** that is effective no later than January 1, 2020. The system must be able to collect relevant nonproprietary information, authorize HDOA to prescreen and release commodities electronically, require manifests to indicate whether the goods are of foreign or domestic origin, identify port of origin, and be implementable on a trial basis between 2017 and 2019 to identify the need for any improvements. (Also see PrePol1.2)	2017–2020	ES/EF	HDOA	HDOT	1
PrePro1.2	Conduct **risk analyses of terrestrial plants,** pests, diseases, commodities, and pathways to prioritize screening and inspections. When warranted by science and risk assessments, take the next policy, process, and staffing steps in collaboration with federal partners to approve and implement more restrictive state policies and rules—and seek complementary federal policies and rules—to protect Hawaii from the introduction of new pest threats.	2018–2027	ES/EF	HDOA	APHIS UH DLNR	1
PrePro1.3	Based on the results of the risk analyses, annually **write/update import requirements** for high-risk commodities imported to Hawaii.	2020–2027	ES/EF	HDOA	APHIS UH DLNR	1
PrePro1.4	Implement a **state-of-the-art biosecurity database system** within HDOA to meet important functions, such as emanifest, efficient input from risk assessments, capability to house survey and taxonomic data, ability to communicate among different databases, and ability to produce query-specific reports.	2017–2025	ES/EF	HDOA	DLNR	1
PrePro1.5	Obtain **MOUs for sharing data** between state and federal agencies and the industry that facilitate sharing relevant biosecurity information and also ensure proper handling of proprietary or confidential information.	2017–2018	ES/EF	HDOA	APHIS DLNR Industry	2
PrePro1.6	Conduct an **annual policy review of animal disease import regulations** to identify new threats and ensure that adequate biosecurity measures are taken.	2017–2027	ES/EF	HDOA	APHIS Industry	3
PrePro1.7	Conduct **risk assessments for hull fouling, ballast water, aquaculture, and aquarium issues** to better inform regulation of AIS organisms being introduced via these pathways and affecting native habitats.	2017–2027	ES/EF	DLNR	DOH HDOT USCG HDOA APHIS USFWS Industry Pacific	1

Objective—PrePro1. Improve Systems to Collect and Share Data and Conduct Regular Risk Assessments to Identify Pests, Diseases, Commodities, and Pathways of High Risk to Hawaii						
PrePro1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
					Regional States and Countries	

Objective—PrePro2. Support Agriculture, Aquaculture, and Landscape Industries in a Way That Protects Hawaii from Pests						
PrePro2	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PrePro2.1	Create **working groups** with representatives of the **food, forestry, livestock, biofuel, and landscape industries** to work with HDOA's import substitution program (also see PreTifs2.4), DLNR, and UH staff to substitute importation of plants (already in Hawaii) that pose a high-risk pathway for the introduction of pests and pathogens with plants that can be grown locally. Reduce importation with local production by 2027.	2017–2027	ES/EF	HDOA DLNR	UH USFWS	3
PrePro2.2	Create **working groups** with representatives and end users of the **aquaculture, wetland agriculture, and aquarium industries** to work directly with agency staff to identify high-risk pathways and standards for facilities and institute self-policing practices to minimize AIS threats.	2017–2027	ES/EF	DLNR	HDOA USFWS Industry UH	3

Objective—PrePro3. Reduce the Accidental and Illegal Introduction of Invasive Species						
PrePro3	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PrePro3.1	Enter **cooperative agreements with ecommerce industries** (e.g., online plant nurseries, pet stores) to include language on their websites about what is not allowed to be imported or shipped to Hawaii, and compel them to follow existing import regulations.	2020–2021	ES/EF	HDOA	AG DLNR USFWS Industry	3
PrePro3.2	Enter **MOAs with DOD** to allow for the inspection and clearance by HDOA of any military vessel and related cargo and equipment entering Hawaii and to identify and close gaps in policy, process, and procedures to prevent inadvertent introduction of invasive species via household goods, equipment and other materials transported by DOD's units and contractors.	2018–2027	ES/EF	HDOA	DOD DLNR USDA	1
PrePro3.3	In collaboration with other state and federal regulatory agencies, establish an **intelligence unit** with the purpose of identifying and	2017–2027	ES/EF	HDOA	AG DLNR APHIS CBP	2

Objective—PrePro3. Reduce the Accidental and Illegal Introduction of Invasive Species						
PrePro3	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
	preventing illegal introductions (including ecommerce) to Hawaii.				USFWS USCG	

Objective—PrePro4. Establish Processes and Protocols for Offshore (Preborder) Screening and Certification of Goods and Manifests						
PrePro4	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PrePro4.1	Write Hawaii-specific **standards and protocols for use in compliance agreements for offshore prescreening** of agricultural and nonagricultural commodities en route to Hawaii.	2020–2021	ES/EF	HDOA	APHIS Industry	1
PrePro4.2	Enter into cooperative agreements or contracts with private industry to **conduct inspections at transitional facilities at offshore sites** for high-risk import commodities.	2022–2027	$600,000	HDOA	AG APHIS Industry	1

3.1.4 Technology, Infrastructure, Funding, and Staffing–Related Objectives and Implementation Tasks for Preborder

Objective—PreTifs1. Develop New and Improve Existing Infrastructure and Technology to Support Preborder Biosecurity for Hawaii						
PreTifs1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PreTifs1.1	Fund equipment and licensing to support the **emanifest** system.	2019–2027	$490,000	HDOA	HDOT	1
PreTifs1.2	Fund equipment and licensing to support HDOA's **biosecurity database** system.	2019–2027	$1,960,000	HDOA	DLNR	1
PreTifs1.3	Fund equipment, licensing, and employee training on data systems that will **record the movement of livestock animals** and hold prearrival testing results. The data are aligned with existing federal databases to track movement and animal identification for disease trace-back.	2019–2027	$260,000	HDOA	APHIS	2

Objective—PreTifs2. Enhance Funding and Staffing Support for Preborder Biosecurity Operations						
PreTifs2	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PreTifs2.1	Hire two **policy analysts** to conduct international, federal, and state policy analysis and write necessary rules and regulations listed in this plan.	2018–2027	$1,100,000	HDOA	DLNR DOH	1
PreTifs2.2	Hire three **entomologists,** two **plant pathologists, and two botanists** at HDOA to	2018–2027	$2,970,000	HDOA	DLNR UH	1

Objective—PreTifs2. Enhance Funding and Staffing Support for Preborder Biosecurity Operations						
PreTifs2	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
	conduct risk analysis on pathways and on organisms and commodities entering Hawaii.					
PreTifs2.3	Hire four **data management specialists** to support HDOA's new biosecurity database system.	2018–2027	$1,800,000	HDOA	DLNR	1
PreTifs2.4	Fund an **annual import substitution program** to encourage Hawaii growers to identify and grow food and nonfood alternative products to phase out imports of high-risk pathway food/commodities by 2027.	2018–2027	$2,500,000	HDOA	UH Industry	2
PreTifs2.5	Contract or hire two **biologists** at DLNR to conduct risk analysis on vessels, pathways and organisms entering Hawaii via ballast water, biofouling, and aquaculture and pet industry pathways.	2018–2027	$1,300,000	DLNR	HDOA DOH USCG	1

3.2 Border

Goal: Enhance the Detection and Control of Pests and Diseases at Ports of Entry

3.2.1 Background

Effective surveillance, detection, and treatment of pests at the border depend on a robust regulatory framework that authorizes state and federal agricultural inspectors to take action on species that reach our borders, processes that allow for efficient execution of biosecurity measures, and infrastructure and technology to support implementation of border security processes.

The same agencies engaged in preborder security also have a mandate to ensure the inspection for pests and treatment of invasive species that reach Hawaii's borders. HDOA, APHIS, CBP, and USFWS are among the key regulatory agencies that screen incoming people and products at our borders. Hawaii has 16 ports and harbors, and Honolulu Harbor and Honolulu International Airport receive the vast majority (more than 90%) of passengers, cargo, and conveyances arriving from both domestic and foreign sources. Hawaii also receives goods through local, national, and international mail at its various statewide post offices and Honolulu is one of only a handful of cities in the nation with an international mail facility. HDOA and USDA agricultural inspectors prevent the introduction of harmful pests and diseases from domestic (other U.S. states) and foreign sources, respectively. This work is conducted primarily through various programs, including permit reviews, air and sea ports-of-entry inspections and quarantine, interisland inspections (covered in Section 3.3, "Postborder"), and investigation and enforcement of state and federal quarantine laws and regulations.

Screening for pests at the border primarily involves visual inspection of agricultural items (including plants, plant parts, nondomestic animals, microorganism cultures, microbial products, arthropods, and soil). HDOA maintains lists of taxa that are conditionally approved for importation, restricted, or prohibited from importation. For example, all unlisted nondomestic animals are considered prohibited from entry, but there is no list of prohibited microorganisms, so they can only be imported after review and approval by the agriculture board. However, these lists do not include important plants, animals, and microorganisms recognized to be harmful to Hawaii. For example, the state's noxious weed list primarily includes weeds of agriculture and temperate climates, many of which are already widespread in Hawaii. Therefore, to enhance biosecurity, lists of state-regulated organisms must be updated periodically to include organisms (based on the results of plant or pest risk assessments, see Section 3.1, "Preborder") that are harmful to Hawaii's agriculture, its natural environment, and the health and lifestyle of its people (BorPol2).

Honolulu International Airport and Honolulu Harbor receive the vast majority of commodities shipped to Hawaii. At these border ports, HDOA is our first line of defense against invasive species entering Hawaii. (Source: HDOA)

At the federal level, the mandate of the agencies is to protect the United States from the impacts of harmful species. However, as discussed above, Hawaii has unique biosecurity needs compared to the other 49 states (see Section 2.0, "Introduction," and Section 3.1, "Preborder"). Therefore, the federal lists of pests to report and take action on do not always include pests that are specifically harmful to Hawaii, and the related regulations also do not always address these harmful pests. State and federal inspectors in Hawaii coordinate to detect invasive species of state importance entering via foreign pathways. However, it is in the state's best interest to coordinate and harmonize pest lists and actions whenever possible and to share information on interceptions and species of concern through formal (e.g., policy change, see Section 3.1, "Preborder") and informal (e.g., meetings, workshops, see BorPol1, BorPro1) mechanisms to ensure that Hawaii is protected from harmful pests entering from foreign sources.

In general, imported agricultural commodities are inspected where they first arrive: in cargo areas of importers, in temporary spaces, or even on the dock piers or airport tarmacs. Given this current situation, combined with the increasingly high volume of cargo shipped to Hawaii and concern for food safety, there is an urgent need to plan and secure additional and appropriate inspection facilities. This need is likely to be magnified further if HDOA is authorized to also inspect high-risk nonagricultural commodities.

Imported produce often awaits inspection outdoors at the ports (left). To meet the growing volume of imported goods, HDOA urgently needs enclosed, well-lit, and temperature-controlled facilities (right) to conduct inspections efficiently and enhance border protection. (Source: HDOA)

In 2009, HDOA implemented a pilot program whereby inspections for some agricultural commodities are conducted at a transitional facility transitional facilities owned and operated by private industry (e.g., produce distributor) in Honolulu. Because the unloading and inspections are performed in an air-conditioned area and the facility is secured, this approach reduces the chance for pests to escape and maintains food quality during the inspection process. The importers also benefit because perishable goods are transported immediately to these secure and temperature-controlled facilities for inspection. Having additional transitional inspection facilities, especially near major ports and harbors statewide, would greatly facilitate increased inspections and enhance border security for Hawaii (BorTifs2). However, a change in statute is needed to require importers to transport commodities that are high risk to such off-port state-designated transitional facilities. Current HDOA regulations allow for inspection at such transitional inspection facilities; however, formulating well-defined regulations and developing building and operating standards so that these facilities meet HDOA's biosecurity standards would better meet the industry demand for such facilities and would strengthen border security (BorPol1, BorProl1).

Although based on the results of the pilot program, transitional facilities have proved to work well for agricultural items, HDOA anticipates needing more space for screening high-risk nonagricultural commodities. Furthermore, HDOA does not have the authority to require shippers or importers to transport nonagricultural goods for inspection to a facility located outside of a port or harbor. HDOA therefore needs to pursue an amendment to existing regulation that will authorize it to require the transport of high-risk commodities to off-site transitional facilities (BorPol1). However, in the interim, HDOA needs to work with HDOT and the private sector to use available space at the ports and harbors to meet the growing needs for inspection.

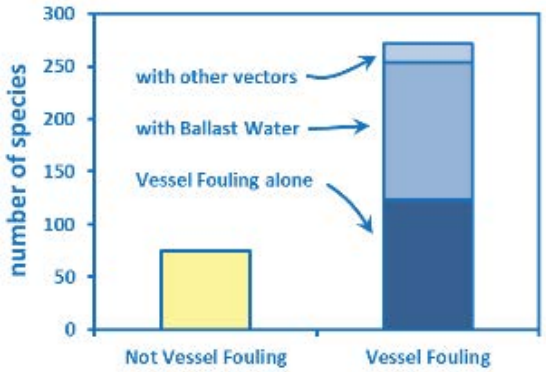
Pest interception reports indicate that cargo inspections yield more interceptions when additional staff members participate (BorTifs1). This participation includes the use of dogs (with handlers) trained to detect agricultural materials in places not otherwise visible to the inspectors (e.g., passenger bags) (BorTifs2). With adequate staffing, cargo inspection plays a major role in mitigating pest introduction and therefore is a high priority when

resources are allocated. Additional resources, such as Xray machines for surveillance and autoclaves and freezers for destroying harmful pests, contribute to make border security processes more efficient (BorTifs2).

A risk assessment study at the Kahului airport reported to have detected on average, one organism per day that was not known to occur in Hawaii and could potentially be a pest (HDOA 2002). Invasive species not known to occur in Hawaii, such as the brown tree snake, and predicted to cause huge economic and ecological damage, have been intercepted multiple times at the borders. These interceptions highlight the need for continuous monitoring in and around ports of entry to capture pests that infiltrated the borders (BorPro1). In addition, there are numerous examples where a lack of dedicated funding or immediate, coordinated efforts for detection and eradication allowed newly detected pests (in the vicinity of borders or beyond) (e.g., banana bunchy top virus, coffee berry borer [*Hypothenemus hampei*], little fire ant) to become established, leaving no other option than expensive and perpetual containment or control. Hawaii needs to establish an interagency biosecurity emergency task force with dedicated funding to enhance its capacity to take timely action to eradicate new pest incursions (BorPol1, BorPro3).

The brown tree snake (*Boiga irregularis*) remains a constant threat to Hawaii. (Source: CGAPS)

Movement of domestic animal species is a recognized pathway whereby diseases and exotic parasites of high concern may enter the state. Current border activities that guard against entry of animal disease include inspection by AI staff to examine animals for clinical signs of illness and presence of foreign parasites; verify permits, shipping documents, and tracking devices; and enforce import and handling requirements. However, livestock disease monitoring services (staff and infrastructure) are limited to only some ports and need to be expanded (BorPro1, BorTifs1, BorTifs2). Policy changes to effectively enforce penalties for violating animal import requirements also would facilitate better border protection (BorPol1).



Vessel biofouling has contributed between 35% and 78% of Hawaii's introduced and cryptogenic species (n=346). It is ranked highest among all vectors of initial introduction to Hawaii, but there are no regulations that authorize the state to inspect vessels. (Source: Davidson et al. 2014)

Ballast water (addressed in Section 3.1) and hull biofouling are two important pathways for the entry of AIS into the state. There currently are no state rules in place for DAR to regulate inspection of vessels (for invasive species that may be attached to the hull) that enter state waters (PrePol1). USCG does not regulate biofouling; therefore, DAR's authority to manage this risk is very important. Developing standard operating procedures for collecting and reporting data, implementing best management practices for hull cleaning, testing and applying new techniques for treating ballast water and hull biofouling are just a few strategies identified in this HIBP to minimize the spread of AIS that

cross our border (BorPro2). Staffing must be increased, and a data management system must be implemented (BorTifs3) to support a comprehensive program to manage biosecurity threats related to ballast water and hull biofouling.

Specific objectives and implementation tasks related to policy, process, and infrastructure and funding resources needed to enhance border security in Hawaii are listed below.

3.2.2 Policy Related Objectives and Implementation Tasks for Border

Objective—BorPol1. Address Gaps in Federal and State Policies and Enact Regulations to Improve Border Protection for Hawaii						
BorPol1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
BorPol1.1	Propose for enactment appropriate legislation (through HRS Chapter 150A) to enable HDOA oversight and establishment of **transitional facilities** in Hawaii for freight inspection and quarantine.	2017–2019	ES/EF	HDOA	AG	1
BorPol1.2	Propose for enactment appropriate legislation (through HRS Chapter 150A) to enable HDOA to require the importer to **transport shipped commodities** that HDOA determines to be of high risk to **state-designated inspection facilities**.	2017–2019	ES/EF	HDOA	AG	1
BorPol1.3	Propose for enactment necessary legislation (through HRS Chapter 141 or 150A) to create a **biosecurity emergency response fund** to support multiagency terrestrial and aquatic emergency responses at or beyond (postborder) ports by emergency task forces (see also BorPro3.1).	2018–2019	ES/EF	HDOA	DOH HDOT DLNR	1
BorPol1.4	Propose for enactment legislation to move enforcement of HDOA's importation statutes and regulations under the **Hawaii Environmental Court** by amending **HRS § 604A-2** to include civil fines for violations of HRS Chapter 150A within the Environmental Court's jurisdiction.	2022–2023	ES/EF	HDOA	AG	1
BorPol1.5	Amend the current penalty section in HRS §142-12, relating to violations of AI Division Quarantine Rules, to authorize issuance of administrative **citations for minor violations** such as failure to file written or verbal reports in prescribed time, or failure to provide nonconsequential information on shipping and import forms.	2018–2020	ES/EF	HDOA	AG	2
BorPol1.6	Propose for enactment the necessary legislation to **authorize DLNR** to inspect vessels and regulate **hull-fouling threats, with penalty provisions for noncompliance**.	2018–2019	ES/EF	DLNR	HDOT DOH USCG	1
BorPol1.7	Collaborate with CBP, APHIS, CDC, and HDOA to review agency authorities, policies,	2017–2019	ES/EF	DOH	APHIS CBP	2

Objective—BorPol1. Address Gaps in Federal and State Policies and Enact Regulations to Improve Border Protection for Hawaii						
BorPol1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
	and procedures and write a **plan to take preventive action when disease-carrying vectors** not on the APHIS actionable list (e.g., mosquitoes) are found in foreign cargo or conveyances (unintentional import).				CDC HDOA	

Objective—BorPol2. Update State-Regulated-Pest Lists to Provide More Protection to Hawaii						
BorPol2	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
BorPol2.1	Amend HRS 141-3 to provide HDOA the flexibility to not have to cover the costs associated with the control of noxious weeds and update the state's noxious weed list and noxious weed seed list as outlined and/or required in **HAR Chapter 4-68 and HAR Chapter 4-67,** respectively, to include invasive plant species harmful to Hawaii's agriculture and natural systems.	2018–2019	ES/EF	HDOA	AG DLNR UH HISC	2
BorPol2.2	**Promulgate administrative rules, as required under HRS § 150A-6.1**, to add species to the restricted plant list, and regulate or prohibit the introduction, sale, distribution, and propagation of specific plants put on the restricted plant list.	2018–2020	ES/EF	HDOA	DLNR AG UH HISC	2
BorPol2.3	Update **HAR Chapter 13-124** to add aquatic species to the state's injurious wildlife list.	2020–2021	ES/EF	DLNR	HDOA AG USFWS NOAA DOFAW UH HISC	2

3.2.3 Process Related Objectives and Implementation Tasks for Border

Objective—BorPro1. Enhance Invasive Species Surveillance, Detection, and Treatment Processes at the Borders						
BorPro1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
BorPro1.1	Implement inspections by state **detector dogs** to intercept high-risk species difficult to detect by other methods of inspection or at ports of entry difficult to inspect with other methods (see also BorTifs1.3).	2017–2027	ES/EF	HDOA	APHIS CBP DLNR	1
BorPro1.2	**Write a set of minimum standards, specifications, and operational protocols** that would constitute HDOA's certification program for operating **transitional facilities** in Hawaii. For example, secure facilities with appropriate mechanisms, such as fences, double doors, and negative pressure, to	2017–2019	ES/EF	HDOA	Industry APHIS AG UH	1

Objective—BorPro1. Enhance Invasive Species Surveillance, Detection, and Treatment Processes at the Borders						
BorPro1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
	contain any pests encountered; appropriate processes executed when pests are found; and appropriate equipment based on the type of goods being inspected, such as air conditioning and refrigerators for perishable goods. Work with industry on specifications and operational protocols.					
BorPro1.3	Enter into public-private partnership (e.g., contracts, cooperative agreements) to **operate transitional facilities** for freight and commodity inspections in Hawaii under HDOA's transitional facility certification program (see also BorPro1.2).	2017–2027	ES/EF	HDOA	AG Industry	1
BorPro1.4	Hold quarterly coordinating meetings/ workshops with APHIS, CBP, DHS, USFWS, and DOH to **facilitate communication** relative to border processes, such as inspection and detection. In collaboration with federal partners, take the next policy, process, and staffing steps to implement more protective state policies and rules and seek complementary federal policies and rules to protect Hawaii from the introduction of new pest threats.	2017–2027	ES/EF	HDOA	APHIS CBP DHS USFWS DOH HDOT	3
BorPro1.5	Provide **annual training** for state and federal inspectors on identification of emerging pests and diseases, as well as on new detection and screening methods for pests and disease.	2018–2027	$100,000	HDOA	APHIS CBP DHS DOH DLNR UH	3
BorPro1.6	Based on the results of pathway and species risk assessments, run **monitoring programs at major ports, harbors** (ports and harbors that receive both domestic and foreign cargo), **and post offices** for high-risk pests not known to occur in Hawaii (e.g., brown tree snake) (see also BorTifs2.8).	2018–2027	$9,600,000	HDOA	DLNR HDOT DOH USDA USFWS	2
BorPro1.7	Administer the **livestock disease detection monitoring program** focused on contagious animal diseases of high consequence and exotic parasites (and increase staffing and operations to include new port locations; see BorTifs1.3).	2018–2027	ES/EF	HDOA	APHIS	2

Objective—BorPro2. Improve Inspection and Treatment Processes for Ballast Water and Hull Biofouling Threats						
BorPro2	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
BorPro2.1	Create **standard operating procedures and protocols** and **ballast water reporting forms** to regulate ballast water management and treatment specific for Hawaii. Develop	2018–2019	ES/EF	DLNR	DOH EPA USCG	2

Objective—BorPro2. Improve Inspection and Treatment Processes for Ballast Water and Hull Biofouling Threats						
BorPro2	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
	compliance assessments and protocols to quarantine noncompliant vessels.					
BorPro2.2	Create standard operating procedures for vessel biofouling inspections and a **form to report hull inspection** applicable to Hawaii. Develop compliance assessments and protocols to quarantine noncompliant vessels (see also BorPol1.4).	2018–2019	ES/EF	DLNR	DOH HDOT EPA USCG	2
BorPro2.3	Create a **database to house data collected for ballast water reporting and management and hull inspections** and hull biofouling treatment. The database should also be able to generate reports that can be used to conduct risk analysis regarding ballast water and hull biofouling (see also PrePro1.3).	2018–2019	ES/EF	DLNR	HDOA HDOT USCG EPA	1
BorPro2.4	Test and apply **new methods and technologies for ballast water and hull biofouling monitoring, treatment, and compliance monitoring and assessment**, including in-water cleaning and treatment methods relative to their application in Hawaii.	2022–2023	ES/EF	DLNR	HDOA HDOT DOH USCG EPA	2
BorPro2.5	**Write best ballast water and hull husbandry practices** and proactive ballast water and hull cleaning standards for all nonmilitary vessels to minimize movement of AIS into Hawaii's ports, harbors, and marinas. Include incentives to encourage vessel ballast water discharge and biofouling compliance.	2018–2019	ES/EF	DLNR	DOH HDOT EPA USCG	2
BorPro2.6	Before regulations for ballast and hull biofouling inspection and treatment are enacted, **enter into MOUs or cooperative agreements with partner agencies and port authorities** to implement effective AIS prevention, inspection, and response best management practices.	2017–2019	ES/EF	DLNR	DOH HDOT EPA USCG	2

