



THE SILENT INVASION

VENOMOUS SNAKES, KILLER BEES, TROPICAL DISEASES...HAWAII'S FUTURE IS AT STAKE.

THE SILENT INVASION OF

Hawai'i by insects, disease organisms, snakes, weeds, and other pests is the single greatest threat to Hawaii's economy and natural environment and to the health and lifestyle of Hawaii's people. Pests already cause millions of dollars in crop losses, the extinction of native species, the destruction of native forests, and the spread of disease. But many more harmful pests now threaten to invade Hawai'i and wreak further damage. Even one new pest—like the brown tree snake—could forever change the character of our islands. Stopping the influx of new pests and containing their spread is essential to Hawaii's future well-being.

Despite the efforts of more than 20 state, federal, and private agencies, unwanted alien pests are entering Hawai'i at an alarming rate – about 2 million times more rapid than the natural rate. In 1994, the federal Office of Technology Assessment declared Hawaii's alien pest species problem the worst in the nation. Hawaii's evolutionary isolation from the continents, and its modern role as the commercial hub of the Pacific make these islands particularly vulnerable to destruction by alien pests. Gaps in current pest prevention systems and a lack of public awareness add further to this serious problem.

The present problem is severe. The future could be even more dire. Slow, incremental action will not be sufficient. Dramatic improvements must be made now to stem the invasion of alien pests. Only committed political leadership and widespread public support can preserve Hawaii's environment, lifestyle, and economy.




THE THREAT IS URGENT. OUR FUTURE IS AT RISK.

What is Alien? The term alien (also non-native, exotic, non-indigenous, or introduced) refers to species that arrive in Hawai'i with the help of human activity. For example, the term alien, when used in the context of agriculture, is based entirely on desirable non-native plants and animals. Mango, coconut, banana trees, orchids, and anthuriums which symbolize Hawaii are all alien species.



AT RISK. STOP THE ALIEN ONSLAUGHT.

of humans, whether through intentional or accidental means. Clearly, not all alien species are undesirable. Hawai'i's agricultural
symbolize Hawai'i in many people's minds are actually alien species. In this document we are only concerned with stopping potentially harmful alien pests.



Two PIRANHAS were caught in Lake Wilson in 1992-93. There may be more. We don't know.

WHY SHOULD YOU WORRY?

Experts say that without significant improvements in prevention systems, it is only a matter of time before the brown tree snake establishes itself in Hawai'i. Accidentally introduced to Guam in the late 1940's, this snake causes, on average, one power outage every four days. It has devastated Guam's native bird population. **Two hundred people have been treated for bites from this aggressive, venomous snake**, which can cause respiratory failure in infants. The brown tree snake has already made its way to Hawai'i at least six times as a stowaway on aircraft and in cargo from Guam. Fortunately, these were caught by the system; but even one pregnant female snake slipping through could devastate Hawaii's economy, environment, visitor industry, and quality of life.

A single alien pest that slipped through our borders—the **Formosan ground termite**—now causes nearly **\$150 million** in treatment and damage repair costs annually, most of which is paid by private homeowners. By comparison, the combined budget of all government pest prevention programs to protect Hawai'i is only \$25 million. Although Hawai'i now has four kinds of damaging termites, there are more than 2,000 termite species in the world, including **many destructive species that could thrive in Hawai'i's** agreeable climate.

Each year, an average of 20 new alien insects make their way to Hawai'i, half of which are known pests. For Hawaii's farmers it is becoming impossible to cope with the number of new

Malaria and other tropical diseases are not yet a problem in Hawai'i, but the threat is real. Just one infected, pregnant *Anopheles* mosquito could start a **MALARIA** epidemic in Hawai'i.



WHAT SHOULD YOU KNOW?

pests. They are being forced to increase pesticide use, change crops, or quit farming altogether. The agriculture industry estimates **it is losing \$300 million** per year in revenue from potential markets that now refuse Hawai'i exports because of alien fruit flies that infest many island crops.

More than one-third of all the threatened and endangered plants and birds in the entire U.S. live only in Hawai'i. For more than 95% of these 282 imperiled Hawaiian species, alien competitors, diseases, or predators are a primary threat. As new pests pour into our forests, streams, and coastal waters, **the number of native species threatened with extinction is increasing faster than conservation programs can protect them.**

Malaria and many other tropical diseases are not yet a problem in Hawai'i, in part because we do not yet have the mosquito species that carry these diseases between hosts. But the threat of additional mosquitoes reaching the islands is very real. The Health Department **has collected 104 different species of mosquitoes from aircraft** landing in Honolulu.