Objective—BorPro3. Establish an Emergency Response System for New Pests or Disease Incursions at Ports of Entry						
BorPro3	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
BorPro3.1	Create a multiagency **Biosecurity Emergency Response Task Force** to coordinate and respond to new aquatic and terrestrial pests or disease incursions both at and beyond (postborder) ports of entry. This task force should comprise representatives from relevant government agencies and consult with private industries working at the borders (e.g., airlines, shippers, freight forwarders).	2017–2027	ES/EF	HDOA DLNR	DOH HISC HDOT HI-EMA APHIS CBP USCG USFWS NPS DOD USCG	2

Objective—BorPro3. Establish an Emergency Response System for New Pests or Disease Incursions at Ports of Entry						
BorPro3	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
					NOAA EPA	
BorPro3.2	Hold postincident meetings/workshops hosted by HDOA of the Biosecurity Emergency Response Task Force to **coordinate/review/debrief rapid response actions,** and set up an incident command system.	2017–2027	ES/EF	HDOA	DLNR HISC DOH HDOT HI-EMA APHIS CBP USCG USFWS NPS DOD Industry	3
BorPro3.3	Write **species-specific response** plans for high-risk/priority pests that detail the roles of relevant agencies and stakeholders. Review plans annually to ensure alignment with existing policies and USDA response plans.	2020–2027	ES/EF	HDOA DLNR DOH	APHIS HISC UH USFWS NPS	1
BorPro3.4	**Write general and taxa-specific (e.g., insects, plants, fish), rapid-response** strategies that can be implemented immediately in response to an emergency involving multiple agencies and private industries.	2020–2023	ES/EF	HDOA DLNR DOH	APHIS HISC UH USFWS NPS	2
BorPro3.5	Write plans to respond to **livestock diseases or exotic parasites**. Review plans annually to ensure alignment with existing policies and USDA response plans.	2017–2027	ES/EF	HDOA	APHIS Industry	2
BorPro3.6	Write contingency plans for treating and disposing of dirty **ballast water and for cleaning biofouling vessels.** Also include plan to dispose of harmful paint removed during the treatment.	2018–2019	ES/EF	DLNR	DOH HDOT USCG EPA NOAA	2

3.2.4 Technology, Infrastructure, Funding, and Staffing—Related Objectives and Implementation Tasks for Border

Objective—BorTifs1. Build Staff and Funding Capacity to Enhance Biosecurity at Ports and Harbors						
BorTifs1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
BorTifs1.1	Double HDOA's current **PQ staff** from 91 to 182 over the 10-year period of the plan to meet current and future needs for inspection services at all ports of entry. Adjust pay scales commensurate with positions, increasing responsibilities, and duties.	2020–2027	$39,181,900	HDOA	DLNR DOH	1
BorTIfs1.2	Increase **AI staff and resources** by adding 15 new positions and operating funds to implement an expanded livestock disease detection monitoring program focused on contagious animal diseases of high	2018–2027	$7,500,000	HDOA	APHIS	1

Objective—BorTifs1. Build Staff and Funding Capacity to Enhance Biosecurity at Ports and Harbors						
BorTifs1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
	consequence and exotic parasites at five ports.					
BorTifs1.3	Add four new state **detector dog units** (handler + dog) to intercept high-risk species difficult to detect by other methods of inspection or at ports of entry difficult to inspect with other methods.	2020–2027	$1,300,000	HDOA	APHIS CBP OIA	2
BorTifs1.4	Allocate money on a yearly basis to the **biosecurity emergency response fund** (see also BorPol1.4 and BorPro3.1).	2018–2027	$30,000,000	HDOA	DLNR	1
BorTIfs1.5	Increase staffing and operating funds for the DOH **Vector Control Branch** by adding 13 new staff members (total 33: current 20 in FY2017 plus 13 new positions) to be able to detect and respond to threats from disease vectors such as mosquitoes and diseases such as dengue, Zika, and rat lungworm.	2019–2027	$5,790,980	DOH	HDOA DLNR	1

Objective—BorTifs2. Build Infrastructure to Enhance Biosecurity at Ports and Harbors						
BorTifs2	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
BorTifs2.1	Use **state-of-the-art diagnostics technology** to test for disease in imported plants.	2021–2027	$350,000	HDOA	UH Industry	1
BorTifs2.2	Install **effective containment features** (e.g., fences), attractants, and traps in the vicinity of ports of entry to help monitor for pests (see also BorPro1.6).	2020–2027	$800,000	HDOA	HDOT	2

Objective—BorTifs3. Expand the Inspection Capacity to Address Ballast Water and Hull Biofouling Threats						
BorTifs3	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
BorTifs3.1	Contract or hire five **full-time positions at DLNR's** DAR to manage ballast water and biofouling threats and inspections: two biologists stationed on Oahu, two biologists stationed on the Big Island, and one technician position to collect water quality samples and assess releases of harmful antifouling paints.	2018–2027	$2,500,000	DLNR	DOH HDOT EPA USCG	1
BorTifs3.2	Fund **equipment and licensing** to support DLNR's ballast water and hull fouling reporting, tracking, and compliance monitoring data management system, and **aquatic invasive organism reporting, tracking and compliance database** system.	2018–2027	$950,000	DLNR	DOH HDOT EPA USCG	1
BorTifs3.3	Contract or hire one **data management specialist** to support DLNR's new ballast	2018–2027	$500,000	DLNR	HDOA HDOT	1

Objective—BorTifs3. Expand the Inspection Capacity to Address Ballast Water and Hull Biofouling Threats						
BorTifs3	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
	water, biofouling, and aquatic invasive species database systems.					
BorTifs3.4	Contract a public institution or private company to **use molecular techniques to identify organisms recruited onto the settlement plates,** and build an eDNA database of nonindigenous and invasive species established in Hawaii.	2018-2027	$60,000	DLNR	UH HDOT DOH Industry	1

3.3 Postborder

Goal: Protect Hawaii from Invasive Species Already Present within the State

3.3.1 Background

In this HIBP, the term *postborder* refers to the area in which a pest is found after it has passed the point or opportunity of border inspection, whether or not it was detected. *Postborder* encompasses the policies, processes, and programs aimed at detecting, eradicating, or controlling the spread or impacts of pest plants, animals, and diseases after they are beyond the ports of entry and inspection process. Measures to address the interisland movement of pests are identified in this section.

Even the best efforts at preborder and border prevention, detection, and interception cannot intercept 100% of the species that will become invasive in Hawaii. Similarly, investing solely in preborder or prevention activities ignores the costs and impacts of pests that are already present in Hawaii and species that need active management to keep from incurring even higher costs (and possibly causing irreversible harm). Hawaii needs to continue to build and support early detection and rapid response capacities, policies, and processes that can reduce interisland movement of pests, as well as programs that control widespread pests or their impacts on the environment, public health, and the economy.

It is estimated that an organism not known to occur in Hawaii, and potentially a new pest, is detected at Hawaii's ports every day and that more than 20 insect species are introduced annually (HISC 2015, Rago and Sugano 2015). Newly arrived, incipient species may be eradicated if they are detected early enough. Established species that may have been introduced many years ago, such as strawberry guava, may require biocontrol to slow its spread. What is established on one island may be incipient on another. Between 1995 and 2003, an average of 89 additional alien species became established in Hawaii each year, and it is estimated that 300–500 of the more than 5,000 established alien species in the islands are invasive and damaging (Eldredge and Evenhuis 2003, Loope and Kraus 2009). These pests have major impacts on farmland, ranchland, native habitats, rare and endangered species, watersheds, marine and freshwater ecosystems, and they threaten or

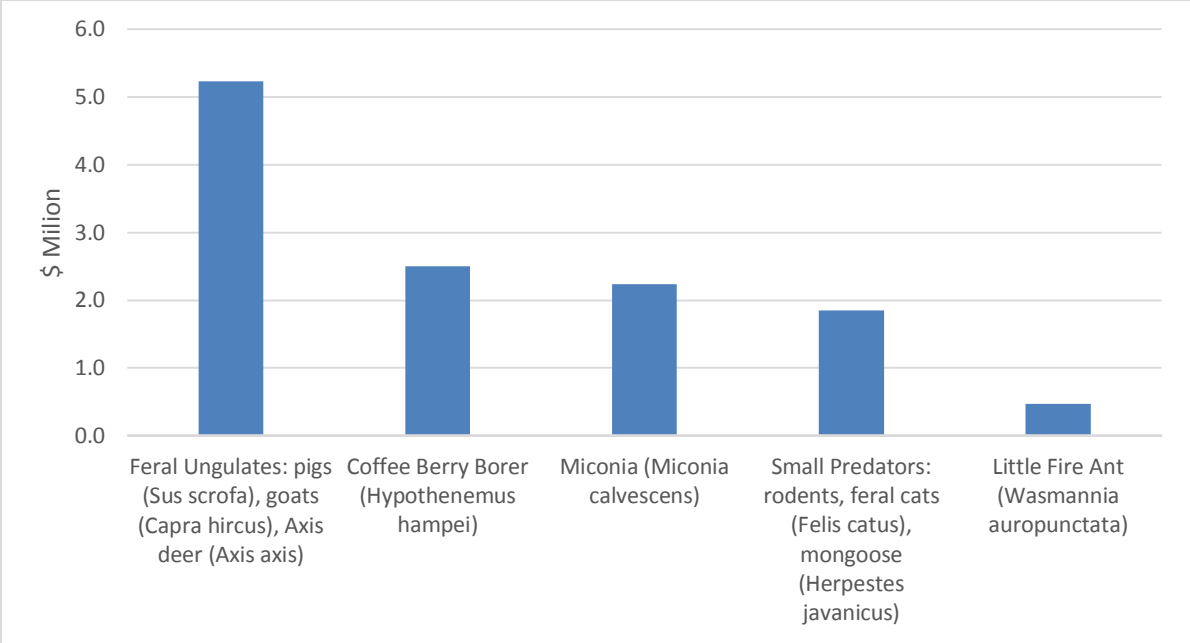
affect human and animal health and safety, aquaculture, agriculture, quality of life, tourism, and other cultural and economic resources important to the state.

A conservation worker manually removes miconia (*Miconia calvescens*). This plant degrades forests by displacing native species in Hawaii. (Source: HISC)

A sampling of the harmful species that are the target of current control programs or that require expanded control include the mosquitoes *Aedes aegypti* and *Aedes albopictus*, which spread dengue fever and the Zika virus; the mosquito *Culex quinquefasciatus*, which carries the parasite that causes avian malaria; the new strain of *Ceratocystis fimbriata*, a fungus that causes Rapid Ohia Death, which kills ohia (*Metrosideros polymorpha*) and damages watersheds on Hawaii Island; feral ungulates, including feral pigs (*Sus scrofa*), goats (*Capra hircus*), and axis deer (*Axis axis*), which damage watersheds and agricultural crops; small predators, such as rodents and mongoose (*Herpestes javanicus*), which prey on native animals and plants; coffee berry borer, which reduces the quality and value of coffee beans; marine algae and snowflake coral (*Carijoa riisei*), which invade, overgrow, smother, and kill coral reefs statewide; little fire ant, which threatens agriculture, quality of life, and tourism; albizia (*Falcataria moluccana*), which threatens public health and safety and native forests; and other invasive plants like miconia, and strawberry guava, which outcompete and replace native forests and reduce the capture and recharge of fresh, clean water. The lost agricultural production, lost ecosystem services, and the cost of control, as well as the impacts on our lifestyle and culture associated with invasive species such as these, have a large impact on our economy and well-being.

Postborder biosecurity in agricultural and natural systems primarily falls under the invasive species or disease control programs of HDOA, DLNR, and DOH and the research, agricultural extension, conservation, and enforcement programs at UH. Federal agencies, such as USFWS, the National Oceanic and Atmospheric Administration (NOAA), USFS, USGS, NPS, the Natural Resources Conservation Service, and DOD, control invasive species on their lands and/or provide direct and technical assistance, research, and funding to state and private partners for their efforts. USFWS also conducts Section 7 consultations under the ESA for all actions that may affect listed endangered species. For example, the Federal Highway Administration consults with USFWS on road construction projects. These consultations include identification of best management practices that the Federal Highway Administration and HDOT implement to prevent further spread of invasive species. In addition, nonfederal agencies or private landowners may develop habitat conservation plans under Section 10 of the ESA to mitigate for actions that "take" listed species. Habitat conservation plans are another tool that can be used to incorporate measures to avoid the spread of invasive species. These front-line agencies spend millions of dollars annually to control established pests in agricultural lands, watersheds, and native habitats and to protect other important cultural and economic resources (Rago and Sugano 2015). Other state agencies, county governments, conservation groups, and many private landowners also have programs to

manage invasive species on their lands. Many of the county, state, and federal agencies provide grants to help public and private landowners control and manage invasive species on their lands. The state grant programs consistently receive far more requests for funding than they have funds to award (DLNR 2015).



Amounts spent by state agencies in 2014 on control of the five most costly invasive species in the state. (Source: Rago and Sugano 2015)

The UH's island-based Invasive Species Committees (ISCs) also play an important role in the control of invasive species. They function as informal multipartner committees that can work with a variety of funding sources and across landownership boundaries and agency jurisdiction to provide rapid response and control services for incipient pests (Kraus and Duffy 2010). Similarly, the Watershed Partnerships field crews that control ungulates, weeds, and invasive species on private and public forestlands on all islands. HAL provides technical expertise, direction, and field support for the detection and control of invasive ants. All these agencies and partners are engaged in some aspect of invasive species control and demonstrate the multiagency scope and collaborative approach described in this plan.

An additional line of defense in the efforts to control invasive species is the private pest control industry. Private industry often takes over after government programs end and responsibility for control passes to the private landowner. These operations often require specialized licensing for use of toxicants for pests such as termites or little fire ants or toxicants used in conservation areas. Finding ways to support industry and safely streamline regulations so that private industry can operate more efficiently will assist all our efforts to control invasive species in urban areas, on crop and noncrop rural lands, and on conservation lands.

This HIBP identifies policies, processes, and resources to support three strategies for limiting and controlling the impacts of invasive species. These strategies are (1) early detection, rapid response, and eradication of

incipient populations; (2) containment in localized area or on a single island; and (3) long-term pest management of islandwide or statewide pests. Early detection, rapid response, and eradication involve authorities, programs, and response capabilities of HDOA, DLNR, DOH, UH, ISCs, HAL, UH's CTAHR, as well as federal partners, including APHIS, USFWS, and NPS, to detect and attempt to eradicate pests and diseases before they become established. This HIBP identifies the resources that state agencies need to support staff and rapid response capacity statewide.

Containment, which includes interisland control, involves HDOA, DLNR, DOH, UH, Watershed Partnerships, ISCs, HAL, and industry using their authority, programs, and response capabilities to attempt to prevent the spread of invasive species. Containment involves working with producers and industries that ship high-risk commodities interisland and inspecting their cargo. It also involves containing newly found incipient-pests within an island and preventing the spread of noxious established pests into high-value natural communities. Long-term pest management and resource protection requires the participation of HDOA, DLNR, UH, and Watershed Partnerships; federal partners, including USFWS, NOAA, USFS, and NPS; and private industry and landowners. Long-term pest management falls mostly on land managers, both public and private, and this HIBP identifies tasks to support and develop tools for private and public land managers and landowners. Tasks include HDOA biocontrol projects, control of pests in the habitat of threatened and endangered species and protected areas, removal of invasive algae from coral reefs, and control of predators. Challenges related to implementing these strategies and the HIBP objectives and implementation tasks identified to meet these challenges are discussed further below.

The large number of invasive species and their distribution across many different habitats and landowners presents difficult challenges for public and private landowners to control pests and protect important lands and resources. Many public landowners manage protected areas that are open to commercial and recreational uses and are at risk from the introduction of invasive species through commercial and recreational activities. Changes in rules to prevent the introduction and spread of invasive species into protected areas is needed. Similarly, protected aquatic habitats are at risk from the spread of AIS, and stricter regulation of the importation, sale, husbandry, and distribution of high-risk AIS is needed (PosPol2). The ability to enforce biosecurity laws and rules on private and public lands is also a critical issue. An analysis and report of the effectiveness of current enforcement and prosecution of biosecurity laws, and which administrative and criminal penalties should be revised, is needed to provide more effective deterrence and increased compliance (PosPro1).

Detecting and controlling invasive species across a large landscape present difficult challenges. There is often limited technology, infrastructure, funding, and staffing to control wide-spread established pests. Agencies and landowners need to work together to be effective. Cooperative approaches that are needed include statewide surveillance and monitoring programs to enable early detection of and rapid response to new infestations (PosPro1); working with partners to write species-specific and generic emergency response plans (PosPro3); supporting the statewide Watershed Partnerships to assist private and public landowners to control invasive species on their lands; and supporting ISCs and HAL to fill gaps in response capacity at the county level to control high-risk and incipient populations of invasive species on private and public lands (PosPro1). To

provide a more established presence for the ISCs and HAL in the biosecurity program, their funding and organizational structure should be institutionalized in the UH system. Currently, ISCs and HAL exist as research and management programs under PCSU at UH, and this HIBP includes a task to institutionalize funding and organizational structure in UH.

Greater coordination amongst agencies in administrative measures can also help to control the spread of established pests and prevent damage to important areas. Writing best management practices for control of invasive species that agencies, industry, and private individuals can readily access and follow (PosPro1) will give individuals and agencies useful tools they may implement. Additionally, incorporating those standards into Hawaii Environmental Policy Act/National Environmental Policy Act (HEPA/NEPA) reviews, permit and project reviews, and state contracts (PosPro3) will set requirements that would be enforceable.

Hawaii Division of Aquatic Resources diver using super sucker to remove invasive algae. (Source: DAR)

Management of AIS presents similar difficulties as with terrestrial systems. New species are continually arriving, and there is often limited technology, infrastructure, funding, and staffing to control widespread established pests, and the logistical challenges of working in marine environments add complexities. Agencies and community partners need to work together to be effective. Cooperative approaches that are needed include coordinating survey and monitoring efforts among the various public and private agencies and organizations conducting early monitoring for AIS; writing protocols to deal with tsunami and other floating debris after it reaches Hawaii shores; increasing state agency efforts and supporting local community efforts to control and eradicate AIS. Using mechanical removal and native grazers to control invasive algae on at-risk reefs statewide; investigating successful AIS vector control programs in other states and countries; and raising standards for aquaculture and point-of-sale facilities that keep, propagate, and sell imported aquatic species, to minimize chances of release into the wild (PosPro4) are a few strategies identified to control AIS. These programs will require additional funding to implement (PosTifs1).

These expanded efforts to control established terrestrial species and AIS require more resources than is currently being provided. Additional resources for ongoing mechanical and chemical control of invasive species in watersheds, on state lands, on farms and ranches, and in neighborhoods and communities was identified as a major need in meetings with agencies, during stakeholder workshops, and in recent reports (Loope and Kraus 2009, DLNR 2015, HDOA 2015, Rago and Sugano 2015). There is also a need to continually refine and develop control techniques that are more efficient, effective, safe, and/or economical, as well as the means to disseminate this information rapidly so that it can be adopted by those battling invasive species. Some pests are

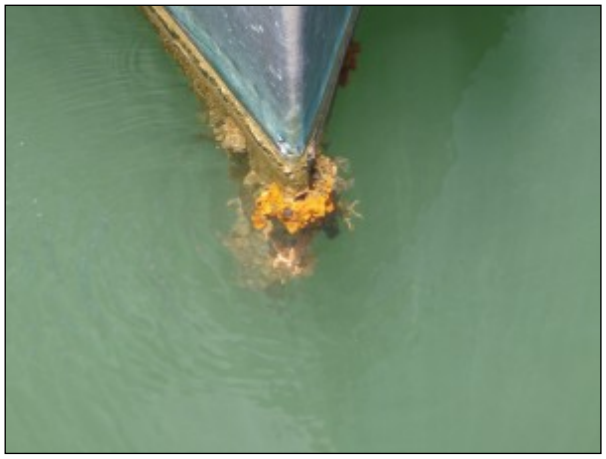
beyond the threshold to eradicate or cost effectively control. Biocontrol is recognized as a key tool for managing established invasive species, particularly insects and the most damaging weeds (Loope and Kraus 2009, HISC 2015). Current facilities for the PPC Branch, including biocontrol research facilities, are outdated and not fully equipped.

To address gaps in staffing in its invasive species control program, HDOA will need to triple the staffing in its PPC Branch; double the size of HDOA's Biological Control Section staff; and build a new office complex, laboratories, and research facility for chemical/mechanical control and biocontrol efforts. HDOA also will update its Animal Industry Division offices and laboratories to monitor and control high-risk animal diseases. HDOA will also need to add new staff members to coordinate statewide surveillance and monitoring programs for high-risk pests, and add operating funds for these programs.

The parasitic wasp (*Aroplectrus dimerus*) was released and is effectively controlling invasive nettle caterpillars (*Darna pallivitta*) in Hawaii. (Source: HDOA)

DLNR likewise has technology, funding, and staffing needs that it must meet to expand its control programs and fill gaps in its terrestrial biosecurity program (PosTifs1). Additional staffing needs include forest health specialists and a forest pathologist to monitor, detect, and manage high-risk pathogens like Rapid Ohia Death. DOFAW manages more than 800,000 acres of forests, and expanding its monitoring of insects and disease threats is critical to protect watersheds. To detect, monitor, remove, and control invasive species in all state-protected areas, including forests and watersheds, additional field crews will be needed. Extending support to private landowners who manage critical watersheds and native species habitat to assist with invasive species control, is a strategy that will enable more regional approaches to invasive species control (PosTifs1, PosTifs2).

A great deal of the support that goes directly to farmers and ranchers in rural communities to help them manage and control invasive species on their properties comes from UH agricultural extension programs in CTAHR. Providing assistance to county farmers and ranchers was identified as a gap in the workshop. Hiring additional UH agricultural and aquaculture extension agents, extension specialists, and researchers both to help control pests on farms, nurseries, and ranches and in surrounding areas and to develop screening and quarantine protocols tailored to Hawaii's needs addresses that gap. Hiring diagnosticians to provide insect and disease identification services for the program will also provide critical support services and is needed. UH also can help county government efforts to support the agricultural community by providing cooperative agreements for its extension agents or ISC staff members to work directly on invasive species control initiatives of concern to the county and work directly with county farmers and ranchers. Another major initiative for the UH is to create and fund positions for ISCs' staff in the university system, which will institutionalize the role of ISCs in the biosecurity program.