Because of these and hundreds of other examples, THERE IS WIDESPREAD AGREEMENT AMONG FARMERS, SCIENTISTS, GOVERNMENT AGENCIES, BUSINESS PEOPLE, AND OTHERS THAT STOPPING THE INFLUX OF NEW PESTS IS ESSENTIAL to Hawaii's future well-being.



THE JOY OF BEING IN HAWAII

has much to do with our pleasant, non-threatening environment. But many of the diseases, nuisance insects, and other pests that make most tropical areas in the world less attractive than Hawaii would thrive here if they ever reached our shores.

SOME ALREADY HAVE.

RED FIRE ANTS

almost made their way to Hawaii in 1991 when agricultural inspectors in Honolulu intercepted an infested mail parcel from Florida. These ants send more than 20,000 people from the U.S. to doctors each year. **In 1989, 32 people died from allergic reactions to the ants' toxic stings.** Fire ants are voracious predators of beneficial insects and



THE POTENTIAL IMPACT OF NEW PESTS ON

destroy germinating seeds, flowers, and young fruit of many crop plants. They are capable of killing ground-nesting birds and small animals, and killing trees by girdling their trunks. Fire ants are particularly fond of well-manicured turf grasses, such as golf courses, and wreak havoc on drip-irrigation systems by gnawing apart drip lines.

SCORPIONS

Because of restrictions placed on inspecting First Class mail, many dangerous and potentially devastating species, such as piranhas, giant emperor scorpions, and venomous spiders reach Hawaii through the illegal mail-order pet trade.



SEVERAL OTHER SNAKE SPECIES HAVE ALREADY PROVEN THEIR ABILITY TO INVADe ISLANDS WITH DEVASTATING EFFECT. WE MUST GUARD AGAINST THEM ALL.



OUR HEALTH AND LIFESTYLE IS IMMENSE.

THE BROWN TREE SNAKE

For many Hawai'i residents and visitors, the fact that **our islands have no snakes** (other than the small, earthworm-like blind snake) is a source of tremendous comfort. The people of Guam felt the same way before they were invaded by the brown tree snake. Of the more than 200 people treated in Guam emergency rooms for snakebites, most **(84%) were bitten at night while asleep in bed**. On more than one occasion, parents checking on a crying baby have been horrified to find an **eight foot snake coiled around the child, the baby's hands punctured and swollen from repeated bites**.

Snakes on Guam are also responsible for power outages every four days on average. Considering the conservative cost estimate of \$13 million for a major O'ahu power outage triggered by a fallen tree

branch in April 1991, the prospect of frequent snake-induced outages in Hawai'i is a costly one.

Although they'll eat anything from lizards to garbage to hamburgers straight from the grill, **the brown tree snake's preferred prey is birds**. The brown tree snake **has already wiped out 9 of Guam's 11 native land bird species** and most of the non-native birds as well. Hawai'i has already lost half of its native birds to extinction, and if the brown tree snake makes its way here, many of **Hawaii's birds would inevitably be wiped out as well**.

While the brown tree snake is the most imminent threat to Hawai'i today, there are an estimated 1,000 other snake species in the world that could pose a threat. **State inspectors captured 32 snakes and nearly 100 other illegal reptiles and amphibians in Hawai'i during 1994 alone**.

BELOW: 32 PEOPLE DIED IN THE U.S. IN 1989 FROM ALLERGIC REACTIONS TO FIRE ANT TOXINS. RIGHT: BITING SAND FLIES CAN INFLICT UP TO 10,000 BITES PER PERSON PER DAY.



KILLER BEES, FLESH-EATING FISH, VENOMOUS

BITING SAND FLIES

A NIGHTMARE FOR BEACHGOERS

Imagine walking out on Waikiki beach on a perfect, sunny day. You stretch out on the sand, and **within seconds you are engulfed in a swarm of tiny, biting flies**. They bite your arms and legs, burrow into your ears and eyelids, and even find their way under your swimsuit. Each bite becomes a raised welt that itches for a week or more. You retreat to the beachside restaurant. They follow. You resort to repellent, and find you need to reapply it every hour just to slow them down. Your kids can't stop scratching their bites, **and have dozens of infected sores on their legs and ankles**.

SCIENCE FICTION? Not really! The threat of biting flies in Hawai'i is very real.