The bow of a ship with attached marine organisms. The most common pathway for the introduction of alien marine and harbor species is from hull biofouling, followed by ballast water. (Source: DAR)

A major gap identified during stakeholder meetings was the threat that invasive species introduced to one island would spread to other islands. There is great concern that Rapid Ohia Death on Hawaii Island will spread to the other islands; that the coffee berry borer on Hawaii Island and Oahu will spread to Kauai, Maui, Molokai, and Lanai; that the coconut rhinoceros beetle, in spite of its limited distribution and the ongoing eradication efforts on Oahu, might spread to other islands; and that the little fire ant will continue to spread throughout the state. Similarly, the current interisland movement of commercial and recreational vessels that are encrusted with hull-fouling organisms facilitates the spread of AIS between islands. DAR identified vessel biofouling as the most common pathway for the introduction of alien marine and estuarine species (DLNR 2016).

This HIBP identifies a combination of policy actions, program developments, and staffing and resource increases to prevent the interisland spread of invasive species between islands (PosPol1, PosPro2, PosTifs1). In the near term, a key strategy to achieve this goal will be to focus on preventing known risks from moving between islands, rather than identifying all biosecurity risks associated with interisland transport. Needed revisions to policy include passing statutes and rules to authorize HDOA to screen and inspect nonagricultural commodities (the agency already has limited authority to inspect some agricultural products) in interisland transport, amending rules for stricter regulation of interisland movement of pests and pathogens, regulating the interisland movement of soil, and requiring the use of the emanifest system to track and screen products in interisland shipments (PosPol1). The emanifest system should be designed to be user friendly for the public and industry and should focus on identifying known risks to target for inspection efforts. The plan also includes a policy task directed at preventing the inadvertent movement of marine invasive species by establishing new laws and rules that require both commercial and recreational watercraft moving between islands to be free of hull-fouling organisms and implementing and using a system to track and report compliance (PosPol1).

Invasive species are found on different islands and affect different resources and therefore fall under different agency jurisdictions. For these reasons, invasive species issues are multiagency, cross-sector issues with no single agency acting as the lead. Currently, invasive species are addressed by a complex set of programs housed in different agencies with a mix of inadequate funding sources. Although the HISC was established to coordinate among these programs, the current structure of the HISC does not provide dedicated staffing or funding, nor does it provide a process for nongovernment (e.g., industry) representation on the HISC. A policy initiative in the plan is establishing an autonomous Hawaii Invasive Species Authority, with additional board seats for industry and subject matter experts, to resolve these organizational and coordination limitations and give

industry a seat at the table to help develop ways to more effectively control invasive species, streamline regulatory processes, and work together on common goals. The plan also includes funding support for staffing and a competitive grant program to support projects that fill gaps in other agency programs (PosPol2, PosTifs1).

HDOA's Animal Industry Division manages animal disease detection, screening, and control of outbreaks in the state. Management activities for the program include surveys for the presence of diseases of high concern (brucellosis, pseudorabies, tuberculosis) and effective response and control if they are detected. Animal Industry Division inspectors and veterinary medical staff members have responsibilities to protect animal and public health and engage with producers to promote good animal husbandry practices in order to prevent and control disease outbreaks and enhance local food security. Postborder tasks in the plan that support these objectives include using veterinary certification program data to track the movement of farm animals to prevent and control the spread of disease, developing agreements with county waste management facilities to accommodate disposal of diseased carcasses in the event of a disease outbreak, and providing updated office and laboratory facilities for the administration of the program and investigation of animal diseases that affect food security and human health.

Specific objectives and implementation tasks related to policy, process, and infrastructure and funding resources needed to enhance postborder security in Hawaii are listed below.

3.3.2 Policy-Related Objectives and Implementation Tasks for Postborder

Objective—PosPol1. Enact or Reform Policies Governing Interisland Transport of Commodities and Movement of Invasive Species						
PosPol1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Rating**
PosPol1.1	Propose for enactment necessary legislative amendments to HRS § 150A-5 (and other related sections) to authorize HDOA to screen, **inspect, and regulate nonagricultural commodities** in interisland transport and amend corresponding administrative rules (HAR Chapter 4-72).	2020–2022	ES/EF	HDOA	HDOT DLNR AG HISC	1
PosPol1.2	Propose for enactment the necessary legislation (see also PrePol2.1 and PrePol2.2) and regulations (HAR Chapter 4-72) to authorize HDOA to require the use of the **emanifest reporting and data management system** for interisland shipments.	2020–2022	ES/EF	HDOA	HDOT DLNR AG HISC	1
PosPol1.3	Develop a **comprehensive approach to minimize the interisland movement of plant pathogen and pests** via the interisland transport of agricultural products. This could include one or more mechanisms, such as amend and update HAR Chapter 4-72 for stricter regulation of interisland movement of pests and pathogens, enter into compliance	2018–2020	ES/EF	HDOA	DLNR UH AG	1

Objective—PosPol1. Enact or Reform Policies Governing Interisland Transport of Commodities and Movement of Invasive Species						
PosPol1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Rating**
	agreements, or develop an interisland nursery certification program (see also PosPro2.2).					
PosPol1.4	Revise HDOA or DLNR rules, HAR Chapter 4-71 and HAR Chapter 13-124, and corresponding lists pertaining to nondomestic animals and **injurious wildlife**, to regulate movement of injurious wildlife and set up a permit process to allow legal interisland transport of pets classified as injurious (e.g., parrots).	2022–2023	ES/EF	HDOA DLNR	AG	3
PosPol1.5	Update HAR Chapter 4-72 to further prevent the interisland **movement of pathogens and pests via soil**.	2020–2021	ES/EF	HDOA	AG	1
PosPol1.6	Propose for enactment the necessary legislation and regulations (HAR Chapter 13-76) to require **vessels and waterborne equipment >5 feet long to conduct and document proper hull husbandry management** before being moved or shipped between islands (see also BorPol1.3).	2020–2021	ES/EF	DLNR	HDOT USCG DOH HISC	1

Objective—PosPol2. Improve State Statutes, Rules, and Policy to Manage Invasive Species Already Present in Hawaii						
PosPol2	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PosPol2.1	Propose for enactment the necessary legislation and regulation to restructure the HISC as the **Hawaii Invasive Species Authority,** an autonomous interagency body to manage and administer biosecurity programs.	2017–2019	ES/EF	HDOA	DLNR DOH HISC	1
PosPol2.2	Enter into MOUs with waste management facilities to accommodate disposal of **carcasses associated with disease outbreaks.**	2020–2021	ES/EF	HDOA	DOH	1
PosPol2.3	Propose for enactment the necessary legislative amendments (e.g., through HRS Chapters 150A, 183, 126, 195, and 183C), and promulgate new administrative rules to prevent the introduction of invasive species to natural areas, sensitive ecosystems, and protected areas and the spread of these species in these areas via **commercial activities** such as ecotourism, agrotourism, and construction activities.	2020–2021	ES/EF	DLNR HDOA	AG HISC Industry	3
PosPol2.4	Submit petitions to HDOA to place additional high-risk AIS on the lists of prohibited and restricted animals to **regulate their sale, distribution, culture, husbandry, and spread in the state.** Key issues to address: prevent release of pet aquarium species into natural areas, and include adequate administrative and criminal	2020–2021	ES/EF	DLNR	HDOA HISC USFWS NOAA	1

Objective—PosPol2. Improve State Statutes, Rules, and Policy to Manage Invasive Species Already Present in Hawaii						
PosPol2	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
	penalties that provide effective deterrence and require restoration and mitigation of harm caused related to the intentional introduction or release of AIS.					

3.3.3 Process-Related Objectives and Implementation Tasks for Postborder

Objective—PosPro1. Enhance Protection of Human Health, Native Habitats and Species, Aquaculture, Agriculture, and Other Cultural and Economic Resources of High Value from the Impact of Invasive Species						
PosPro1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PosPro1.1	Surveillance and monitoring coordinator (see also PosTifs1.6) to collaborate with state, federal, county, and private entities to design, build, and coordinate **islandwide comprehensive and uniform surveillance/ monitoring programs for high-risk taxa** (e.g., mosquitoes, plant pathogens, ants, plants, rat lungworm disease and vectors). Surveillance and monitoring to be conducted by other staff from HDOA and partnering organizations such as ISCs and DOH. Role of these positions would be to facilitate uniform data gathering methods and data entry into HDOA's biosecurity database.	2020–2027	ES/EF	HDOA	DLNR DOH USFWS APHIS NPS UH ISCs County Industry	3
PosPro1.2	Contract an independent analysis of effectiveness of current enforcement and prosecution of biosecurity laws, and prepare a report of recommendations on what **administrative and criminal penalties** should be revised to be more effective deterrents.	2020–2021	$50,000	HDOA HISC	DLNR AG USFWS	3
PosPro1.3	In coordination with the overarching Biosecurity Emergency Response Task Force, write species-specific and generic **postborder aquatic and terrestrial emergency response plans** (see also BorPro3.1). Encourage federal, state, and county agencies to develop their own emergency response plans. Key Issues to address: clarification of what constitutes a postborder biosecurity emergency, determination of roles and responsibilities of participating organizations, decision-making processes, commitment of resources for emergency response, a realistic assessment of feasibility of eradication, and determination of when different cease-action triggers are pulled. These triggers relate to when to stop a rapid response, when to engage in long-term control, and when to engage in biocontrol.	2020–2023	ES/EF	DLNR HDOA DOH	HISC ISCs APHIS CBP USFWS NPS HDOT UH HI-EMA County	1
PosPro1.4	Integrate invasive species control and mitigation actions into project requirements	2017–2027	ES/EF	DLNR	OEQC HDOA	3

Objective—PosPro1. Enhance Protection of Human Health, Native Habitats and Species, Aquaculture, Agriculture, and Other Cultural and Economic Resources of High Value from the Impact of Invasive Species						
PosPro1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
	during environmental review and approval processes (e.g., **HEPA/NEPA and ESA consultation**) to protect native resources.				DOH HDOT USFWS NOAA	
PosPro1.5	Institutionalize the funding in the UH system, and create the organizational structure in the Research Corporation of the University of Hawaii (RCUH)/PCSU to **fund and implement the critical services provided by ISCs and HAL** for invasive species control.	2017–2019	ES/EF	UH	HISC DLNR HDOA DOH County USFWS	2
PosPro1.6	Write and adopt **best management practices to control invasive species** that state government agencies, counties, industry, and private individuals can follow or require for actions on their lands.	2018–2027	ES/EF	UH HDOA DLNR DOH	APHIS USFWS USFS USGS NPS County Industry	1

Objective—PosPro2. Enhance Processes to Minimize the Interisland Movement of Invasive Species						
PosPro2	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PosPro2.1	Implement an **emanifest** data management system (see also PosPol1.2 and PrePro1.1) for interisland transport of commodities to improve record keeping and inform interisland risk assessments. Design the interisland system to focus on preventing the known risks and be user friendly to the public and industry.	2020–2027	ES/EF	HDOA	AG HDOT Industry	1
PosPro2.2	Improve **data utilization from livestock movement documents** by collecting and entering data into the HDOA biosecurity database to support animal disease traceability. The existing movement documents that provide the data are the DC-44 (Certificate of Livestock Movement/ Ownership) and DC-8 (Permit to Ship).	2020–2027	ES/EF	HDOA	Industry	3

Objective—PosPro3. Improve Efforts Statewide to Control the Spread and Impact of Established Terrestrial Invasive Species						
PosPro3	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PosPro3.1	Create standardized language for **best management practices** to incorporate into state contracts to minimize the spread of invasive species in the islands.	2017–2019	ES/EF	HDOA	AG DLNR and all other state agencies	3

Objective—PosPro3. Improve Efforts Statewide to Control the Spread and Impact of Established Terrestrial Invasive Species						
PosPro3	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PosPro3.2	Create working group to develop effective solutions that address **carcass disposal**, including carcasses of marine animals.	2018–2027	ES/EF	HDOA	DOH UH County	1
PosPro3.3	Effectively control and eradicate established harmful pests on **private and public lands** by increasing base funding of competitive grants for Watershed Partnerships from the current $2 million per year to $6 million per year. The competitive grant program supports Watershed Partnerships and agency projects and is implemented by agency, Watershed Partnerships, and ISC staff to specifically engage in weed control, ungulate control, and public outreach for watershed protection. This measure is needed for the control of detrimental established invasive species in Watershed Partnerships lands.	2018–2027	$40,000,000	DLNR	HDOA DOH UH	1

Objective—PosPro4. Enhance Efforts Statewide to Prevent the Spread and Impact of Aquatic Invasive Species						
PosPro4	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PosPro4.1	Write protocols and standard operating procedures for statewide field response to inspect, isolate, and appropriately dispose of unexpected arrivals of high-risk AIS of distant origin, such as **materials transported by a tsunami or floating debris from other sea structures or vessels,** and implement those procedures by January 2019.	2017–2018	ES/EF	DLNR	HDOT NOAA USFWS County	1
PosPro4.2	Increase efforts statewide to **control established AIS,** including development of new control techniques, such as the use of Rotenone to control introduced invasive fish. Contribute data gathered to HDOA's biosecurity database.	2018–2027	ES/EF	DLNR	UH NOAA USFWS NPS HDOA HDOT	2
PosPro4.3	Implement comprehensive approaches to remove and **control the spread of algal AIS using mechanical removal, native grazers (e.g., urchins), and other technologies** in at-risk high-value native habitats identified based on survey and monitoring data.	2018–2027	$2,500,000	DLNR	UH NOAA NPS	3
PosPro4.4	Collaborate with DLNR, NOAA, USFWS, UH, research entities, and others and **write uniform survey and monitoring methods for early detection and rapid response** efforts, and clarify the roles and responsibilities of collaborating organizations.	2017–2019	ES/EF	DLNR	UH Bishop Museum NOAA USFWS USGS NPS Industry NGOs	3

Objective—PosPro4. Enhance Efforts Statewide to Prevent the Spread and Impact of Aquatic Invasive Species						
PosPro4	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PosPro4.5	Consult with New Zealand, Australia, and the states of Alaska, Washington, Oregon, California, and Florida on how AIS vectors are managed elsewhere; **conduct in-state studies to document recreational and commercial fleet AIS issues**; and based on the results of research and studies, implement appropriate actions to reduce AIS impacts.	2018–2020	$45,000	DLNR	New Zealand Australia Alaska Washington Oregon California Florida HDOA	2
PosPro4.6	Submit petitions to HDOA to raise **minimum standards for aquaculture and other point-of-sale facilities** (e.g., pet stores and live seafood sellers) to minimize the chance that high-risk species are intentionally or inadvertently released into the wild.	2018–2027	ES/EF	DLNR	HDOA APHIS USFWS	2
PosPro4.7	Provide **training and logistical support** (e.g., boats, personal protective equipment) to local community organizations to effectively control and eradicate established aquatic pests**.**	2018–2027	$800,000	DLNR	HDOA DOH UH	1

3.3.4 Technology, Infrastructure, Funding, and Staffing–Related Objectives and Implementation Tasks for Postborder

Objective—PosTifs1. Increase Funding and Staffing to Control the Spread of Invasive Species Established in the Islands						
PosTifs1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PosTifs1.1	Fund **the Hawaii Invasive Species Authority** to coordinate and implement interagency invasive species efforts, including an annual grant program for interagency projects for control, prevention, outreach, research, and administrative costs.	2018–2027	$77,000,000	HDOA	HISC DLNR DOH HDOT DBEDT UH	1
PosTifs1.2	**Triple HDOA's current PPC staff** from 10 to 30 positions over the 10-year term of the plan, to increase effective plant and pest control using chemical and mechanical methods. Triple the current operating budget to support staff fieldwork.	2020–2027	$5,590,000	HDOA	USFS DLNR UH	1
PosTifs1.3	**Double HDOA's Biocontrol Section's staff** from 24 to 48 positions over the 10-year term of the plan to conduct statewide surveys; provide diagnostic and scientific support to PQ and PPC; and research, screen, and test new biocontrol agents for biocontrol of widespread established pests. Double the current operating budget to support staff fieldwork.	2020–2027	$9,381,240	HDOA	USFS DLNR UH	1
PosTifs1.4	Increase operating funds for HDOA's biocontrol program by $100,000 per year to	2020–2027	$800,000	HDOA	USFS DLNR UH	1

Objective—PosTifs1. Increase Funding and Staffing to Control the Spread of Invasive Species Established in the Islands						
PosTifs1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
	support **exploration of foreign natural enemies** of established invasive species.					
PosTifs1.5	Hire two surveillance and monitoring coordinators—one an entomologist and one a botanist—to coordinate statewide **comprehensive and uniform surveillance/ monitoring programs for high-risk** taxa (e.g., mosquitoes, ants, plants, rat lungworm disease vectors) (see also PosPro1.1).	2020–2027	$1,000,000	HDOA	DLNR DOH USFWS UH	3
PosTifs1.6	Hire **a biological control program coordinator** plus operational support to help increase public support for biocontrol, assist with the regulatory process for biocontrol agents, and coordinate international activities that may be of benefit and impact Hawaii.	2020–2027	$720,000	HDOA	USFS ARS Australia New Zealand	1
PosTifs1.7	Increase **DLNR's AIS program** funding by $400,000 per year to address threats from established AIS (see also PosPro4.2).	2018–2027	$4,000,000	DLNR	UH NOAA USFWS HDOA HDOT	2
PosTifs1.8	**Hire four forest health specialists and one forestry pathologist** to conduct monitoring, detection, and control for high-risk pests and pathogens in forest habitats (e.g., Rapid Ohia Death, ohia rust, myoporum [naio] thrips [*Klambothrips myopori*], lobate lac scale [*Paratachardina pseudolobata*], hala scale [*Thysanococcus pandani*]).	2018–2027	$2,300,000	DLNR	UH HDOA USFS	1
PosTifs1.9	Develop **grant programs to assist private landowners** with invasive species removal and control. **Hire one grant program technical staff member** to oversee the program and annual grant funding.	2018–2027	$5,400,000	DLNR	HDOA USFS Industry	2
PosTifs1.10	Hire **45 invasive species technicians** plus operational support and purchase vehicles to be used to detect, monitor, remove, and control invasive species in DOFAW's protected areas.	2018–2027	$13,984,560	DLNR	UH HDOA USFS	1
PosTifs1.11	Allocate funds in the UH budget to provide stable funding of **core positions for the ISCs and HAL in RCUH/PCSU** in order to carry out invasive species control operations statewide.	2024–2027	$8,397,600	UH	DLNR HDOA HISC	2
PosTifs1.12	**Hire four agricultural extension agents**, and provide operating funds to facilitate areawide control (and prevent the reintroduction) of pests on farms, nurseries, and ranches. Support collaborative efforts to control those targeted pests on farms and in the surrounding areas.	2018–2027	$5,400,000	UH	HDOA DLNR DOH County	1
PosTifs1.13	**Hire two aquaculture extension agents, one extension specialist, and one researcher** to conduct research, develop screening and	2018–2027	$6,600,000	UH	HDOA DLNR	1

Objective—PosTifs1. Increase Funding and Staffing to Control the Spread of Invasive Species Established in the Islands						
PosTifs1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
	quarantine protocols, develop pest management strategies, and conduct outreach specific to Hawaii.					
PosTifs1.14	**Hire four agricultural diagnosticians** to provide for rapid screening, diagnostic testing, and identification of insects and diseases to support extension agents, farmers and ranchers, the general public, and other government agencies in monitoring, detection, and pest management efforts.	2018–2027	$2,340,000	UH	HDOA DLNR	1
PosTifs1.15	Enter into **cooperative agreements between county governments and UH** to support county farmers and ranchers with invasive species early detection, control, and research needs provided by UH extension agents, researchers, or specialists.	2018–2027	$4,000,000	Kauai County Oahu County Maui County Hawaii County	UH	3

Objective—PosTifs2. Develop Infrastructure and Technology to Control the Spread of Established Invasive Species						
PostTifs2	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PosTifs2.1	Build new office complex to house the PPC Branch, which will include new **biocontrol program facilities and chemical/mechanical pest control facilities**. The new campus will include containment facilities sufficient to run 10 parallel biocontrol projects at one time, diagnostic laboratories, molecular diagnostic laboratories, insectaries, pathogen-rearing facilities, greenhouses, office space, chemical and pesticide storage, meeting spaces, and reference collections (insect, disease, plant and literature).	2018–2027	$35,000,000	HDOA	USFS DLNR UH ARS APHIS	1
PosTifs2.2	Upgrade and update **Animal Industry Division office and laboratory facilities** for the investigation of animal diseases that affect food security and human health. Facilities will house a laboratory, training center, and administration and operation services and will be located at the Animals Industry office complex in Halawa Valley, Oahu.	2020–2021	$25,000,000	HDOA	APHIS	1
PosTifs2.3	Annually fund the **development of techniques to control** established invasive species, including chemical and mechanical means and new technologies, such as gene drive and other biotechnology, and support for maintaining or replacing the staff necessary to conduct research.	2018–2027	$2,500,000	HDOA HISC	UH DLNR DOH USFWS	3
PosTifs2.4	Annually fund research and **development of detection techniques** (e.g., use of drones,	2018–2027	$2,500,000	DLNR	HISC UH HDOA	2

Objective—PosTifs2. Develop Infrastructure and Technology to Control the Spread of Established Invasive Species						
PostTifs2	Implementation Tasks	Timeline	Funds Needed	Lead Agency	Partners	Priority Ranking
	remote sensing, environmental DNA) for new and established invasive species.				DOH USFWS	

3.4 Public Awareness and Support

Goal: Enhance Public Awareness and Support for Hawaii Biosecurity

3.4.1 Background

Engaging the community has been shown to be a valuable way to address biosecurity concerns (Warren 2006, HISC 2014, Burnett and Coffman 2015, USN 2015), but in general the residents of Hawaii may not fully appreciate the invasive species problem or the biosecurity threats to our state (Burnett and Coffman 2015, HISC 2015, Rago and Sugano 2015). Enhancing awareness and building public engagement for a comprehensive biosecurity program are essential to gaining the support of the general public, policymakers, and industry for the program. As an additional benefit, an educated and engaged community would assist with detecting and reporting on invasive species, helping to prevent their spread and establishment. Early detection and notification is the key to successful eradication. Inspectors and control staff will not always be in the right place at the right moment to achieve early detection. Having a community that is watchful and knowledgeable about how to report their detections is extremely valuable.

Much progress has been made with invasive species education and outreach. HDOA, DLNR, and DOH all have communications staff members and programs that provide information on invasive species to the public. HISC funds specific outreach projects and outreach staff in the ISCs through its competitive grant program. CGAPS has conducted public outreach campaigns and public opinion surveys on invasive species and has a goal to continue to educate the public and decision makers regarding preventing the introduction of invasive species to Hawaii (Burnett and Coffman 2015). County ISCs distribute educational materials targeting statewide or county-specific invasive species issues (HISC 2015). Even with this concerted effort on the part of agencies and partners to inform the public, many of the participants in the workshops conducted for this plan identified outreach as one of the most important actions to include. The plan provides for many new projects, additional communication specialists staff in HDOA and the UH, and operational support to launch outreach campaigns to meet this need (PwsPro3, PwsTifs2).

Making it easy to report a pest encourages public participation. (Source: HISC)

One of the issues identified during the planning process as a gap is the relative lack of targeted messages for different audiences. Messaging targeted at specific audiences, including those responsible for invasive species introductions, is a critical need (DLNR 2003, HDOA 2007, Hauk et al. 2009). Targeted messages to the agricultural industry, nonprofit agricultural associations, conservation groups, native Hawaiian groups, realtors, homeowners associations, and other interested communities can develop partnerships to facilitate the prevention and control of invasive species (PwsPro3). Similarly, Hawaii lacks an aggressive and organized effort to make visitors aware of the invasive species issue, problem, and regulations in Hawaii, so most visitors are unaware that they are a part of the pest introduction problem (Warren 2006, DeNitto et al. 2015). Key strategies identified during the planning process include developing a campaign targeted at visitors. Done in collaboration with the Hawaii Tourism Authority (HTA), the campaign would target visitors before their arrival, in flight, and during their stay with key messages, including the importance of biosecurity to Hawaii (PwsPro3). The campaign would include new signs and displays regarding biosecurity at airports (PwsTifs1).

Likewise, aquatic education specialists have tasks to target harbor workers, the transportation industry, and the general public with messages about harm done when live AIS are discarded (PwsPro3). HDOA Animal Industry staff would engage the veterinary medical community to participate in detection of diseases of high concern (PwsPro1). The plan also provides resources to hire communications staff members for the UH's CTAHR Office of Communications Services to create comprehensive education and outreach materials targeted at a wide range of audiences, including the native Hawaiian community, tourists, boaters, nursery growers, livestock producers, and farmers with specific invasive species messages (PwsTifs2).

Community outreach events help educate and engage residents and visitors on biosecurity issues. (Source: CGAPS)

Another approach to reach the public involves inspiring Hawaii residents to engage in addressing biosecurity threats (PwsPro1). Key strategies identified during the planning process include producing materials that highlight successes of the biosecurity program and presenting stories about HDOA inspectors' firsthand experience in preventing the introduction of pests to Hawaii. These materials should foster a sense of pride and encourage the public to take responsibility for protecting Hawaii's agriculture, environment, culture, and lifestyle. Another strategy is to encourage Hawaii residents to use locally produced plants and animals rather than imports, which often harbor harmful pests or disease, and to publicize and promote the use of the certified nurseries program for local products.

The successful development and implementation of a comprehensive biosecurity program require the support of the state's policymakers. An objective of the plan is to keep the state's policymakers informed of biosecurity

issues (PwsPro2). This is particularly important because turnover in policy-making positions is high and both new and incumbent office holders need to be kept informed about invasive species issues. Strategies to meet this objective include encouraging the native Hawaiian community and cultural practitioners to advocate for culturally based biosecurity programs and to organize and advocate for stronger and more effective biosecurity programs with their legislators, and encouraging HDOA staff to provide briefings to lawmakers on program successes.

Providing an education about invasive species in schools was identified as a needed step for greater public awareness. The Hawaii Department of Education has strict guidelines on curriculum, and it may require legislation or approval by the Board of Education for policy to require that biosecurity and invasive species issues be included in the environmental science K–12 curriculum. One policy task included in the plan is to propose necessary legislation and work with the Board of Education to achieve this step (PwsPol1). Tasks were included to expand university-level teaching, both classroom and research, on biosecurity problems and solutions to provide an educated and trained workforce for biosecurity programs in the future (PwsPro3, PwsTifs1).

Promoting greater public awareness would require not only traditional methods of community outreach, such as meetings, posters, letters, and email, but also more efficient technology, equipment, and staffing (PwsTifs1, PwsTifs2). Effective outreach requires using the most up-to-date technology and tools. Some of the key approaches identified during the planning process include building a state-of-the-art pest notification and reporting system, building a comprehensive biosecurity website and portal to provide key information to partners and the public, developing social media applications to engage the public and build support for addressing biosecurity issues, and hiring dedicated communications specialists and a natural resource economist as agency staff members to support and implement the outreach program.

Involving communities in invasive species management can create a sense of pride and responsibility regarding dealing with biosecurity issues in Hawaii. (Source: CGAPS)

Protecting the health of the public, as well as the state's livestock and poultry industries, requires a comprehensive and modern pest and disease notification and reporting system able to effectively communicate the most current information about disease occurrence and to initiate actions to prevent or control the entry or spread of pests and diseases (PwsTifs1, PwsTifs2). HDOA's Animal Industry staff needs to engage producers and the veterinary medical community to keep informed when incidences of diseases of high concern occur, provide other biosecurity and food safety notifications, and promote good agricultural practices and production of local food items (PwsPro1). If disease outbreaks do occur, successful animal disease containment

rests on the foundation of good, swift communication of risk in the affected industry and to the general public. Timely notification of disease occurrence in the community greatly influences the final cost of containment, eradication, and recovery (PwsPro3). Development and use of a variety of communication tools, such as social media, industry newsletters, and industry websites, will provide the staff with the tools to more effectively protect the animal livestock industries and safeguard public health (PwsPro1 and PwsPro3).

Specific objectives and implementation tasks related to policy, process, and infrastructure and funding resources needed to enhance public awareness and support in Hawaii are listed below.

3.4.2 Policy-Related Objective and Implementation Tasks for Public Awareness and Support

Objective—PwsPol1. Develop Relevant Policy and Rules to Enhance Public Awareness on Biosecurity and Invasive Species Issues in Hawaii						
PwsPol1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PwsPol1.1	Propose for enactment the necessary legislative amendment or clarification (e.g., clarification of existing authority under HRS §150A-53), and obtain the approval of the Board of Education for policy to **require biosecurity and invasive species issues to be included in the environmental science K–12 curriculum** in Hawaii. Build on existing efforts of integrating invasive species into curriculum, such as the Hoike o Haleakala curriculum.	2022–2023	ES/EF	DLNR	DOE UH HDOA HISC HEEA	2

3.4.3 Process-Related Objective and Implementation Tasks for Public Awareness and Support

Objective—PwsPro1. Inspire Hawaii Residents to Engage in Solutions to Biosecurity Threats						
PwsPro1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PwsPro1.1	Collect pertinent examples and **publish stories highlighting biosecurity successes** (e.g., notable pest interceptions, capture of illegal animals, biocontrol releases, animal disease control programs, weed control programs) to distribute through social media and outreach products (e.g., shareable videos, fliers, newsletter, posters).	2018–2027	$500,000	HDOA	CGAPS UH DLNR HISC	3
PwsPro1.2	Contract a professional public relations firm to produce **outreach materials to encourage residents to buy local products, and foster a sense of pride and self-responsibility** in protecting Hawaii's agriculture, environment, and lifestyle. Have **HDOA inspectors and agricultural producers share firsthand experience** on protecting Hawaii from pests.	2018–2027	$1,500,000	HDOA	UH DLNR CGAPS Industry	2

Objective—PwsPro1. Inspire Hawaii Residents to Engage in Solutions to Biosecurity Threats						
PwsPro1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PwsPro1.3	Coordinate with partners in the industry, nonprofits, and community groups to use their existing media avenues, such as **internal newsletters, cooperative association meetings, social media, websites**, **and newspapers**, to share biosecurity information, send pest and disease notifications, and muster support.	2017–2027	ES/EF	HDOA	Industry UH DLNR CGAPS Nonprofits Community Groups	2
PwsPro1.4	Recruit a network of citizen scientists and other important and competent contributors, and provide logistics and administrative support to develop a **citizen science–based comprehensive surveillance system for pests and pathogens.**	2018–2027	$100,000	HDOA	DLNR DOH NPS UH HEEA	3
PwsPro1.5	Publicize and promote the **certified nurseries program** by posting information on HDOA's website on what nurseries, farms, and shippers are certified and information if participants lose certification.	2017–2027	ES/EF	HDOA	Industry UH HISC CGAPS HEEA	2
PwsPro1.6	Engage the **veterinary medical community** to enhance its role in detection of diseases and parasites of high concern, including ectoparasites, which can transmit wildlife and human diseases.	2017–2027	ES/EF	HDOA	Hawaii Veterinary Medical Association	3
PwsPro1.7	Engage the **education, medical, and public health community** to increase education and public awareness about the dangers from human health diseases, such as dengue, Zika, and rat lungworm disease, and increase outreach efforts regarding control of vectors, including mosquitoes, rats, slugs, and snails, and, in the case of rat lungworm disease, mitigation in gardens and safe food preparation.	2017–2027	ES/EF	DOH	HDOA UH DOE DLNR HEEA Industry Hawaii Medical Association	3

Objective—PwsPro2. Inform the State's Policymakers on Hawaii's Biosecurity Issues						
PwsPro2	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PwsPro2.1	Solicit support from the native Hawaiian community, including the Office of Hawaiian Affairs and the Aha Moku Council, and from cultural practitioners to **advocate for culturally based biosecurity programs** to ensure that natural and cultural resources are sustained for traditional and cultural practices. Encourage native Hawaiian communities to **organize and advocate** with their legislators **for stronger and more effective biosecurity programs**.	2017–2027	ES/EF	HDOA	DLNR DOH UH	3

Objective—PwsPro2. Inform the State's Policymakers on Hawaii's Biosecurity Issues						
PwsPro2	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PwsPro2.2	Highlight program successes in **briefings to lawmakers, county officials, and members of boards and commissions**. Key successes to include: implementation of departmental programs and projects, pest interceptions, capture of illegal animals, biocontrol releases, and weed eradication.	2017–2027	ES/EF	HDOA HISC	DLNR DOH UH HDOT Industry	2

Objective—PwsPro3. Develop an Effective and Comprehensive Education and Outreach Campaign to Inform the Public of Harm from Invasive Species						
PwsPro3	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PwsPro3.1	Biosecurity communications specialist at HDOA to develop outreach materials to launch a **visitor awareness campaign**. Key campaign issues: importance of biosecurity to Hawaii via outreach materials to visitors before their arrival, during flights, and during their stay in Hawaii.	2018–2027	$1,000,000	HDOA HISC	HTA HDOT DLNR CGAPS USFWS HEEA	2
PwsPro3.2	Create and disseminate through various media outlets (e.g., little fire ant video produced by the Maui Invasive Species Committee) accurate and current information to **help the public understand** the circumstances under which species in the state are regulated and why.	2018–2027	ES/EF	HDOA	DLNR DOH CGAPS HEEA	3
PwsPro3.3	Biosecurity communications specialist to **develop tools to measure success** of public awareness campaigns (that can be used to leverage future funding for biosecurity needs).	2018–2027	ES/EF	HDOA	DLNR DOH UH HTA CGAPS HEEA	2
PwsPro3.4	Biosecurity communications specialist to **develop and maintain an interagency biosecurity website and portal**. Key information to include: Hawaii's unique position relative to biosecurity; interagency biosecurity plan; clear guidance on regulated species at interisland, interstate, and international levels; pest reporting; and import/export restrictions.	2018–2027	ES/EF	HDOA	DLNR DOH CGAPS HEEA	2
PwsPro3.5	Help implement HISC's state-of-the-art **pest notification and reporting system**, and integrate it with the biosecurity online portal.	2018–2027	ES/EF	HDOA DLNR	CGAPS DOH UH HEEA	3
PwsPro3.6	Agency staff to **provide technical assistance to community volunteer groups** working to control invasive species in terrestrial and aquatic systems.	2018–2027	ES/EF	DLNR	NOAA USFWS NPS UH	3

Objective—PwsPro3. Develop an Effective and Comprehensive Education and Outreach Campaign to Inform the Public of Harm from Invasive Species						
PwsPro3	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
					CGAPS HEEA	
PwsPro3.7	Aquatic education specialist (existing position) to conduct a comprehensive campaign to **prevent the introduction and spread of AIS**. Key campaign issues: **preventing the discard of live AIS** into the environment, development of outreach materials for harbor workers and transportation industry.	2018–2021	ES/EF	DLNR	NOAA USFWS CGAPS HEEA	2
PwsPro3.8	**Expand University level teaching**, both classroom and research, on biosecurity problems and solutions to provide an educated and trained workforce for biosecurity programs in the future.	2018-2027	ES/EF	UH	HDOA DLNR DOH HEEA	3

3.4.4 Technology, Infrastructure, Funding, and Staffing–Related Tasks for Public Awareness and Support

Objective—PwsTifs1. Enhance Funding, Staffing, and Infrastructure to Build Public Awareness and Support for Hawaii Biosecurity						
PwsTifs1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PwsTifs1.1	**Hire a full-time biosecurity communications specialist** at HDOA to develop and coordinate public awareness programs for HDOA's biosecurity programs.	2018–2027	$650,000	HDOA	DLNR DOH	3
PwsTifs1.2	**Hire a full-time natural resource economist** to analyze the costs of inaction on high-profile biosecurity threats and to publicize the true effects of inaction when requesting funds for biosecurity projects.	2018–2019	$800,000	HDOA	UH DLNR DOH CGAPS	1
PwsTifs1.3	Collaborate with HTA to **obtain funds from the visitor industry** to pay for biosecurity media campaigns.	2018–2027	$1,000,000	HDOA	HTA DLNR	2
PwsTifs1.4	Collaborate with HTA to contract a professional public relations firm to create visually **appealing signs and displays regarding biosecurity at airports**.	2018–2027	$500,000	HDOA	HTA CGAPS HDOT DOH DLNR	2
PwsTifs1.5	Contract the creation and maintenance of a **user-friendly risk assessment tool for vessel operators as it relates to ballast water and vessel biofouling regulation and management**. The risk assessment tool should be available to the public and similar to https://vesselcheck.fish.wa.gov.au/.	2018–2027	$100,000	DLNR	HDOT DOH UH Industry	1

Objective—PwsTifs1. Enhance Funding, Staffing, and Infrastructure to Build Public Awareness and Support for Hawaii Biosecurity						
PwsTifs1	**Implementation Tasks**	**Timeline**	**Funds Needed**	**Lead Agency**	**Partners**	**Priority Ranking**
PwsTifs1.6	**Hire a communications specialist, videographer, and web developer** from CTAHR Office of Communications Services to write, develop and disseminate new statewide comprehensive **education and outreach materials targeted at specific audiences**, such as the native Hawaiian community, tourists, boaters, nursery growers, livestock producers, and farmers, with specific invasive species messages. The CTAHR communications team would work in close coordination with the HDOA biosecurity communications specialist.	2018–2027	$3,000,000	UH	CGAPS DLNR HDOA HTA Industry HEEA	1
PwsTifs1.7	**Hire two university instructors/researchers** to teach and conduct research on biosecurity program and university field of study.	2018–2027	$2,400,000	UH	HDOA DLNR	3

Section 4.0 Analysis of Tasks and Funding

4.1 Analysis of Biosecurity Implementation Tasks

This HIBP identifies 147 implementation tasks that are spread across the four biosecurity program areas (preborder, border, postborder, and public awareness and support) and that represent a rough estimate of the proposed effort. Prevention actions make up the largest effort, 51% of the tasks, which represents the combined preborder (24%, 35) and border (27%, 40) actions (Figure 4.1). This allocation of effort is consistent with the basic principle of biosecurity: to focus more effort on actions to prevent the introduction of invasive species, which can in turn help avoid unnecessary and costly control efforts in the future. Control efforts, or postborder program actions, constitute 32% (47) of the tasks. Twenty-five, or 17%, of the actions identified in this HIBP relate to increasing public awareness and support for Hawaii's residents and visitors. In general, most of the tasks in each of the program areas were process related rather than policy or resource (technology, infrastructure, funding, and staffing) related (Figure 4.1).

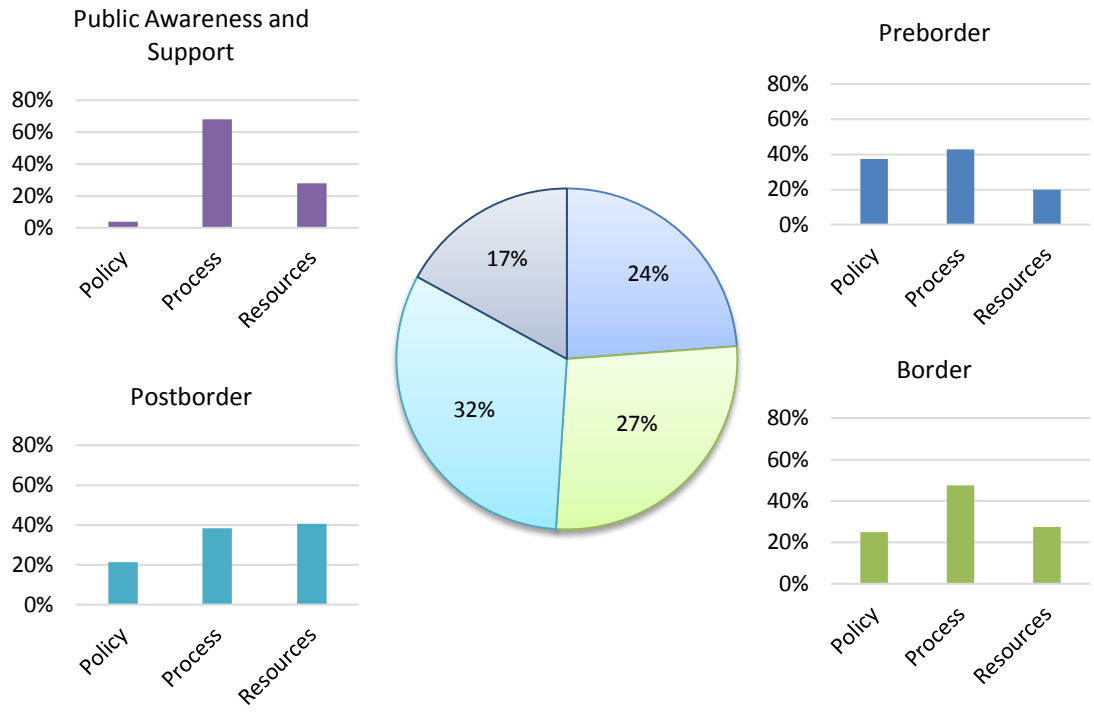


Figure 4.1. Percentage of Biosecurity Implementation Tasks by Program Area and by Type of Action

From the perspective of the type of actions, most of the tasks (68, 46%) are related to implementing new processes and program initiatives, followed by tasks to develop or secure resources of staffing, funding, infrastructure, or technology (45, 31%). The lowest number (34, 23%) of implementation tasks were policy related (i.e., related to updating protocols or administrative rules or formulating new legislation) (Figure 4.2).

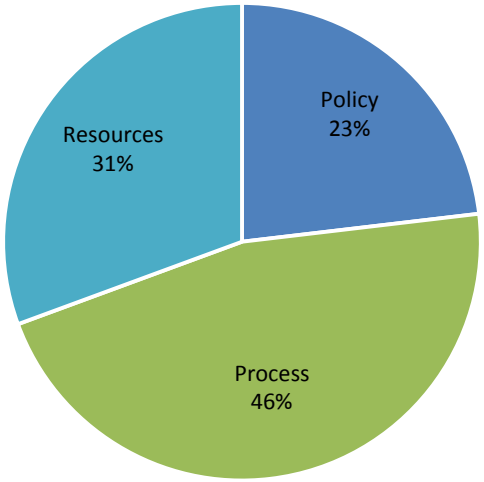


Figure 4.2. Percentage of Hawaii Interagency Biosecurity Plan Tasks by Type of Action

HDOA, as the primary agency involved in all aspects of biosecurity, is the lead on 93 tasks or is responsible for implementing 63% of the plan (Figure 4.3). Its efforts are broadly spread across all program areas, with the largest number of tasks identified in the preborder (31%) and border (27%) program areas. DLNR is the lead agency on 41 (28%) implementation tasks, which includes management of both terrestrial species and AIS programs. Its effort is also spread across all programs areas, but unlike HDOA its largest focus is on postborder (44%) control efforts (Figure 4.3). UH is the lead on nine (6%) tasks involving postborder control and public awareness and support. Its postborder actions primarily involve pest control support for agriculture through CTAHR's research and extension programs. DOH is the primary lead on three tasks (2%), two border and one public awareness and support, involving its vector control program and prevention of human diseases coming into the state. The counties are identified as lead on one task (1%): providing funding to UH extension programs to support pest control efforts in the farming industry in their counties. Of the 147 tasks, 11 tasks have HDOA, DLNR, UH, DOH, or county identified as coleads for implementation.

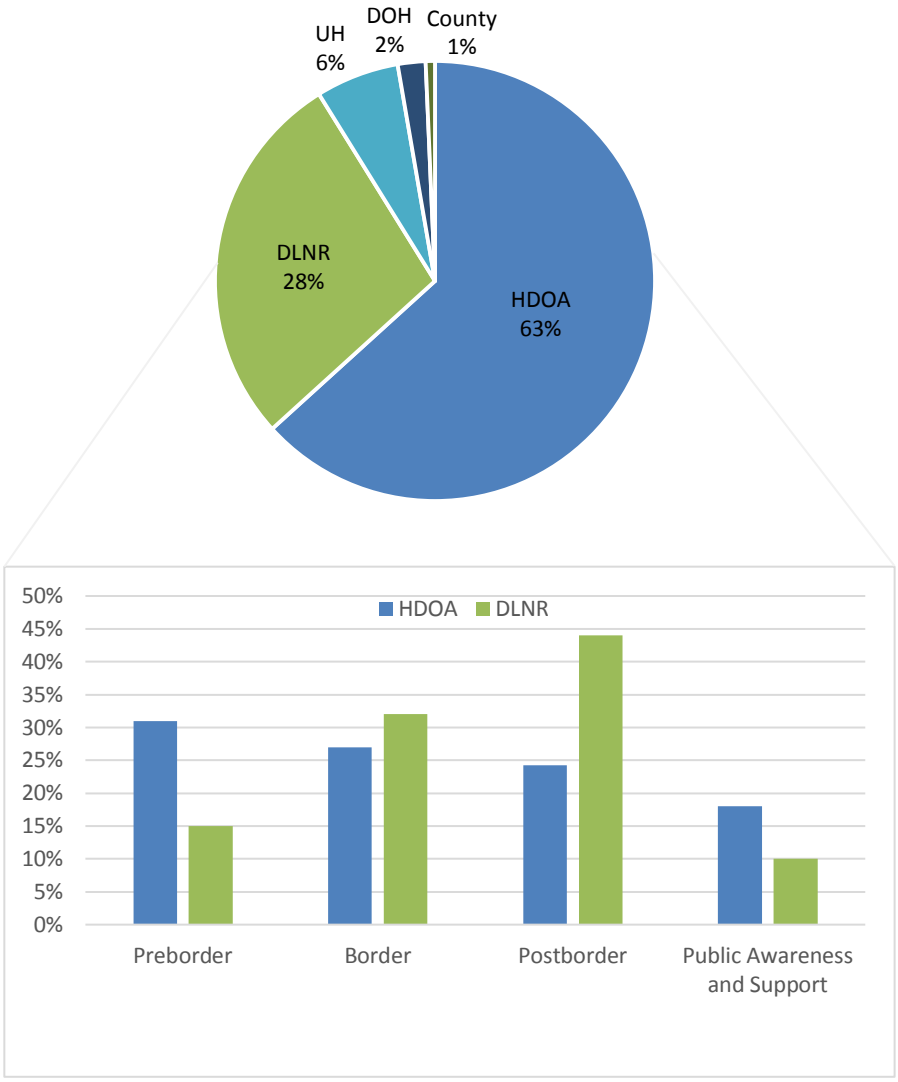


Figure 4.3. Percentage of Biosecurity Implementation Tasks by Agency and Program Area

4.2 Analysis of Funds Required

4.2.1 Overall Costs

The costs described in this HIBP represent the agencies' best estimates of what it would take to implement a realistic but effective biosecurity system. Actual costs associated with implementing this plan may change over time and will depend on both the ability of agencies to implement these tasks and the political will to provide needed policy and funding support. Over the course of 10 years, full implementation of the HIBP will cost approximately $378 million, of which $318 million (84%) are personnel and operating costs and other expenses and $60million (16%) are costs for CIPs for the construction of new facilities (Table 4.1). The operating costs generally increase over time as new staff members are hired and the extent of services increases incrementally over 10 years (Table 4.1). The construction costs of $60 million planned for the first 4 years (FY2018–2019 and FY2020–2021) include costs to build an urgently needed new office complex for HDOA's PPC Branch, new

biocontrol facilities, and funds to update and upgrade offices and laboratory facilities for the AI Division. These facilities are necessary to maintain and expand the basic function for these biosecurity programs.