On May 2, 1995, three canoes in the historic Polynesian voyaging fleet sailing from the **Marquesas to Hawai'i** reported biting flies on board. The crews had seen for themselves the swarms of these no-no flies at beaches and streams on Nuku Hiva, and the infected sores on the legs of bitten Marquesan children. These tiny, voracious flies breed in beach

sand or in streams, and are most active on sunny days. Peak swarms can inflict up to 10,000 bites per person per day. Millions of dollars have been spent trying to control the flies in the Marquesas with little success; complete eradication is regarded as impossible. Fortunately for Hawai'i, the crews of the canoes understood the severity of the situation and took great pains to destroy these flies before they reached our islands.

At least one resort development in the Caribbean learned about biting sand flies the hard way. On the day of the resort's debut before an invited horde of travel agents, the flies completed their seasonal reproductive cycle in marshy areas created by the hotel's construction work. **The visiting travel reps were the first course for the flies' feeding season, and the new resort never recovered from the bad press.**

The most likely way for biting flies to reach Hawai'i would be aboard aircraft or ships from fly-infested regions that might carry wet sand, soil, or plant material where the flies breed. Once here, drastic control measures including poisoning and re-engineering of beaches to minimize breeding habitat would be needed to keep the flies from driving sunbathers and beachside diners away.

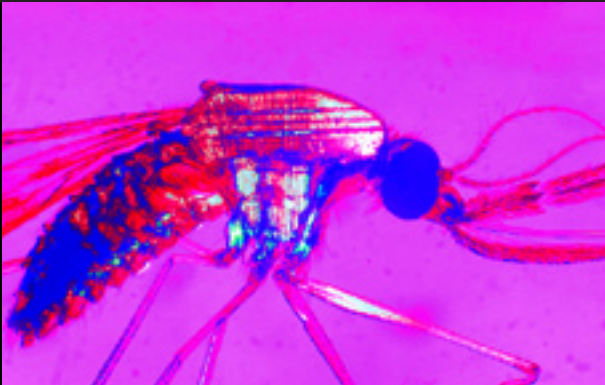


A live bat infected with rabies was found in a cargo container in March 1991 at Honolulu Harbor. Fortunately, it was caught.



Killer bees have now spread into southern California, greatly increasing the chances of bees stowing away on ships bound for Hawai'i. In Latin America these bees have caused nearly 1,000 human deaths and 200,000 attacks requiring medical treatment.

MOUS SNAKES...IT COULD HAPPEN HERE.

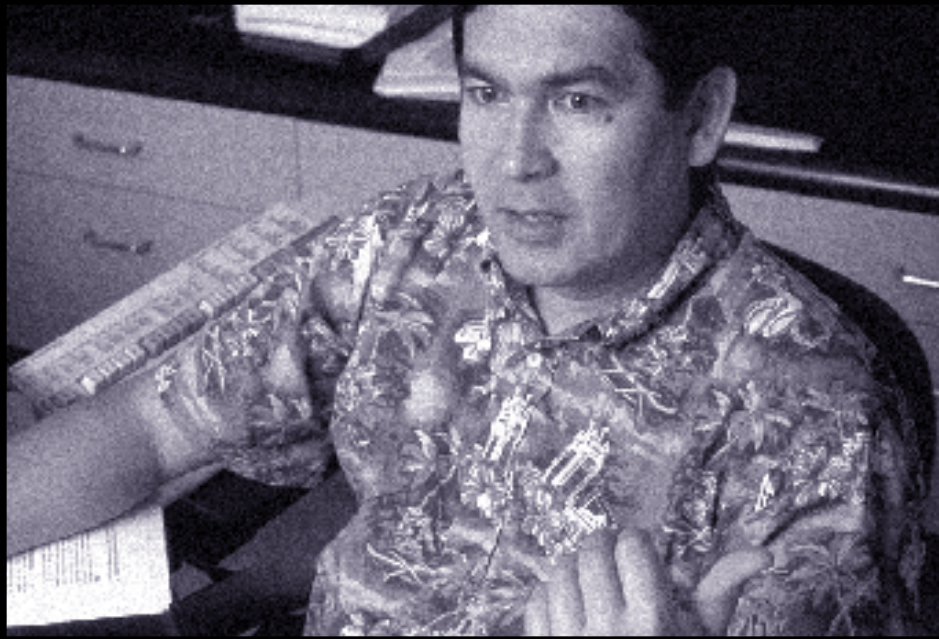


Hawai'i currently has no malaria-carrying mosquitoes. But with the frequency of air travel to Hawai'i and the capacity of mosquitoes to survive in wet cargo containers, tires, and elsewhere, it is entirely possible that they could make their way here.