Table 4.1. Hawaii Interagency Biosecurity Plan Funding by Program Area and Fiscal Year

	FY2018–FY2019	FY2020–FY2021	FY2022–FY2023	FY2024–FY2025	FY2026–FY2027	10-Year Total
Preborder	$2,750,000	$2,160,000	$2,690,000	$2,690,000	$2,690,000	$12,980,000
Border	$9,461,100	$14,730,270	$20,225,570	$24,870,870	$29,345,070	$98,632,880
Postborder	$72,082,304	$62,856,732	$36,391,160	$40,789,388	$43,188,816	$255,308,400
Public awareness and support	$2,310,000	$2,310,000	$2,310,000	$2,310,000	$2,310,000	$11,550,000
Grand total	**$86,603,404**	**$82,057,002**	**$61,616,730**	**$70,660,258**	**$77,533,886**	**$378,471,280**
Construction funds	$35,000,000	$25,000,000	$0	$0	$0	$60,000,000
Operational funds	$51,603,404	$57,057,002	$61,616,730	$70,660,258	$77,533,886	$318,471,280

The overall cost of the plan is a significant investment on the part of the state to implement an effective biosecurity system. When put into context with the overall cost of government, the annual average cost of $37.8 million to fully implement the plan is 0.3% of the state's annual $13.7 billion budget (SOH 2016). The Legislative Reference Bureau estimated annual spending of $57 million on invasive species activities by all state, county, and federal agencies in 2014. Of that amount, state agencies spent $42 million in state, federal, and other funds, including special fund cargo fees (Rago and Sugano 2015). When combined, the current state spending plus the additional funds needed to implement the plan total 0.6% of the state's annual budget. The need for additional support and ideas on how to fund the plan were suggested at the agency, stakeholder, and public meetings. A variety of ideas were suggested, including seeking increased support from general funds, securing more federal funds, establishing a special fund for biosecurity, increasing inspection fees on incoming cargo and passengers, increasing state taxes, and asking the visitor industry to help pay its share.

4.2.2 Costs by Program Area

Preborder costs rely primarily on compliance agreements or actions taken by other jurisdictions, and as such make up only 3% of the costs outlined in this HIBP (Figure 4.4). Ninety-four percent of the budget will support border (26%) and postborder (68%) efforts (Figure 4.4). This amount is not surprising because these program areas require the greatest increases in program infrastructure in the form of new facilities and increased staffing to implement the initiatives to detect and respond to pest incursions at the borders, control high-impact established invasive species in agricultural and natural areas, and prevent their spread between islands.

The highest (68%) cost of postborder efforts involves major program efforts by HDOA, DLNR, and UH to implement 32% of the tasks (Figure 4.1) in the plan. These funds will cover containing and controlling harmful

established pests throughout the state, including constructing new biocontrol facilities, offices and laboratory facilities for plant pest control and animal disease control and adding new staff members, equipment, and technology to effectively control established pests and prevent their spread between islands. These high future costs for control are the consequence of Hawaii's prior history of frequent introduction and establishment of invasive species. The only option agencies have to address these harmful established pests is to continue to contain or control their spread and minimize their impact on high-value resources—sometimes through difficult and expensive mechanisms, such as landscape-scale chemical and mechanical control.

This HIBP builds on the fact that prevention is the most cost-effective strategy to manage invasive species. In contrast to postborder activities, only 29% of the budget (Figure 4.4) will be needed to implement 51% of the implementation tasks (24% preborder plus 27% border tasks, Figure 4.1) planned to prevent the entry of harmful pests into the state. Prevention tasks include adding adequate monitoring, detection, and inspection capacity to prevent introductions and providing resources for emergency responses.

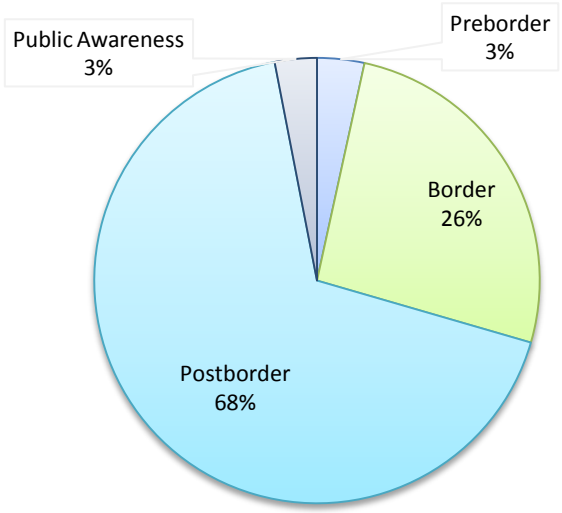


Figure 4.4. Hawaii Interagency Biosecurity Plan Funding by Program Area

Public awareness and support accounts for a relatively small portion (3%) of the overall plan costs (Figure 4.4). This cost is low because public awareness and support tasks will largely involve existing staff members and will add relatively few new positions over the course of the plan (see Section 4.2.4, "New Hires"). However, it should be noted that various other programs supported in this HIBP also provide funding through their competitive grant programs awarded to CGAPS, the ISCs, and watershed partnerships for public outreach and education projects, and those amounts are not reflected in this total.

4.2.3 Costs by Agency

HDOA, which has the broadest responsibilities in all four program areas and the largest share of implementation tasks, will require the largest amount of funding ($264 million, or 70%) over 10 years with an average of approximately $26.4 million per year (Table 4.2, Figure 4.5) to carry out its responsibilities.

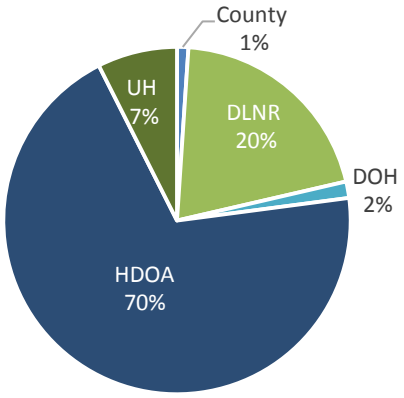


Figure 4.5. Hawaii Interagency Biosecurity Plan 10-Year Cost by Agency

Within this budget, the largest program costs (approximately $157 million, 60% of HDOA funds) are for implementing its postborder program primarily because of increases in staffing for the PPC Branch, building new facilities for the PPC Branch and AI Division, and forming the Hawaii Invasive Species Authority to coordinate and implement interagency efforts for invasive species management. During the last 4 years of the plan, if the ISCs are successfully institutionalized in the UH system (i.e., they create and fund core positions), then fewer funds will be needed by HDOA for postborder program efforts. The second largest (approximately $89 million, 34%, Table 4.2) share of HDOA funds will go toward its border program, which includes an increase in staffing for the PQ Branch and AI Division.

Table 4.2. Funding Levels by Agency and Program Area to Implement Tasks in the 10-Year Hawaii Interagency Biosecurity Plan

	FY2018–FY2019	FY2020–FY2021	FY2022–FY2023	FY2024–FY2025	FY2026–FY2027	10-Year Total
HDOA	**$68,320,000**	**$61,402,424**	**$39,874,848**	**$44,017,272**	**$49,988,596**	**$263,603,140**
Preborder	$2,490,000	$1,900,000	$2,430,000	$2,430,000	$2,430,000	$11,680,000
Border	$7,320,000	$12,815,300	$18,310,600	$22,955,900	$27,430,100	$88,831,900
Postborder	$57,300,000	$45,477,124	$17,924,248	$17,421,372	$18,918,496	$157,041,240
Public awareness and support	$1,210,000	$1,210,000	$1,210,000	$1,210,000	$1,210,000	$6,050,000
DLNR	**13,964,304**	**$14,351,608**	**$15,438,912**	**$16,141,216**	**$17,043,520**	**$76,939,560**
Preborder	$260,000	$260,000	$260,000	$260,000	$260,000	$1,300,000

	FY2018–FY2019	FY2020–FY2021	FY2022–FY2023	FY2024–FY2025	FY2026–FY2027	10-Year Total
Border	$1,162,000	$712,000	$712,000	$712,000	$712,000	$4,010,000
Postborder	$12,522,304	$13,359,608	$14,446,912	$15,149,216	$16,051,520	$71,529,560
Public awareness and support	$20,000	$20,000	$20,000	$20,000	$20,000	$100,000
UH	**$2,540,000**	**$4,300,000**	**$4,300,000**	**$8,498,800**	**$8,498,800**	**$28,137,600**
Postborder	$1,460,000	$3,220,000	$3,220,000	$7,418,800	$7,418,800	$22,737,600
Public awareness and support	$1,080,000	$1,080,000	$1,080,000	$1,080,000	$1,080,000	$5,400,000
DOH	**$979,100**	**$1,202,970**	**$1,202,970**	**$1,202,970**	**$1,202,970**	**$5,790,980**
Border	$979,100	$1,202,970	$1,202,970	$1,202,970	$1,202,970	$5,790,980
County	$800,000	$800,000	$800,000	$800,000	$800,000	$4,000,000
Postborder	$800,000	$800,000	$800,000	$800,000	$800,000	$4,000,000
Grand total	**86,603,404**	**$82,057,002**	**$61,616,730**	**$70,660,258**	**$77,533,886**	**$378,471,280**

* The amount of funding requested by HDOA (for Hawaii Invasive Species Authority competitive grant programs) may be reduced if the ISCs become part of the UH budget under the postborder control program.

To implement its responsibilities across all programs areas, DLNR will require approximately $77 million, or 20% (Figure 4.5, Table 4.2) of the plan costs over 10 years with an average of $7.7 million per year. Out of the $77 million, the vast majority ($72 million, 93%) of program costs for DLNR will be dedicated to early detection, monitoring, and statewide control of established terrestrial and aquatic pests, and expansion of its ballast water and hull-fouling program staff and resources.

The UH will require $28 million, or approximately 7%, in funding support over the 10-year period (Figure 4.5, Table 4.2) of the plan with an average cost of $2.8 million per year. The bulk ($14.3 million, 51%) of UH's requested funds will be used to hire research and extension agents to provide pest control and plant pest and disease diagnostic and other research services to farmers, ranchers, and the nursery growers through CTAHR's cooperative extension programs. Additional ($5.4 million, 19%) UH funds will also go to CTAHR to expand university-level teaching and research on biosecurity and provide outreach and education to targeted stakeholder groups through its communication programs. The increase in funding for UH during the last 4 years of the plan ($8.4 million, 30%) will be needed to create and fund 27 core positions for the ISCs at the county level, providing sustained support for its invasive species management programs.

DOH will require $5.8 million in funding support, representing 2% of the overall plan costs (Figure 4.5, Table 4.2). DOH responsibilities under the plan will focus on the agency's role in implementing the vector control program to prevent the introduction and spread of human disease. The plan proposes to restore staff and field capacity of the vector control program, to monitor and control vectors of human disease, such as mosquitoes

and rat lungworm. Much of DOH's Vector Control Branch program capacity was lost in previous staff layoffs (see Section 4.2.4, "New Hires").

The counties also have a role in supporting and implementing the plan. They are the lead on one task: providing annual funding to the UH extension programs to assist county farmers and ranchers with responding in a timely manner to new pest incursions and managing established invasive species. Under the plan, each county will provide $100,000 per year for the duration of the plan to directly support their county farmers and ranchers. Maui County in 2016 funded operational costs for UH extension agents, and its successful program serves as a model to other counties.

4.2.4 New Hires

Budget cuts following the economic recession in 2008 caused several state agencies to lose many staff positions. Some agencies in FY2017 are still struggling to restore that lost capacity. For example, HDOA's PI Division had a staff of 147 positions in 2008 and lost many positions soon after. Despite economic improvement, the staff capacity in 2016 (121 positions) is still below that in 2008 (Figure 4.6). The PI Division comprises the PPC and the PQ Branches, which primarily execute HDOA's biosecurity program. A reduction in staff positions in these two branches has significantly affected the state's biosecurity functions.

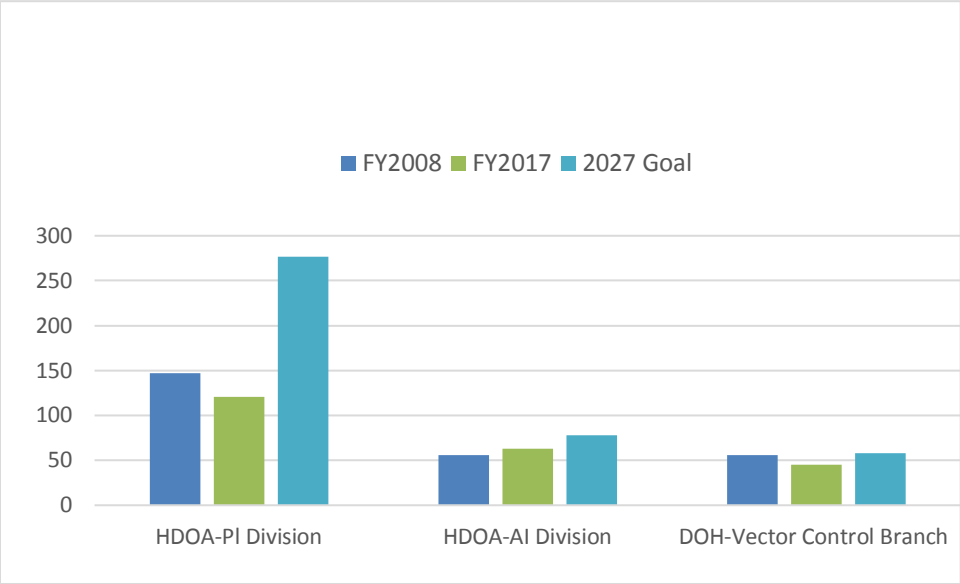


Figure 4.6. Staffing Capacity: Past (FY2008), Present (FY2017), and Future (2027 Goal)

A total of 288 new positions will be added across the four lead biosecurity agencies (HDOA, DLNR, UH, and DOH) over the 10-year span of the plan. To carry out their ongoing and new responsibilities outlined in this HIBP, HDOA will require 172, UH 44, DLNR 59, and DOH 13 new positions. In general, the staff will increase incrementally over the course of the 10-year period as the program initiatives are launched over time.

To execute the existing and new biosecurity initiatives identified in this HIBP, an increase of 93% (172 positions) in PI and AI Division staffs combined (PI Division positions: increase from 121 to 278, 130% increase; AI Division positions: increase from 63 to 78, 24% increase) is planned for HDOA over the next 10 years (Figure 4.7). This significant increase in HDOA's staff capacity will largely go to enhance border protection by ramping up the urgently needed inspections of agricultural and nonagricultural products (later, after appropriate regulations are in place) at Hawaii's borders, as well as inspection of commodities transported interisland. Positions added to postborder programs at HDOA will contribute to established plant pest control in agricultural and natural areas. Thirteen positions will be added to preborder programs to develop the needed changes in policy and regulations, conduct risk analysis for imports, and manage the biosecurity database and emanifest system. Positions of biosecurity communications specialist and natural resource economist at HDOA will guarantee focused and consistent biosecurity outreach not only to Hawaii's stakeholders but to its visitors. Fifty-one of the 59 positions being added to DLNR will support postborder biosecurity efforts (Figure 4.7). These efforts will include control of established invasive plants and animals in Hawaii's watersheds and other natural areas and monitoring of forest health conditions statewide. Six positions related to ballast water and hull fouling programs will support border protection. Two positions will be added to the AIS preborder program to conduct risk analysis on vessels, pathways, and on organisms entering Hawaii via ballast water, hull fouling, aquaculture and pet industry pathways.

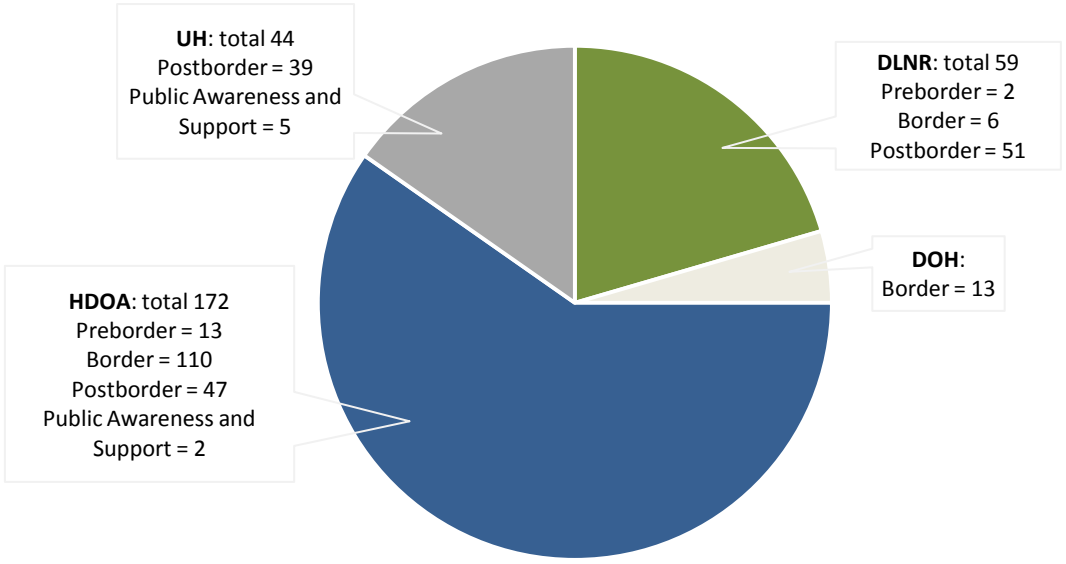


Figure 4.7. Staffing Needed to Implement the Hawaii Interagency Biosecurity Plan by Agency

Thirty-nine of the 44 new positions at UH will support postborder biosecurity programs. These new positions at UH will staff ISCs for early detection and control, and extension agents and researchers at CTAHR's cooperative extension program to assist farmers and ranchers with control of agricultural pests and diagnostic services. Three technical staff members will also be hired at CTAHR's Office of Communications Services to write, develop, and disseminate new statewide comprehensive education and outreach materials targeting

specific key audiences. Two instructors/researchers will be added to expand university-level instruction both in the classroom and in the field to research biosecurity issues and produce an educated and trained workforce for biosecurity programs in the future.

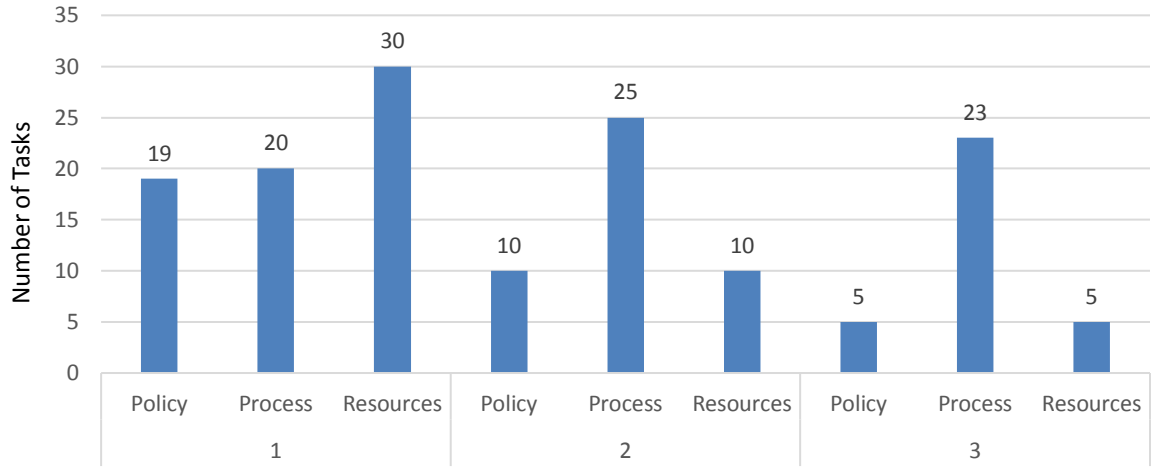
The 13 new positions that will be added at DOH over the next 10 years will staff its Vector Control Branch and will protect human health by helping prevent the introduction and spread of disease-causing vectors, such as mosquitoes. It should be noted that Figure 4.6 identifies staffing capacity for DOH's Environmental Health Services, which provides vector control in addition to many other services. Shortly after the recession began in 2008, DOH's Vector Control Branch was decommissioned. A dengue outbreak in Hawaii, among other biosecurity issues, was instrumental in driving home the importance of reinstating DOH's Vector Control Branch, and it was only in FY2017 that 20 new positions were restored to this branch. Depending on the type of threat to public health in the state, it is possible that DOH might need more than the 13 positions budgeted for in this HIBP.

4.3 Analysis of Task Prioritization

As discussed in Section 2.0, "Introduction," each lead agency prioritized the implementation tasks for which it was designated as the lead. The priority ranking was subjectively based on the following criteria: 1= critical for effective biosecurity, 2 = strongly beneficial for effective biosecurity, and 3 = generally beneficial for effective biosecurity.

4.3.1 Priority Ranking by Type of Action and Program Area

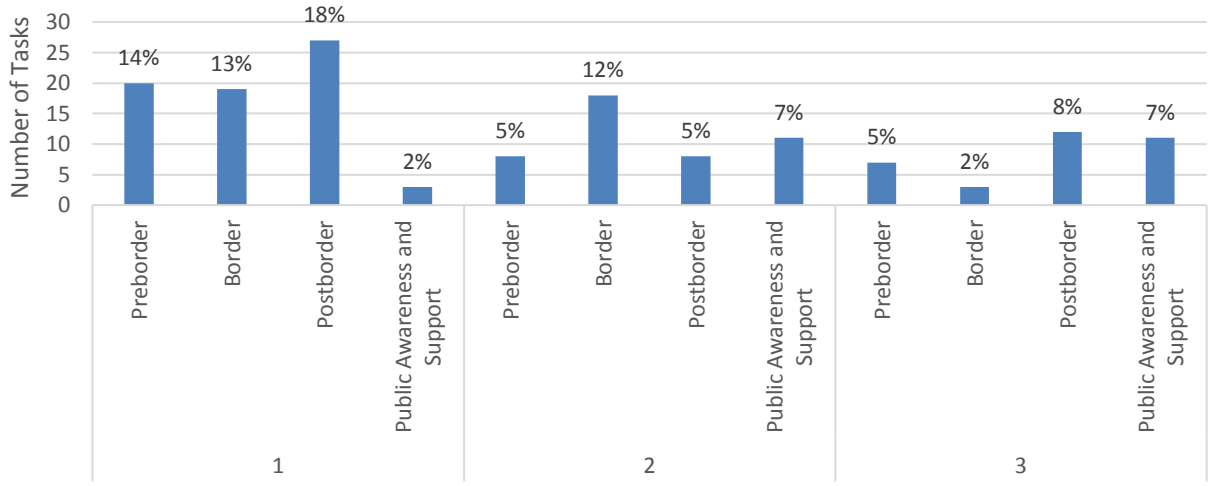
Of the 147 tasks, 69 tasks (47%) were identified as Priority 1, critical for effective biosecurity; 45 tasks (31%) were identified as Priority 2, strongly beneficial; and 33 tasks (22%) were identified as Priority 3, generally beneficial. Of the Priority 1 tasks, 19 (13%) were policy actions, 20 (14%) were process actions, and 30 (20%) were resource-related (technology, infrastructure, funding, and staffing) actions, emphasizing the importance of securing more resources for existing and new tasks across all program areas (Figure 4.8).



Priority Ranking: 1 = critical for effective biosecurity, 2 = strongly beneficial for effective biosecurity, 3 = generally beneficial for effective biosecurity.

Figure 4.8. Priority Ranking of Number of Biosecurity Implementation Tasks by Type of Action

Among the Priority 1 tasks, the combined number for preborder (20) and border (19) tasks represents the highest (39, 27%) number of implementation tasks compared to other program areas and prioritization categories (Figure 4.9). Similar to the allocation of effort (as discussed in Section 4.1), this prioritization is also consistent with the basic principal of biosecurity wherein a larger number of preborder and border program area tasks to prevent the introduction of invasive species fall in the highest-priority (Priority 1) category.



Priority Ranking: 1 = critical for effective biosecurity, 2 = strongly beneficial for effective biosecurity, 3 = generally beneficial for effective biosecurity.

Figure 4.9. Priority Ranking of Number of Biosecurity Implementation Tasks by Program Area

4.3.2 Costs by Priority Ranking

Overall, Priority 1 tasks, or the tasks that are critical for an effective biosecurity program, will require the greatest share of the overall budget: 75% ($283 million) of the estimated 10-year costs (Figure 4.10). Priority 2 and Priority 3 tasks will require 12% ($44 million) and 13% ($50 million), respectively, of the overall costs. It is not surprising that almost all of the Priority 1 funds and approximately 70% of the Priority 2 funds will be needed for resource-related tasks. The costs associated with supporting urgently needed technology (e.g., updating and installing new databases) and infrastructure (e.g., biocontrol and AI Division facilities) and hiring new staff members are higher compared to the costs associated with policy- or process-related tasks, most of which are planned to be executed using existing staff members and resources. Although the industry and other stakeholders were not involved in the prioritization, in general, these urgently needed resource-related tasks also were supported by them and the public participants involved in the planning process.

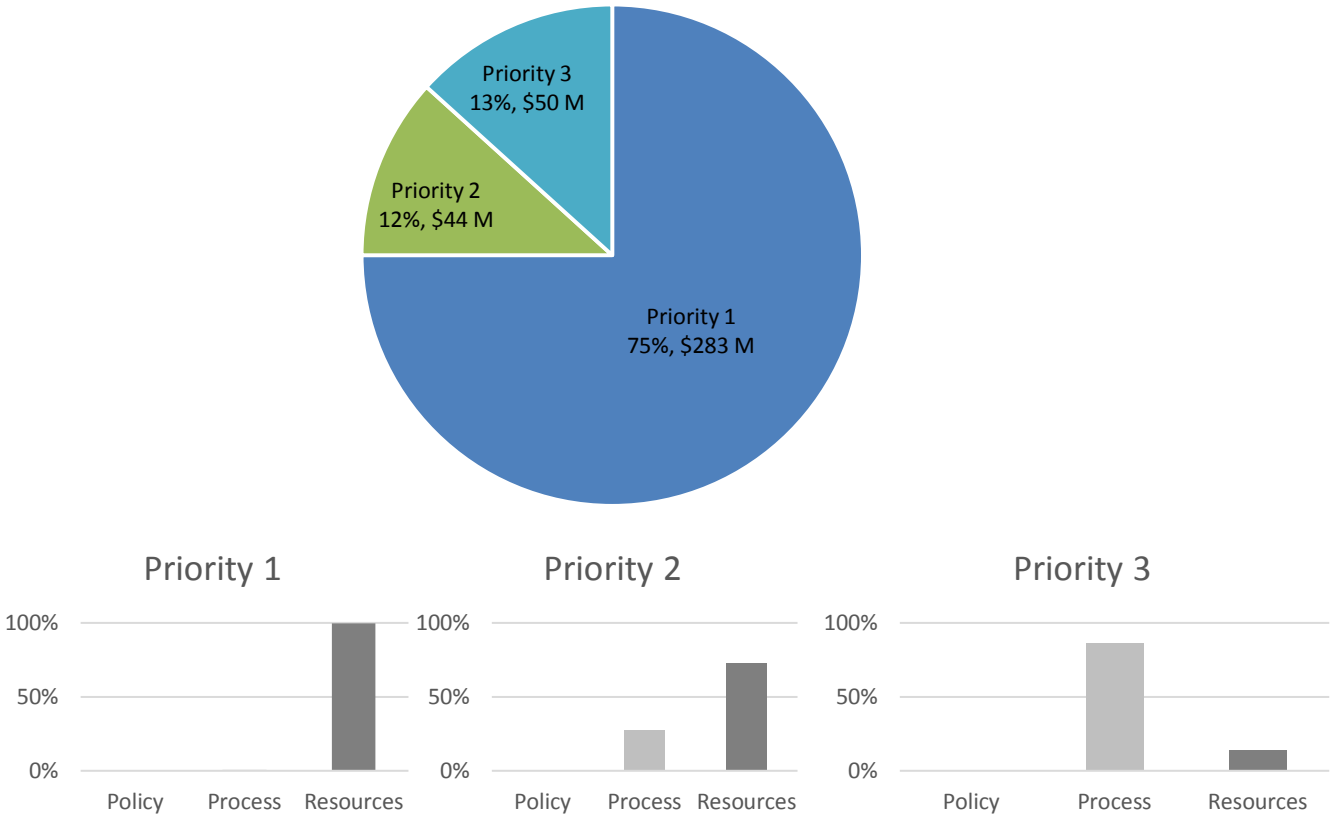
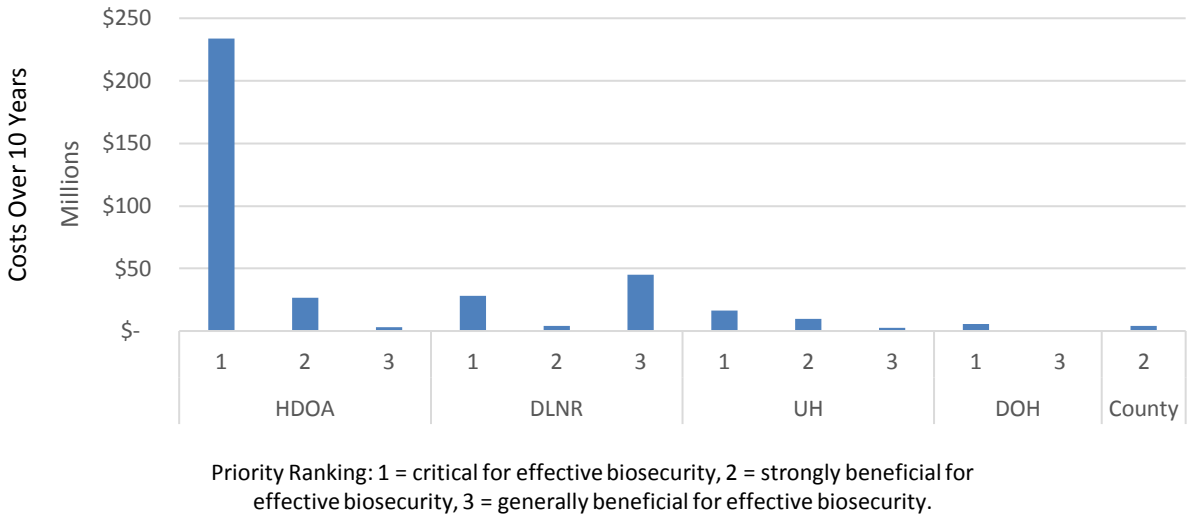


Figure 4.10. Hawaii Interagency Biosecurity Plan Costs by Priority Ranking and Action Type

Over the 10-year life of the plan, HDOA will require the largest share ($234 million) of the total budget to implement the largest number (45) of tasks that fall in the Priority 1 category. DLNR's critical tasks will cost $28 million, UH's critical tasks will cost $16 million, and DOH's critical tasks will cost $5.8 million. An additional $94 million will be needed to implement the remaining Priority 2 and 3 tasks of all the agencies (Figure 4.11).



Priority Ranking: 1 = critical for effective biosecurity, 2 = strongly beneficial for effective biosecurity, 3 = generally beneficial for effective biosecurity.

Figure 4.11. Prioritization of Biosecurity Implementation Tasks by Agency

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Appendix A. Plan Implementation and Budget Matrix

Item #	Task #	Implementation Task	Timeline	Lead Agency	Partners	Priority Ranking	Budget and Implementation Detail	10 Year Total	FY2018-FY2019	FY2020-FY2021	FY2022-FY2023	FY2024-FY2025	FY2026-FY2027	# New hires
1	PrePol1.1	Propose for enactment the necessary legislative amendments to HRS §150A-5 (and other related sections) to enable HDOA to screen and inspect nonagricultural commodities and amend or promulgate corresponding administrative rules, as needed.	2017–2019	HDOA	AG HDOT	1	ES/EF	ES/EF						
2	PrePol1.2	Propose for enactment the necessary legislative amendments (e.g., an amendment to the list of commodities regulated by statute, as proposed in Prepol2.1), and promulgate administrative rules in accordance with HRS §§ 150A-9 and -53 to implement a comprehensive emanifest system. Examples include redefine "inspect" to include electronic release, authorize HDOA to prescreen and release commodities electronically, and require manifests to indicate whether the goods are of foreign or domestic origin and the port of origin.	2017–2019	HDOA	AG	1	ES/EF	ES/EF						
3	PrePol1.3	Amend HAR Chapter 4-70 to enable HDOA to require importers to treat/fumigate commodities identified by HDOA as a high biosecurity risk. Use fumigation of coffee imports as a successful model system.	2020–2021	HDOA	AG	2	ES/EF	ES/EF						
4	PrePol1.4	Require declaration of high-risk packaging materials in shipments to Hawaii regardless of commodity.	2022–2023	HDOA	HDOT	3	ES/EF	ES/EF						
5	PrePol1.5	Amend HAR Chapter 4-70 to update quarantine requirements for tissue-cultured plants. Certified tissue-cultured plants indexed for targeted pests and pathogens by a qualified lab independent of the exporter and imported in sealed vials and in sterile media should not be quarantined as long as these plants are of species, subspecies, variety, or type that can otherwise be permitted for importation.	2020–2021	HDOA	UH	3	ES/EF	ES/EF						
6	PrePol1.6	Amend HAR Chapter 13-76 to make it consistent with USCG ballast water regulations. For example, develop and implement minimum ballast water discharge standards for organisms and certain indicator microorganisms.	2017–2021	DLNR	DOH HDOT USCG	1	ES/EF	ES/EF						
7	PrePol1.7	Obtain an MOA between the Office of the Governor of Hawaii, DOD, and other federal quarantine and regulatory agencies to require that military vessels (including those participating in Rim of the Pacific Exercise) entering Hawaii meet state standards regarding ballast water treatment and hull cleaning.	2020–2021	DLNR	DOD APHIS USCG	3	ES/EF	ES/EF						
8	PrePol1.8	Submit petitions to HDOA to either add unlisted high-risk AIS organisms to the list of prohibited species or change list placement (e.g., from conditionally approved to restricted or prohibited list) to allow for more stringent regulation.	2022–2023	DLNR	AG HDOT	2	ES/EF	ES/EF						

Item #	Task #	Implementation Task	Timeline	Lead Agency	Partners	Priority Ranking	Budget and Implementation Detail	10 Year Total	FY2018-FY2019	FY2020-FY2021	FY2022-FY2023	FY2024-FY2025	FY2026-FY2027	# New hires
9	PrePol2.1	Enter into cooperative agreements with other state departments of agriculture or with private industries to establish offshore screening programs (similar to HDOA's current Christmas tree screening program in Oregon) for high-risk commodities being shipped to Hawaii.	2020–2021	HDOA	AG HDOT	1	ES/EF	ES/EF						
10	PrePol2.2	Amend HRS Chapter 4-70 to require phytosanitary certificates for high-risk plant materials imported from domestic sources, and identify needed federal actions or enter into cooperative agreements to obtain phytosanitary certificates for imports of high-risk plant materials from foreign sources (also see PrePol1.1).	2020–2021	HDOA	AG APHIS	1	ES/EF	ES/EF						
11	PrePol3.1	Complete an analysis of international and federal laws and regulations that currently preclude the state from taking effective action to prevent the introduction of invasive species to Hawaii, and list amendments and recommendations to better protect Hawaii (also see PreTifs2.1). Key Issues include working with APHIS on solutions to state quarantine needs relative to the Plant Protection Act, determining whether insular areas can get special recognition in the United States from a biosecurity perspective, and strengthening federal quarantine laws dealing with nonagricultural products.	2018–2019	HDOA	AG DOH HISC DLNR (for aquatics) HDOT APHIS USFWS CBP DOD	2	ES/EF	ES/EF						
12	PrePol3.2	Consult with the California and Florida Departments of Agriculture regarding what state and federal laws, regulations, and policies have been enacted to give them special protection at the state level, and produce recommendations to enact comparable protection for Hawaii.	2017–2019	HDOA	AG CDFA FDACS	2	ES/EF	ES/EF						
13	PrePol3.3	Align the notifiable disease list with internationally and nationally recognized lists of existing threats to domestic livestock (terrestrial and aquatic).	2017–2020	HDOA	USDA OIE	1	ES/EF	ES/EF						
14	PrePro1.1	Implement a comprehensive emanifest system that is effective no later than January 1, 2020. The system must be able to collect relevant nonproprietary information, authorize HDOA to prescreen and release commodities electronically, require manifests to indicate whether the goods are of foreign or domestic origin, identify port of origin, and be implementable on a trial basis between 2017 and 2019 to identify the need for any improvements. (Also see PrePol1.2)	2017–2020	HDOA	HDOT	1	ES/EF	ES/EF						
15	PrePro1.2	Conduct risk analyses of terrestrial plants, pests, diseases, commodities, and pathways to prioritize screening and inspections. When warranted by science and risk assessments, take the next policy, process, and staffing steps in collaboration with federal partners to approve and implement more restrictive state policies and rules—and seek complementary federal policies and rules—to protect Hawaii from the introduction of new pest threats.	2018–2027	HDOA	APHIS UH DLNR	1	ES/EF	ES/EF						

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16	PrePro1.3	Based on the results of the risk analyses, annually write/update import requirements for high-risk commodities imported to Hawaii.	2020–2027	HDOA	APHIS UH DLNR	1	ES/EF	ES/EF						
17	PrePro1.4	Implement a state-of-the-art biosecurity database system within HDOA to meet important functions, such as emanifest, efficient input from risk assessments, capability to house survey and taxonomic data, ability to communicate among different databases, and ability to produce query-specific reports.	2017–2025	HDOA	DLNR	1	ES/EF	ES/EF						
18	PrePro1.5	Obtain MOUs for sharing data between state and federal agencies and the industry that facilitate sharing relevant biosecurity information and also ensure proper handling of proprietary or confidential information.	2017–2018	HDOA	APHIS DLNR Industry	2	ES/EF	ES/EF						
19	PrePro1.6	Conduct an annual policy review of animal disease import regulations to identify new threats and ensure that adequate biosecurity measures are taken.	2017–2027	HDOA	APHIS Industry	3	ES/EF	ES/EF						
20	PrePro1.7	Conduct risk assessments for hull fouling, ballast water, aquaculture, and aquarium issues to better inform regulation of AIS organisms being introduced via these pathways and affecting native habitats.	2017–2027	DLNR	DOH HDOT USCG HDOA APHIS USFWS Industry Pacific Regional States and Countries	1	ES/EF	ES/EF						
21	PrePro2.1	Create working groups with representatives of the food, forestry, livestock, biofuel, and landscape industries to work with HDOA's import substitution program (also see PreTifs2.4), DLNR, and UH staff to substitute importation of plants (already in Hawaii) that pose a high-risk pathway for the introduction of pests and pathogens with plants that can be grown locally. Reduce importation with local production by 2027.	2017–2027	HDOA DLNR	UH USFWS	3	ES/EF	ES/EF						
22	PrePro2.2	Create working groups with representatives and end users of the aquaculture, wetland agriculture, and aquarium industries to work directly with agency staff to identify high-risk pathways and standards for facilities and institute self-policing practices to minimize AIS threats.	2017–2027	DLNR	HDOA USFWS Industry UH	3	ES/EF	ES/EF						
23	PrePro3.1	Enter cooperative agreements with ecommerce industries (e.g., online plant nurseries, pet stores) to include language on their websites about what is not allowed to be imported or shipped to Hawaii, and compel them to follow existing import regulations.	2020–2021	HDOA	AG DLNR USFWS Industry	3	ES/EF	ES/EF						
24	PrePro3.2	Enter MOAs with DOD to allow for the inspection and clearance by HDOA of any military vessel and related cargo and equipment entering Hawaii and to identify and close gaps in policy, process, and procedures to prevent inadvertent introduction of invasive species via household goods, equipment and other materials transported by DOD's units and contractors.	2018–2027	HDOA	DOD DLNR USDA	1	ES/EF	ES/EF						

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25	PrePro3.3	In collaboration with other state and federal regulatory agencies, establish an intelligence unit with the purpose of identifying and preventing illegal introductions (including ecommerce) to Hawaii.	2017–2027	HDOA	AG DLNR APHIS CBP USFWS USCG	2	ES/EF	ES/EF						
26	PrePro4.1	Write Hawaii-specific standards and protocols for use in compliance agreements for offshore prescreening of agricultural and nonagricultural commodities en route to Hawaii.	2020–2021	HDOA	APHIS Industry	1	ES/EF	ES/EF						
27	PrePro4.2	Enter into cooperative agreements or contracts with private industry to conduct inspections at transitional facilities at offshore sites for high-risk import commodities.	2022–2027	HDOA	AG APHIS Industry	1	$100,000/year for contracts for 6 years, FY2022-2027.	$600,000			$200,000	$200,000	$200,000	
28	PreTifs1.1	Fund equipment and licensing to support the emanifest system.	2019–2027	HDOA	HDOT	1	$250,000 to purchase and install equipment in 2019, $30,000/year for maintenance from FY2020-2027.	$490,000	$250,000	$60,000	$60,000	$60,000	$60,000	
29	PreTifs1.2	Fund equipment and licensing to support HDOA's biosecurity database system.	2019–2027	HDOA	DLNR	1	$1,000,000 to purchanse and install equipment in 2019. $120,000/year for maintenance from FY2020-2027.	$1,960,000	$1,000,000	$240,000	$240,000	$240,000	$240,000	
30	PreTifs1.3	Fund equipment, licensing, and employee training on data systems that will record the movement of livestock animals and hold prearrival testing results. The data are aligned with existing federal databases to track movement and animal identification for disease trace-back.	2019–2027	HDOA	APHIS	2	$100,000 to purchase and install equipment in 2019, $20,000/year maintenance from FY2019-2027.	$260,000	$100,000	$40,000	$40,000	$40,000	$40,000	
31	PreTifs2.1	Hire two policy analysts to conduct international, federal, and state policy analysis and write necessary rules and regulations listed in this plan.	2018–2027	HDOA	DLNR DOH	1	$55,000/year/position for 10 years	$1,100,000	$220,000	$220,000	$220,000	$220,000	$220,000	2
32	PreTifs2.2	Hire three entomologists, two plant pathologists, and two botanists at HDOA to conduct risk analysis on pathways and on organisms and commodities entering Hawaii.	2018–2027	HDOA	DLNR UH	1	Add 7 new positions at $55,000/position/year. Add 2 in FY2018-2019, 2 more in FY 2020-2021 (4 positions), and 3 more in 2022-2023 (7 positions) and ontinue for the remainder of 2024-2027.	$2,970,000	$220,000	$440,000	770000	$770,000	$770,000	7
33	PreTifs2.3	Hire four data management specialists to support HDOA's new biosecurity database system.	2018–2027	HDOA	DLNR	1	Add 4 new positions incrementally as program responsibilities expand. Add 2 in FY2018-2019, and 2 more in FY2020-2021. $50,000/year/position.	$1,800,000	$200,000	$400,000	$400,000	$400,000	$400,000	4
34	PreTifs2.4	Fund an annual import substitution program to encourage Hawaii growers to identify and grow food and nonfood alternative products to phase out imports of high-risk pathway food/commodities by 2027.	2018–2027	HDOA	UH Industry	2	$250,000 for a grant program per year for 10 years.	$2,500,000	$500,000	$500,000	$500,000	$500,000	$500,000	
35	PreTifs2.5	Contract or hire two biologists at DLNR to conduct risk analysis on vessels, pathways and organisms entering Hawaii via ballast water, biofouling, and aquaculture and pet industry pathways.	2018–2027	DLNR	HDOA DOH USCG	1	Contract or hire 2 new position at $65,000/year/position for 10 years.	$1,300,000	$260,000	$260,000	$260,000	$260,000	$260,000	2
36	BorPol1.1	Propose for enactment appropriate legislation (through HRS Chapter 150A) to enable HDOA oversight and establishment of transitional facilities in Hawaii for freight inspection and quarantine.	2017–2019	HDOA	AG	1	ES/EF	ES/EF						
37	BorPol1.2	Propose for enactment appropriate legislation (through HRS Chapter 150A) to enable HDOA to require the importer to transport shipped commodities that HDOA determines to be of high risk to state-designated inspection facilities.	2017–2019	HDOA	AG	1	ES/EF	ES/EF						

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38	BorPol1.3	Propose for enactment necessary legislation (through HRS Chapter 141 or 150A) to create a biosecurity emergency response fund to support multiagency terrestrial and aquatic emergency responses at or beyond (postborder) ports by emergency task forces (see also BorPro3.1).	2018–2019	HDOA	DOH HDOT DLNR	1	ES/EF	ES/EF						
39	BorPol1.4	Propose for enactment legislation to move enforcement of HDOA's importation statutes and regulations under the Hawaii Environmental Court by amending HRS § 604A-2 to include civil fines for violations of HRS Chapter 150A within the Environmental Court's jurisdiction.	2022–2023	HDOA	AG	1	ES/EF	ES/EF						
40	BorPol1.5	Amend the current penalty section in HRS §142-12, relating to violations of AI Division Quarantine Rules, to authorize issuance of administrative citations for minor violations such as failure to file written or verbal reports in prescribed time, or failure to provide nonconsequential information on shipping and import forms.	2018–2020	HDOA	AG	2	ES/EF	ES/EF						
41	BorPol1.6	Propose for enactment the necessary legislation to authorize DLNR to inspect vessels and regulate hull-fouling threats, with penalty provisions for noncompliance.	2018–2019	DLNR	HDOT DOH USCG	1	ES/EF	ES/EF						
42	BorPol1.7	Collaborate with CBP, APHIS, CDC, and HDOA to review agency authorities, policies, and procedures and write a plan to take preventive action when disease-carrying vectors not on the APHIS actionable list (e.g., mosquitoes) are found in foreign cargo or conveyances (unintentional import).	2017–2019	DOH	APHIS CBP CDC HDOA	2	ES/EF	ES/EF						
43	BorPol2.1	Amend HRS 141-3 to provide HDOA the flexibility to not have to cover the costs associated with the control of noxious weeds and update the state's noxious weed list and noxious weed seed list as outlined and/or required in HAR Chapter 4-68 and HAR Chapter 4-67, respectively, to include invasive plant species harmful to Hawaii's agriculture and natural systems.	2018–2019	HDOA	AG DLNR UH HISC	2	ES/EF	ES/EF						
44	BorPol2.2	Promulgate administrative rules, as required under HRS § 150A-6.1, to add species to the restricted plant list, and regulate or prohibit the introduction, sale, distribution, and propagation of specific plants put on the restricted plant list.	2018–2020	HDOA	DLNR AG UH HISC	2	ES/EF	ES/EF						
45	BorPol2.3	Update HAR Chapter 13-124 to add aquatic species to the state's injurious wildlife list.	2020–2021	DLNR	HDOA AG USFWS NOAA UH HISC	2	ES/EF	ES/EF						
46	BorPro1.1	Implement inspections by state detector dogs to intercept high-risk species difficult to detect by other methods of inspection or at ports of entry difficult to inspect with other methods (see also BorTifs1.3).	2017–2027	HDOA	APHIS CBP DLNR	1	ES/EF	ES/EF						

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47	BorPro1.2	Write a set of minimum standards, specifications, and operational protocols that would constitute HDOA's certification program for operating transitional facilities in Hawaii. For example, secure facilities with appropriate mechanisms, such as fences, double doors, and negative pressure, to contain any pests encountered; appropriate processes executed when pests are found; and appropriate equipment based on the type of goods being inspected, such as air conditioning and refrigerators for perishable goods. Work with industry on specifications and operational protocols.	2017–2019	HDOA	Industry APHIS AG UH	1	ES/EF	ES/EF						
48	BorPro1.3	Enter into public-private partnership (e.g., contracts, cooperative agreements) to operate transitional facilities for freight and commodity inspections in Hawaii under HDOA's transitional facility certification program (see also BorPro1.2).	2017–2027	HDOA	AG Industry	1	ES/EF	ES/EF						
49	BorPro1.4	Hold quarterly coordinating meetings/ workshops with APHIS, CBP, DHS, USFWS, and DOH to facilitate communication relative to border processes, such as inspection and detection. In collaboration with federal partners, take the next policy, process, and staffing steps to implement more protective state policies and rules and seek complementary federal policies and rules to protect Hawaii from the introduction of new pest threats.	2017–2027	HDOA	APHIS CBP DHS USFWS DOH HDOT	3	ES/EF	ES/EF						
50	BorPro1.5	Provide annual training for state and federal inspectors on identification of emerging pests and diseases, as well as on new detection and screening methods for pests and disease.	2018–2027	HDOA	APHIS CBP DHS DOH DLNR UH	3	$10,000/year for contract services for 10 years.	$100,000	$20,000	$20,000	$20,000	$20,000	$20,000	
51	BorPro1.6	Based on the results of pathway and species risk assessments, run monitoring programs at major ports, harbors (ports and harbors that receive both domestic and foreign cargo), and post offices for high-risk pests not known to occur in Hawaii (e.g., brown tree snake) (see also BorTifs2.8).	2018–2027	HDOA	DLNR HDOT DOH USDA USFWS	2	Start at 2 ports on Oahu, Honolulu Harbor and Honolulu International Airport in FY2018-2019, add 2 more ports in FY2020-2021, and 2 more ports in FY2022-2023 based on pathway and species risk assessments. $200,000/port/year for contract services.	$9,600,000	$800,000	$1,600,000	$2,400,000	$2,400,000	$2,400,000	
52	BorPro1.7	Administer the livestock disease detection monitoring program focused on contagious animal diseases of high consequence and exotic parasites (and increase staffing and operations to include new port locations; see BorTifs1.3).	2018–2027	HDOA	APHIS	2	ES/EF	ES/EF						
53	BorPro2.1	Create standard operating procedures and protocols and ballast water reporting forms to regulate ballast water management and treatment specific for Hawaii. Develop compliance assessments and protocols to quarantine noncompliant vessels.	2018–2019	DLNR	DOH EPA USCG	2	ES/EF	ES/EF						
54	BorPro2.2	Create standard operating procedures for vessel biofouling inspections and a form to report hull inspection applicable to Hawaii. Develop compliance assessments and protocols to quarantine noncompliant vessels (see also BorPol1.4).	2018–2019	DLNR	DOH HDOT EPA USCG	2	ES/EF	ES/EF						

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55	BorPro2.3	Create a database to house data collected for ballast water reporting and management and hull inspections and hull biofouling treatment. The database should also be able to generate reports that can be used to conduct risk analysis regarding ballast water and hull biofouling (see also PrePro1.3).	2018–2019	DLNR	HDOA HDOT USCG EPA	1	ES/EF	ES/EF						
56	BorPro2.4	Test and apply new methods and technologies for ballast water and hull biofouling monitoring, treatment, and compliance monitoring and assessment, including in-water cleaning and treatment methods relative to their application in Hawaii.	2022–2023	DLNR	HDOA HDOT DOH USCG EPA	2	ES/EF	ES/EF						
57	BorPro2.5	Write best ballast water and hull husbandry practices and proactive ballast water and hull cleaning standards for all nonmilitary vessels to minimize movement of AIS into Hawaii's ports, harbors, and marinas. Include incentives to encourage vessel ballast water discharge and biofouling compliance.	2018–2019	DLNR	DOH HDOT EPA USCG	2	ES/EF	ES/EF						
58	BorPro2.6	Before regulations for ballast and hull biofouling inspection and treatment are enacted, enter into MOUs or cooperative agreements with partner agencies and port authorities to implement effective AIS prevention, inspection, and response best management practices.	2017–2019	DLNR	DOH HDOT EPA USCG	2	ES/EF	ES/EF						
59	BorPro3.1	Create a multiagency Biosecurity Emergency Response Task Force to coordinate and respond to new aquatic and terrestrial pests or disease incursions both at and beyond (postborder) ports of entry. This task force should comprise representatives from relevant government agencies and consult with private industries working at the borders (e.g., airlines, shippers, freight forwarders).	2017–2027	HDOA DLNR	DOH HISC HDOT HI-EMA APHIS CBP USCG USFWS NPS DOD USCG NOAA EPA	2	ES/EF	ES/EF						
60	BorPro3.2	Hold postincident meetings/workshops hosted by HDOA of the Biosecurity Emergency Response Task Force to coordinate/review/debrief rapid response actions, and set up an incident command system.	2017–2027	HDOA	DLNR HISC DOH HDOT HI-EMA APHIS CBP USCG USFWS NPS DOD Industry	3	ES/EF	ES/EF						
61	BorPro3.3	Write species-specific response plans for high-risk/priority pests that detail the roles of relevant agencies and stakeholders. Review plans annually to ensure alignment with existing policies and USDA response plans.	2020–2027	HDOA DLNR DOH	APHIS HISC UH USFWS NPS	1	ES/EF	ES/EF						

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62	BorPro3.4	Write general and taxa-specific (e.g., insects, plants, fish), rapid-response strategies that can be implemented immediately in response to an emergency involving multiple agencies and private industries.	2020–2023	HDOA DLNR DOH	APHIS HISC UH USFWS NPS	2	ES/EF	ES/EF						
63	BorPro3.5	Write plans to respond to livestock diseases or exotic parasites. Review plans annually to ensure alignment with existing policies and USDA response plans.	2017–2027	HDOA	APHIS Industry	2	ES/EF	ES/EF						
64	BorPro3.6	Write contingency plans for treating and disposing of dirty ballast water and for cleaning biofouling vessels. Also include plan to dispose of harmful paint removed during the treatment.	2018–2019	DLNR	DOH HDOT USCG EPA NOAA	2	ES/EF	ES/EF						
65	BorTifs1.1	Double HDOA's current PQ staff from 91 to 182 over the 10-year period of the plan to meet current and future needs for inspection services at all ports of entry. Adjust pay scales commensurate with positions, increasing responsibilities, and duties.	2020–2027	HDOA	DLNR DOH	1	Add 91 new staff and operational funds incrementally as program responsibilities expand. Add 23 in FY2020-2021, add 23 more in FY2022-2023 (46 staff), add 23 more in FY2024-2025 (69 staff), and add the final 22 in FY2026 (91 staff). Annual costs for 91 positions = $6,785,000 salary + $1,000,000 in operating costs to support 91 positions. Total annual cost of $7,785,000 or an average of $85,550/position/year.	$39,181,900		$3,935,300	$7,870,600	$11,805,900	$15,570,100	91
66	BorTIfs1.2	Increase AI staff and resources by adding 15 new positions and operating funds to implement an expanded livestock disease detection monitoring program focused on contagious animal diseases of high consequence and exotic parasites at five ports.	2018–2027	HDOA	APHIS	1	Add 15 new staff (3 per port) and operational funds incrementally as monitoring program expands to five ports. Start the monitoring program at the Honolulu Harbor in FY2018-2019, add Kawaihae, Hawai'i in FY2020-2021, Kahului Harbor, Maui in FY2022-2023, Nawiliwili Harbor, Kauai in FY2024-2025, and Hilo Harbor, Hawai'i in FY2026-2027. Annual costs at each port = staffing of 1 supervisor and 2 inspectors @ $155,000 per year + $95,000 in operating costs. The total annual cost per port = $250,000.	$7,500,000	$500,000	$1,000,000	$1,500,000	$2,000,000	$2,500,000	15
67	BorTifs1.3	Add four new state detector dog units (handler + dog) to intercept high-risk species difficult to detect by other methods of inspection or at ports of entry difficult to inspect with other methods.	2020–2027	HDOA	APHIS CBP OIA	2	Add 4 new detector dog units incrementally as program responsibilities expand. Add one new unit in FY2020-2021, add one new unit in FY2022-2023, add one new unit in FY2024-2025, and the final unit in FY2026-2027. Costs for one unit = $55,000 for position + operating funds of $10,000/dog per year. Total annual cost for one dog unit = $65,000.	$1,300,000		$130,000	$260,000	$390,000	$520,000	4
68	BorTifs1.4	Allocate money on a yearly basis to the biosecurity emergency response fund (see also BorPol1.4 and BorPro3.1).	2018–2027	HDOA	DLNR	1	Provide annual funding of up to $3,000,000/year for terrestrial and aquatic emergency responses. Provide funding for 10 years.	$30,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	$6,000,000	
69	BorTIfs1.5	Increase staffing and operating funds for the DOH Vector Control Branch by adding 13 new staff members (total 33: current 20 in FY2017 plus 13 new positions) to be able to detect and respond to threats from disease vectors such as mosquitoes and diseases such as dengue, Zika, and rat lungworm.	2019–2027	DOH	HDOA DLNR	1	Add 13 new staff and operational funds to respond to disease threats beginning in FY2019. Annual costs for 13 positions = $481,188 salary. Operating costs in FY2019 = $497,912. Operating costs FY2020-2027 = $120,297/year. Total cost in FY2019 = $979,100. Total cost per year FY2020-2027 = $601,485.	$5,790,980	$979,100	$1,202,970	$1,202,970	$1,202,970	$1,202,970	13
70	BorTifs2.1	Use state-of-the-art diagnostics technology to test for disease in imported plants.	2021–2027	HDOA	UH Industry	1	$50,000 per year to contract molecular diagnostic services until PPC program lab and staffing is in place. FY2021-2027.	$350,000		$50,000	$100,000	$100,000	$100,000	
71	BorTifs2.2	Install effective containment features (e.g., fences), attractants, and traps in the vicinity of ports of entry to help monitor for pests (see also BorPro1.6).	2020–2027	HDOA	HDOT	2	Phase in the deployment adding 4 ports per year each in FY2020-2021 (4 ports), FY2022-2023 (8 ports), FY 2024-2025 (12 ports), FY2026-FY2027 (16 ports). Costs = $10,000 per port per year.	$800,000		$80,000	$160,000	$240,000	$320,000	

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72	BorTifs3.1	Contract or hire five full-time positions at DLNR's DAR to manage ballast water and biofouling threats and inspections: two biologists stationed on Oahu, two biologists stationed on the Big Island, and one technician position to collect water quality samples and assess releases of harmful antifouling paints.	2018–2027	DLNR	DOH HDOT EPA USCG	1	Contract or hire 4 biologists at $52,000 per year in salary, and 1 technician at $42,000 per year. Costs = $250,000 per year, FY2018-2027.	$2,500,000	$500,000	$500,000	$500,000	$500,000	$500,000	5
73	BorTifs3.2	Fund equipment and licensing to support DLNR's ballast water and hull fouling reporting, tracking, and compliance monitoring data management system, and aquatic invasive organism reporting, tracking and compliance database system.	2018–2027	DLNR	DOH HDOT EPA USCG	1	$500,000 to purchase and install equipment in 2018, $50,000/year for maintenance from FY2019-2027.	$950,000	$550,000	$100,000	$100,000	$100,000	$100,000	
74	BorTifs3.3	Contract or hire one data management specialist to support DLNR's new ballast water, biofouling, and aquatic invasive species database systems.	2018–2027	DLNR	HDOA HDOT	1	$50,000 per year in salary for 10 years, FY2018 to FY2027.	$500,000	$100,000	$100,000	$100,000	$100,000	$100,000	1
75	BorTifs3.4	Contract a public institution or private company to use molecular techniques to identify organisms recruited onto the settlement plates, and build an eDNA database of nonindigenous and invasive species established in Hawaii.	2018-2027	DLNR	UH HDOT DOH Industry	1	Contract services of $6,000 per year for 10 years, FY2018-2027.	$60,000	$12,000	$12,000	$12,000	$12,000	$12,000	
76	PosPol1.1	Propose for enactment necessary legislative amendments to HRS § 150A-5 (and other related sections) to authorize HDOA to screen, inspect, and regulate nonagricultural commodities in interisland transport and amend corresponding administrative rules (HAR Chapter 4-72).	2020–2022	HDOA	HDOT DLNR AG HISC	1	ES/EF	ES/EF						
77	PosPol1.2	Propose for enactment the necessary legislation (see also PrePol2.1 and PrePol2.2) and regulations (HAR Chapter 4-72) to authorize HDOA to require the use of the emanifest reporting and data management system for interisland shipments.	2020–2022	HDOA	HDOT DLNR AG HISC	1	ES/EF	ES/EF						
78	PosPol1.3	Develop a comprehensive approach to minimize the interisland movement of plant pathogen and pests via the interisland transport of agricultural products. This could include one or more mechanisms, such as amend and update HAR Chapter 4-72 for stricter regulation of interisland movement of pests and pathogens, enter into compliance agreements, or develop an interisland nursery certification program (see also PosPro2.2).	2018–2020	HDOA	DLNR UH AG	1	ES/EF	ES/EF						
79	PosPol1.4	Revise HDOA or DLNR rules, HAR Chapter 4-71 and HAR Chapter 13-124, and corresponding lists pertaining to nondomestic animals and injurious wildlife, to regulate movement of injurious wildlife and set up a permit process to allow legal interisland transport of pets classified as injurious (e.g., parrots).	2022–2023	HDOA DLNR	AG	3	ES/EF	ES/EF						
80	PosPol1.5	Update HAR Chapter 4-72 to further prevent the interisland movement of pathogens and pests via soil.	2020–2021	HDOA	AG	1	ES/EF	ES/EF						
81	PosPol1.6	Propose for enactment the necessary legislation and regulations (HAR Chapter 13-76) to require vessels and waterborne equipment >5 feet long to conduct and document proper hull husbandry management before being moved or shipped between islands (see also BorPol1.3).	2020–2021	DLNR	HDOT USCG DOH HISC	1	ES/EF	ES/EF						

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82	PosPol2.1	Propose for enactment the necessary legislation and regulation to restructure the HISC as the Hawaii Invasive Species Authority, an autonomous interagency body to manage and administer biosecurity programs.	2017–2019	HDOA	DLNR DOH HISC	1	ES/EF	ES/EF						
83	PosPol2.2	Enter into MOUs with waste management facilities to accommodate disposal of carcasses associated with disease outbreaks.	2020–2021	HDOA	DOH	1	ES/EF	ES/EF						
84	PosPol2.3	Propose for enactment the necessary legislative amendments (e.g., through HRS Chapters 150A, 183, 126, 195, and 183C), and promulgate new administrative rules to prevent the introduction of invasive species to natural areas, sensitive ecosystems, and protected areas and the spread of these species in these areas via commercial activities such as ecotourism, agrotourism, and construction activities.	2020–2021	DLNR HDOA	AG HISC Indursty	3	ES/EF	ES/EF						
85	PosPol2.4	Submit petitions to HDOA to place additional high-risk AIS on the lists of prohibited and restricted animals to regulate their sale, distribution, culture, husbandry, and spread in the state. Key issues to address: prevent release of pet aquarium species into natural areas, and include adequate administrative and criminal penalties that provide effective deterrence and require restoration and mitigation of harm caused related to the intentional introduction or release of AIS.	2020–2021	DLNR	HDOA HISC USFWS NOAA	1	ES/EF	ES/EF						
86	PosPro1.1	Surveillance and monitoring coordinator (see also PosTifs1.6) to collaborate with state, federal, county, and private entities to design, build, and coordinate islandwide comprehensive and uniform surveillance/ monitoring programs for high-risk taxa (e.g., mosquitoes, plant pathogens, ants, plants, rat lungworm disease and vectors). Surveillance and monitoring to be conducted by other staff from HDOA and partnering organizations such as ISCs and DOH. Role of these positions would be to facilitate uniform data gathering methods and data entry into HDOA's biosecurity database.	2020–2027	HDOA	DLNR DOH USFWS APHIS NPS UH ISCs County Industry	3	ES/EF	ES/EF						
87	PosPro1.2	Contract an independent analysis of effectiveness of current enforcement and prosecution of biosecurity laws, and prepare a report of recommendations on what administrative and criminal penalties should be revised to be more effective deterrents.	2020–2021	HDOA HISC	DLNR AG USFWS	3	$50,000 for contract services in FY2020-2021.	$50,000		$50,000				

Item #	Task #	Implementation Task	Timeline	Lead Agency	Partners	Priority Ranking	Budget and Implementation Detail	10 Year Total	FY2018-FY2019	FY2020-FY2021	FY2022-FY2023	FY2024-FY2025	FY2026-FY2027	# New hires
88	PosPro1.3	In coordination with the overarching Biosecurity Emergency Response Task Force, write species-specific and generic postborder aquatic and terrestrial emergency response plans (see also BorPro3.1). Encourage federal, state, and county agencies to develop their own emergency response plans. Key Issues to address: clarification of what constitutes a postborder biosecurity emergency, determination of roles and responsibilities of participating organizations, decision-making processes, commitment of resources for emergency response, a realistic assessment of feasibility of eradication, and determination of when different cease-action triggers are pulled. These triggers relate to when to stop a rapid response, when to engage in long-term control, and when to engage in biocontrol.	2020–2023	DLNR HDOA DOH	HISC ISCs APHIS CBP USFWS NPS HDOT UH HI-EMA County	1	ES/EF	ES/EF						
89	PosPro1.4	Integrate invasive species control and mitigation actions into project requirements during environmental review and approval processes (e.g., HEPA/NEPA and ESA consultation) to protect native resources.	2017–2027	DLNR	OEQC HDOA DOH HDOT USFWS NOAA	3	ES/EF	ES/EF						
90	PosPro1.5	Institutionalize the funding in the UH system, and create the organizational structure in the Research Corporation of the University of Hawaii (RCUH)/PCSU to fund and implement the critical services provided by ISCs and HAL for invasive species control.	2017–2019	UH	HISC DLNR HDOA DOH County USFWS	2	ES/EF	ES/EF						
91	PosPro1.6	Write and adopt best management practices to control invasive species that state government agencies, counties, industry, and private individuals can follow or require for actions on their lands.	2018–2027	UH HDOA DLNR DOH	APHIS USFWS USFS USGS NPS County Industry	1	ES/EF	ES/EF						
92	PosPro2.1	Implement an emanifest data management system (see also PosPol1.2 and PrePro1.1) for interisland transport of commodities to improve record keeping and inform interisland risk assessments. Design the interisland system to focus on preventing the known risks and be user friendly to the public and industry.	2020–2027	HDOA	AG HDOT Indusrty	1	ES/EF	ES/EF						
93	PosPro2.2	Improve data utilization from livestock movement documents by collecting and entering data into the HDOA biosecurity database to support animal disease traceability. The existing movement documents that provide the data are the DC-44 (Certificate of Livestock Movement/ Ownership) and DC-8 (Permit to Ship).	2020–2027	HDOA	Industry	3	ES/EF	ES/EF						
94	PosPro3.1	Create standardized language for best management practices to incorporate into state contracts to minimize the spread of invasive species in the islands.	2017–2019	HDOA	AG DLNR and all other state agencies	3	ES/EF	ES/EF						
95	PosPro3.2	Create working group to develop effective solutions that address carcass disposal, including carcasses of marine animals.	2018–2027	HDOA	DOH UH County	1	ES/EF	ES/EF						

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96	PosPro3.3	Effectively control and eradicate established harmful pests on private and public lands by increasing base funding of competitive grants for Watershed Partnerships from the current $2 million per year to $6 million per year. The competitive grant program supports Watershed Partnerships and agency projects and is implemented by agency, Watershed Partnerships, and ISC staff to specifically engage in weed control, ungulate control, and public outreach for watershed protection. This measure is needed for the control of detrimental established invasive species in Watershed Partnerships lands.	2018–2027	DLNR	HDOA DOH UH	1	$4,000,000 per year for 10 years to increase the existing Watershed Partnerships grant program of $2 million per year to $6 million per year. The amount of funding can be reduced if the Watershed Partnership Grant Program is supported by other sources of funds.	$40,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	$8,000,000	
97	PosPro4.1	Write protocols and standard operating procedures for statewide field response to inspect, isolate, and appropriately dispose of unexpected arrivals of high-risk AIS of distant origin, such as materials transported by a tsunami or floating debris from other sea structures or vessels, and implement those procedures by January 2019.	2017–2018	DLNR	HDOT NOAA USFWS County	1	ES/EF	ES/EF							
98	PosPro4.2	Increase efforts statewide to control established AIS, including development of new control techniques, such as the use of Rotenone to control introduced invasive fish. Contribute data gathered to HDOA's biosecurity database.	2018–2027	DLNR	UH NOAA USFWS NPS HDOA HDOT	2	ES/EF	ES/EF						
99	PosPro4.3	Implement comprehensive approaches to remove and control the spread of algal AIS using mechanical removal, native grazers (e.g., urchins), and other technologies in at-risk high-value native habitats identified based on survey and monitoring data.	2018–2027	DLNR	UH NOAA NPS	3	Project funding of $250,000 per year for 10 years, FY2018-2027.	$2,500,000	$500,000	$500,000	$500,000	$500,000	$500,000	
100	PosPro4.4	Collaborate with DLNR, NOAA, USFWS, UH, research entities, and others and write uniform survey and monitoring methods for early detection and rapid response efforts, and clarify the roles and responsibilities of collaborating organizations.	2017–2019	DLNR	UH Bishop Museum NOAA USFWS USGS NPS Industry NGOs	3	ES/EF	ES/EF						
101	PosPro4.5	Consult with New Zealand, Australia, and the states of Alaska, Washington, Oregon, California, and Florida on how AIS vectors are managed elsewhere; conduct in-state studies to document recreational and commercial fleet AIS issues; and based on the results of research and studies, implement appropriate actions to reduce AIS impacts.	2018–2020	DLNR	New Zealand Australia Alaska Washington Oregon California Florida HDOA	2	$15,000 in operating costs per year for three years, FY2018-2020.	$45,000	$30,000	$15,000				
102	PosPro4.6	Submit petitions to HDOA to raise minimum standards for aquaculture and other point-of-sale facilities (e.g., pet stores and live seafood sellers) to minimize the chance that high-risk species are intentionally or inadvertently released into the wild.	2018–2027	DLNR	HDOA APHIS USFWS	2	ES/EF	ES/EF						
103	PosPro4.7	Provide training and logistical support (e.g., boats, personal protective equipment) to local community organizations to effectively control and eradicate established aquatic pests.	2018–2027	DLNR	HDOA DOH UH	1	$20,000 operating funds for each county per year for 10 years, FY2018-2027.	$800,000	$160,000	$160,000	$160,000	$160,000	$160,000	

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104	PosTifs1.1	Fund the Hawaii Invasive Species Authority to coordinate and implement interagency invasive species efforts, including an annual grant program for interagency projects for control, prevention, outreach, research, and administrative costs.	2018–2027	HDOA	HISC DLNR DOH HDOT DBEDT UH	1	Funding for an annual competitive grant program of $10 million/year in FY2018-2019, $8 million/year in FY2020-2021, $6 million/year in FY2022-2023, and $5 million per year in FY2024-2027; plus $900,000 per year in administrative support for salaries and operational funds, for 10 years. This would replace the existing HISC grants program (~$5M/yr). The amount of funding needed for the HISA competitive grant program may reduce over time as other elements of HIBP are implemented and less grants are needed to fill gaps in other agency programs.	$77,000,000	$21,800,000	$17,800,000	$13,800,000	$11,800,000	$11,800,000	
105	PosTifs1.2	Triple HDOA's current PPC staff from 10 to 30 positions over the 10-year term of the plan, to increase effective plant and pest control using chemical and mechanical methods. Triple the current operating budget to support staff fieldwork.	2020–2027	HDOA	USFS DLNR UH	1	Add 20 new positions and operational funds incrementally as program responsibilities expand. Add five new positions in FY2020-2021, add five more in FY2022-2023 (10 staff), add five more in FY2024-2025 (15 staff), and add the final five in FY2026-FY2027 (20 staff). Annual costs for 20 positions = $1,011,034 salary + $106,990 in operating costs to support 20 positions. The annual costs of salary for 20 positions plus operating funds totals $1,118,024, or an average of $55,900/position/year.	$5,590,000		$559,000	$1,118,000	$1,677,000	$2,236,000	20
106	PosTifs1.3	Double HDOA's Biocontrol Section's staff from 24 to 48 positions over the 10-year term of the plan to conduct statewide surveys; provide diagnostic and scientific support to PQ and PPC; and research, screen, and test new biocontrol agents for biocontrol of widespread established pests. Double the current operating budget to support staff fieldwork.	2020–2027	HDOA	USFS DLNR UH	1	Add 24 new positions and operational funds incrementally as program responsibilities expand. Add six new positions in FY2020-2021, add six more in FY2022-2023 (12 staff), add six more in FY2024-2025 (18 staff), and add the final six in FY2026-FY2027 (24 staff). Annual costs for 24 positions = $1,360,194 salary + $516,058 in operating costs to support 24 positions. The annual costs of salary for 24 positions plus operating funds totals $1,876,252, or an average of $78,177/position/year.	$9,381,240		$938,124	$1,876,248	$2,814,372	$3,752,496	24
107	PosTifs1.4	Increase operating funds for HDOA's biocontrol program by $100,000 per year to support exploration of foreign natural enemies of established invasive species.	2020–2027	HDOA	USFS DLNR UH	1	$100,000 in operational funds per year for 8 years, FY2020-2027.	$800,000		$200,000	$200,000	$200,000	$200,000	
108	PosTifs1.5	Hire two surveillance and monitoring coordinators—one an entomologist and one a botanist—to coordinate statewide comprehensive and uniform surveillance/ monitoring programs for high-risk taxa (e.g., mosquitoes, ants, plants, rat lungworm disease vectors) (see also PosPro1.1).	2020–2027	HDOA	DLNR DOH USFWS UH	3	Add two new Staff in FY2020 after the biosecurity program database comes on line. The costs per position are $50,000 in salary plus $12,500 for opertaional support per year. Total costs for 2 positions and operational support is $125,000 per year for eight years, FY2020-2027.	$1,000,000		$250,000	$250,000	$250,000	$250,000	2
109	PosTifs1.6	Hire a biological control program coordinator plus operational support to help increase public support for biocontrol, assist with the regulatory process for biocontrol agents, and coordinate international activities that may be of benefit and impact Hawaii.	2020–2027	HDOA	USFS ARS Australia New Zealand	1	Add the new position in 2020 as the new biocontrol facilities are completed. The costs for the coordinator positions is $65,000 per year. The cost for operational support is $25,000 per year. The total costs for coordinator plus operational funds is $90,000 per year, for eight years, FY2020-2027.	$720,000		$180,000	$180,000	$180,000	$180,000	1
110	PosTifs1.7	Increase DLNR's AIS program funding by $400,000 per year to address threats from established AIS (see also PosPro4.2).	2018–2027	DLNR	UH NOAA USFWS HDOA HDOT	2	$100,000 in operational funds per county (4) per year. Annual costs = $400,000, for ten years, FY2018-2027.	$4,000,000	$800,000	$800,000	$800,000	$800,000	$800,000	

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111	PosTifs1.8	Hire four forest health specialists and one forestry pathologist to conduct monitoring, detection, and control for high-risk pests and pathogens in forest habitats (e.g., Rapid Ohia Death, ohia rust, myoporum [naio] thrips [*Klambothrips myopori*], lobate lac scale [*Paratachardina pseudolobata*], hala scale [*Thysanococcus pandani*]).	2018–2027	DLNR	UH HDOA USFS	1	Add two Forest Health Specialists and one Forestry Pathologist in FY2018-2019. Add two more Forest Health Specialist in FY2020-2021. The costs are $50,000 per position per year. The costs for three positions is $150,000 per year. The costs for five positions is $250,000 per year.	$2,300,000	$300,000	$500,000	$500,000	$500,000	$500,000	5
112	PosTifs1.9	Develop grant programs to assist private landowners with invasive species removal and control. Hire one grant program technical staff member to oversee the program and annual grant funding.	2018–2027	DLNR	HDOA USFS Industry	2	Salary costs for one grant program technical staff is $40,000 per year. The annual competitive grant program will costs $500,000 per year. Total costs for the grant program are $540,000 per year for 10 years, FY2018-2027.	$5,400,000	$1,080,000	$1,080,000	$1,080,000	$1,080,000	$1,080,000	1
113	PosTifs1.10	Hire 45 invasive species technicians plus operational support and purchase vehicles to be used to detect, monitor, remove, and control invasive species in DOFAW's protected areas.	2018–2027	DLNR	UH HDOA USFS	1	Hire 45 invasive species technicians, plus provide operational funds, and 2-3 vehicles per branch, to support field work. The salary costs for an invasive species technician is $42,628 per position per year, plus $7,500 per position for operational support. The costs to hire nine technicians is $451,152/year with two each for Kauai, Oahu, Maui, and Hawaii, and one for Molokai per budget biennium ($902,304). Purchase nine vehicles at $50,000 per vehicle, with one for each island in FY2018-2019, and a second vehicle for Kauai, Oahu, Maui, and Hawaii in FY2022-2023.	$13,984,560	$1,152,304	$1,804,608	$2,906,912	$3,609,216	$4,511,520	45
114	PosTifs1.11	Allocate funds in the UH budget to provide stable funding of core positions for the ISCs and HAL in RCUH/PCSU in order to carry out invasive species control operations statewide.	2024–2027	UH	DLNR HDOA HISC	2	Fund within UH budget 27 core positions to include a manager, operations manager, administrative support, data manager, outreach specialist, and botanist per ISC (24 positions), plus add one additional manager (1) for the combined Maui/Molokai ISC; plus add one manager and one entomologist for HAL. Additional staff and operating costs would be funded through competitive grants. Salary costs for the Big Island ISC, Oahu ISC, and Kauai ISC are $460,720 per ISC per year. Salary cost for the Maui/Molokai ISC is $560,720 per year. Salary costs for the HAL is $156,520. The total salary costs are $2,099,400 per year.	$8,397,600				$4,198,800	$4,198,800	27
115	PosTifs1.12	Hire four agricultural extension agents, and provide operating funds to facilitate areawide control (and prevent the reintroduction) of pests on farms, nurseries, and ranches. Support collaborative efforts to control those targeted pests on farms and in the surrounding areas.	2018–2027	UH	HDOA DLNR DOH County	1	Add new staff incrementally with 2 extension agents added in FY2018, and 2 extension agents added in FY2020 (4 staff). The costs are $150,000 per extension agent per year.	$5,400,000	$600,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000	4
116	PosTifs1.13	Hire two aquaculture extension agents, one extension specialist, and one researcher to conduct research, develop screening and quarantine protocols, develop pest management strategies, and conduct outreach specific to Hawaii.	2018–2027	UH	HDOA DLNR	1	Add two new aquacultural extension agents in FY2018-2019, and add one extension specialist and one researcher in FY2020-2021 (4 staff). The cost for each extension agent is $150,000 per position per year. The cost for each faculty extension specialist and researcher is $225,000 per position per year.	$6,600,000	$600,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	4
117	PosTifs1.14	Hire four agricultural diagnosticians to provide for rapid screening, diagnostic testing, and identification of insects and diseases to support extension agents, farmers and ranchers, the general public, and other government agencies in monitoring, detection, and pest management efforts.	2018–2027	UH	HDOA DLNR	1	Add two new diagnosticians in FY2018-2019, and two more in FY2020-2021 (4 staff). The costs per diagnostician positions is $65,000 per position per year. The annual costs for two diagnosticians is $130,000 per year, and the annual costs for four diagnosticians is $260,000 per year.	$2,340,000	$260,000	$520,000	$520,000	$520,000	$520,000	4

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118	PosTifs1.15	Enter into cooperative agreements between county governments and UH to support county farmers and ranchers with invasive species early detection, control, and research needs provided by UH extension agents, researchers, or specialists.	2018–2027	Kauai County Oahu County Maui County Hawaii County	UH	3	$100,000 in operational funds per county per year for 10 years, FY2018-2027.	$4,000,000	$800,000	$800,000	$800,000	$800,000	$800,000	
119	PosTifs2.1	Build new office complex to house the PPC Branch, which will include new biocontrol program facilities and chemical/mechanical pest control facilities. The new campus will include containment facilities sufficient to run 10 parallel biocontrol projects at one time, diagnostic laboratories, molecular diagnostic laboratories, insectaries, pathogen-rearing facilities, greenhouses, office space, chemical and pesticide storage, meeting spaces, and reference collections (insect, disease, plant and literature).	2018–2027	HDOA	USFS DLNR UH ARS APHIS	1	Build new facilities to include containment facilities sufficient to run 10 parallel biocontrol projects at one time, diagnostic laboratories, molecular diagnostic laboratories, insectaries, pathogen rearing facilities, greenhouses, office space, chemical and pesticide storage, meeting spaces, reference collections (insect, disease, plant and literature). Facilities construction costs = $35,000,000	$35,000,000	$35,000,000					
120	PosTifs2.2	Upgrade and update Animal Industry Division office and laboratory facilities for the investigation of animal diseases that affect food security and human health. Facilities will house a laboratory, training center, and administration and operation services and will be located at the Animals Industry office complex in Halawa Valley, Oahu.	2020–2021	HDOA	APHIS	1	Upgrade and update Animal Industry Division laboratory and office facilities in Halawa Valley, Oahu. Facilities to include a laboratory, training center, administration and operation services. Facilities construction costs = $25,000,000.	$25,000,000		$25,000,000				
121	PosTifs2.3	Annually fund the development of techniques to control established invasive species, including chemical and mechanical means and new technologies, such as gene drive and other biotechnology, and support for maintaining or replacing the staff necessary to conduct research.	2018–2027	HDOA HISC	UH DLNR DOH USFWS	3	$250,000 for a competitive grant program per year for 10 years, FY2018-2027.	$2,500,000	$500,000	$500,000	$500,000	$500,000	$500,000	
122	PosTifs2.4	Annually fund research and development of detection techniques (e.g., use of drones, remote sensing, environmental DNA) for new and established invasive species.	2018–2027	DLNR	HISC UH HDOA DOH USFWS	2	$250,000 for a competitive grant program per year for 10 years, FY2018-2027.	$2,500,000	$500,000	$500,000	$500,000	$500,000	$500,000	
123	PwsPol1.1	Propose for enactment the necessary legislative amendment or clarification (e.g., clarification of existing authority under HRS §150A-53), and obtain the approval of the Board of Education for policy to require biosecurity and invasive species issues to be included in the environmental science K–12 curriculum in Hawaii. Build on existing efforts of integrating invasive species into curriculum, such as the Hoike o Haleakala curriculum.	2022–2023	DLNR	DOE UH HDOA HISC HEEA	2	ES/EF	ES/EF							
124	PwsPro1.1	Collect pertinent examples and publish stories highlighting biosecurity successes (e.g., notable pest interceptions, capture of illegal animals, biocontrol releases, animal disease control programs, weed control programs) to distribute through social media and outreach products (e.g., shareable videos, fliers, newsletter, posters).	2018–2027	HDOA	CGAPS UH DLNR HISC	3	Operational costs to produce outreach materials. $50,000 per year for 10 years, FY2018-2027.	$500,000	$100,000	$100,000	$100,000	$100,000	$100,000	

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125	PwsPro1.2	Contract a professional public relations firm to produce outreach materials to encourage residents to buy local products, and foster a sense of pride and self-responsibility in protecting Hawaii's agriculture, environment, and lifestyle. Have HDOA inspectors and agricultural producers share firsthand experience on protecting Hawaii from pests.	2018–2027	HDOA	UH DLNR CGAPS Industry	2	Operational funds for contract services of $150,000 per year for 10 years, FY2018-FY2027.	$1,500,000	$300,000	$300,000	$300,000	$300,000	$300,000	
126	PwsPro1.3	Coordinate with partners in the industry, nonprofits, and community groups to use their existing media avenues, such as internal newsletters, cooperative association meetings, social media, websites, and newspapers, to share biosecurity information, send pest and disease notifications, and muster support.	2017–2027	HDOA	Industry UH DLNR CGAPS Nonprofits Community Groups	2	ES/EF	ES/EF						
127	PwsPro1.4	Recruit a network of citizen scientists and other important and competent contributors, and provide logistics and administrative support to develop a citizen science–based comprehensive surveillance system for pests and pathogens.	2018–2027	HDOA	DLNR DOH NPS UH HEEA	3	Operational funds for technical support for citizen science of $10,000 per year for 10 years, FY2018-2027.	$100,000	$20,000	$20,000	$20,000	$20,000	$20,000	
128	PwsPro1.5	Publicize and promote the certified nurseries program by posting information on HDOA's website on what nurseries, farms, and shippers are certified and information if participants lose certification.	2017–2027	HDOA	Industry UH HISC CGAPS HEEA	2	ES/EF	ES/EF						
129	PwsPro1.6	Engage the veterinary medical community to enhance its role in detection of diseases and parasites of high concern, including ectoparasites, which can transmit wildlife and human diseases.	2017–2027	HDOA	Hawaii Veterinary Medical Association	3	ES/EF	ES/EF						
130	PwsPro1.7	Engage the education, medical, and public health community to increase education and public awareness about the dangers from human health diseases, such as dengue, Zika, and rat lungworm disease, and increase outreach efforts regarding control of vectors, including mosquitoes, rats, slugs, and snails, and, in the case of rat lungworm disease, mitigation in gardens and safe food preparation.	2017–2027	DOH	HDOA UH DOE DLNR HEEA Industry Hawaii Medical Assocation	3	ES/EF	ES/EF						
131	PwsPro2.1	Solicit support from the native Hawaiian community, including the Office of Hawaiian Affairs and the Aha Moku Council, and from cultural practitioners to advocate for culturally based biosecurity programs to ensure that natural and cultural resources are sustained for traditional and cultural practices. Encourage native Hawaiian communities to organize and advocate with their legislators for stronger and more effective biosecurity programs.	2017–2027	HDOA	DLNR DOH UH	3	ES/EF	ES/EF						
132	PwsPro2.2	Highlight program successes in briefings to lawmakers, county officials, and members of boards and commissions. Key successes to include: implementation of departmental programs and projects, pest interceptions, capture of illegal animals, biocontrol releases, and weed eradication.	2017–2027	HDOA HISC	DLNR DOH UH HDOT Industry	2	ES/EF	ES/EF						

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133	PwsPro3.1	Biosecurity communications specialist at HDOA to develop outreach materials to launch a visitor awareness campaign. Key campaign issues: importance of biosecurity to Hawaii via outreach materials to visitors before their arrival, during flights, and during their stay in Hawaii.	2018–2027	HDOA HISC	HTA HDOT DLNR CGAPS USFWS HEEA	2	Operational funds to development outreach materials for a visitor awareness campaign. $100,000 per year for 10 years.	$1,000,000	$200,000	$200,000	$200,000	$200,000	$200,000	
134	PwsPro3.2	Create and disseminate through various media outlets (e.g., little fire ant video produced by the Maui Invasive Species Committee) accurate and current information to help the public understand the circumstances under which species in the state are regulated and why.	2018–2027	HDOA	DLNR DOH CGAPS HEEA	3	ES/EF	ES/EF						
135	PwsPro3.3	Biosecurity communications specialist to develop tools to measure success of public awareness campaigns (that can be used to leverage future funding for biosecurity needs).	2018–2027	HDOA	DLNR DOH UH HTA CGAPS HEEA	2	ES/EF	ES/EF						
136	PwsPro3.4	Biosecurity communications specialist to develop and maintain an interagency biosecurity website and portal. Key information to include: Hawaii's unique position relative to biosecurity; interagency biosecurity plan; clear guidance on regulated species at interisland, interstate, and international levels; pest reporting; and import/export restrictions.	2018–2027	HDOA	DLNR DOH CGAPS HEEA	2	ES/EF	ES/EF						
137	PwsPro3.5	Help implement HISC's state-of-the-art pest notification and reporting system, and integrate it with the biosecurity online portal.	2018–2027	HDOA DLNR	CGAPS DOH UH HEEA	3	ES/EF	ES/EF						
138	PwsPro3.6	Agency staff to provide technical assistance to community volunteer groups working to control invasive species in terrestrial and aquatic systems.	2018–2027	DLNR	NOAA USFWS NPS UH CGAPS HEEA	3	ES/EF	ES/EF						
139	PwsPro3.7	Aquatic education specialist (existing position) to conduct a comprehensive campaign to prevent the introduction and spread of AIS. Key campaign issues: preventing the discard of live AIS into the environment, development of outreach materials for harbor workers and transportation industry.	2018–2021	DLNR	NOAA USFWS CGAPS HEEA	2	ES/EF	ES/EF						
140	PwsPro3.8	Expand University level teaching, both classroom and research, on biosecurity problems and solutions to provide an educated and trained workforce for biosecurity programs in the future.	2018-2027	UH	HDOA DLNR DOH HEEA	3	ES/EF	ES/EF						
141	PwsTifs1.1	Hire a full-time biosecurity communications specialist at HDOA to develop and coordinate public awareness programs for HDOA's biosecurity programs.	2018–2027	HDOA	DLNR DOH	3	Salary costs for a Biosecurity Communications Specialist is $65,000 per year for 10 years, FY2018-2027.	$650,000	$130,000	$130,000	$130,000	$130,000	$130,000	1

Item #	Task #	Implementation Task	Timeline	Lead Agency	Partners	Priority Ranking	Budget and Implementation Detail	10 Year Total	FY2018-FY2019	FY2020-FY2021	FY2022-FY2023	FY2024-FY2025	FY2026-FY2027	# New hires
142	PwsTifs1.2	Hire a full-time natural resource economist to analyze the costs of inaction on high-profile biosecurity threats and to publicize the true effects of inaction when requesting funds for biosecurity projects.	2018–2019	HDOA	UH DLNR DOH CGAPS	1	Salary costs for a Natural Resource Economist is $80,000 per year for 10 years, FY2018-2027.	$800,000	$160,000	$160,000	$160,000	$160,000	$160,000	1
143	PwsTifs1.3	Collaborate with HTA to obtain funds from the visitor industry to pay for biosecurity media campaigns.	2018–2027	HDOA	HTA DLNR	2	Operational funds to support biosecurity media campaign with the visitor industy. $100,000 per year for 10 years, FY2018-2027.	$1,000,000	$200,000	$200,000	$200,000	$200,000	$200,000	
144	PwsTifs1.4	Collaborate with HTA to contract a professional public relations firm to create visually appealing signs and displays regarding biosecurity at airports.	2018–2027	HDOA	HTA CGAPS HDOT DOH DLNR	2	Contract services for design of signs and displays at airports. $50,000 per year for 10 years, FY2018-2027.	$500,000	$100,000	$100,000	$100,000	$100,000	$100,000	
145	PwsTifs1.5	Contract the creation and maintenance of a user-friendly risk assessment tool for vessel operators as it relates to ballast water and vessel biofouling regulation and management. The risk assessment tool should be available to the public and similar to https://vesselcheck.fish.wa.gov.au/.	2018–2027	DLNR	HDOT DOH UH Industry	1	Contract services for creation and maintenance of website. $10,000 per year for 10 years, FY2018-2027.	$100,000	$20,000	$20,000	$20,000	$20,000	$20,000	
146	PwsTifs1.6	Hire a communications specialist, videographer, and web developer from CTAHR Office of Communications Services to write, develop and disseminate new statewide comprehensive education and outreach materials targeted at specific audiences, such as the native Hawaiian community, tourists, boaters, nursery growers, livestock producers, and farmers, with specific invasive species messages. The CTAHR communications team would work in close coordination with the HDOA biosecurity communications specialist.	2018–2027	UH	CGAPS DLNR HDOA HTA Industry HEEA	1	Salary costs for a communications specialist, videographer, and web developer is $75,000 per position per year. Operational funds for each position is $25,000 per position per year. The total cost for salary and operational support is $300,000 per year for 10 years, FY2018-2027.	$3,000,000	$600,000	$600,000	$600,000	$600,000	$600,000	3
147	PwsTifs1.7	Hire two university instructors/researchers to teach and conduct research on biosecurity program and university field of study.	2018–2027	UH	HDOA DLNR	3	Salary costs for a University instructors/researchers is $120,000 per position per year. The total cost for salary and operational support is $240,000 per year for 10 years, FY2018-2027.	$2,400,000	$480,000	$480,000	$480,000	$480,000	$480,000	2
							Total Cost	$378,471,280	$86,603,404	$82,057,002	$61,616,730	$70,660,258	$77,533,886	288
							Total Preborder	$12,980,000	$2,750,000	$2,160,000	$2,690,000	$2,690,000	$2,690,000	
							Total Border	$98,632,880	$9,461,100	$14,730,270	$20,225,570	$24,870,870	$29,345,070	
							Total Postborder	$255,308,400	$72,082,304	$62,856,732	$36,391,160	$40,789,388	$43,188,816	
							Total Public Awareness	$11,550,000	$2,310,000	$2,310,000	$2,310,000	$2,310,000	$2,310,000	
								$378,471,280	$86,603,404	$82,057,002	$61,616,730	$70,660,258	$77,533,886	
							Total Policy Tasks	$0	$0	$0	$0	$0	$0	
							Total Process Tasks	$56,795,000	$10,130,000	$10,965,000	$11,900,000	$11,900,000	$11,900,000	
							Total Technology, Infrastructure, Funding, and Staffing	$321,676,280	$76,473,404	$71,092,002	$49,716,730	$58,760,258	$65,633,886	
								$378,471,280	$86,603,404	$82,057,002	$61,616,730	$70,660,258	$77,533,886	
							Total Infrastructure CIP	$60,000,000	$35,000,000	$25,000,000	$0	$0	$0	
							Operations	$318,471,280	$51,603,404	$57,057,002	$61,616,730	$70,660,258	$77,533,886	
							Average annual	$37,847,128	$43,301,702	$41,028,501	$30,808,365	$35,330,129	$38,766,943	
							Average operations funds	$31,847,128	$25,801,702	$28,528,501	$30,808,365	$35,330,129	$38,766,943	