In 1992, quarantine officers confiscated 39 piranhas (flesh-eating fish from the Amazon) from Hawai'i aquarium enthusiasts who had purchased the deadly pets from a mainland mail-order house. A state officer required 14 stitches after he was bitten by one of the illegal fish. Two piranhas have already been found in O'ahu waterways. Should they thrive in our streams and lakes, a simple swim could become a dangerous and terrifying experience.

“THERE IS A MAJOR COST ASSOCIATED WITH THE INTRODUCTION OF PEST SPECIES. I AM CONCERNED ABOUT THE FUTURE OPTIONS WE MAY BE FORECLOSING ON AS A RESULT OF THE DAMAGE PEST SPECIES ARE CAUSING TODAY.”
PAUL BREWBAKER, CHIEF ECONOMIST, BANK OF HAWAII



HAWAII'S VISITOR IN

THE VISITOR INDUSTRY

The visitor industry is the backbone of Hawaii's economy, generating \$18.9 billion in total sales, 30% of all state and county taxes (\$1.1 billion), and 37% of all civilian jobs in 1994.

Hawaii's visitor industry is largely dependent on the islands' image as a paradise with one of the world's safest and most pleasant outdoor environments – fantastic weather, clean beaches and water, and no dangerous snakes, insects, or tropical diseases to worry about. But these and other pest species threaten Hawaii's borders every year; if any sneak through, they could permanently tarnish this image and pose real threats to the engine that drives Hawaii's economy.



THE FUTURE LOOK OF HAWAII TOURISM? THESE MAKE-BELIEVE PRODUCTS COULD BECOME REALITY IF WE ALLOW NEW PESTS TO INVADE OUR ISLANDS AND EMPTY OUR BEACHES.

“ONE OF THE GREATEST, UNSUNG ADVANTAGES WE HAVE AS A VISITOR DESTINATION IS ALL THE THINGS WE DON’T HAVE—SNAKES, BITING FLIES, TROPICAL DISEASES. AS WE WORK TO ATTRACT MORE VISITORS, IT IS CRITICAL THAT WE ALSO KEEP THESE PESTS OUT.” PAUL CASEY, PRESIDENT, HAWAII VISITORS BUREAU



DUSTY IS AT RISK.



THE POSTCARD AT LEFT SHOWS WHAT THE LETHAL YELLOWING DISEASE CAN DO TO A COASTLINE OF COCONUT TREES. IMAGINE A HAWAII WITHOUT PALM TREES.



“WE’RE IN REAL TROUBLE.

EVERY INFECTED PAPAYA TREE IS PULLING INCOME FROM OUR POCKETS AND FOOD OFF OF OUR TABLES. I KNOW SOME FARMERS WHO HAVE LOST EVERYTHING.”

**WILLIAM JULIAN,
BIG ISLAND PAPAYA GROWER**

MORE PESTS PER ACRE =

SICKLY CROPS AND THRIVING PESTS

The agricultural industry is Hawaii’s third largest revenue source, grossing nearly \$1 billion per year. Pests already established in Hawai‘i are responsible for large losses in damaged agricultural crops and lost markets. New pests are a constant threat. With the downsizing of sugar and pineapple, **these new pests are a major threat to the future of diversified agriculture in Hawai‘i.**

Since 1985, four new sugarcane insect pests have become established in Hawai‘i, costing sugar planters more than \$9 million.

Alien snails, insects, viruses, and other pests threaten the resurgence of taro (already a \$2 million industry

statewide) as an agricultural commodity and the staple of traditional Hawaiian diet. **The taro root aphid causes 90% crop loss in dryland taro.** Big Island taro growers are already battling this pest, and it spread to O‘ahu farms for the first time in late 1994. The only treatment for taro root aphid: removal of all taro from the infested field for at least one year.

Many of Hawaii’s most promising crops are struggling under a siege of alien pests. Anthurium growers battle bacterial blight which has caused a **40% decline** in statewide production since 1980. Several ginger root farmers have suffered **60-70% crop loss** due to a bacterial wilt that first appeared in 1991. An alien root aphid on Maui is causing crop **losses of 20-90%** in affected cabbage, broccoli, and cauliflower crops.

“IF IT ISN'T ONE PEST IT'S ANOTHER. AS SOON AS WE GET A HANDLE ON ONE THING, ANOTHER COMES ALONG. IT'S VERY DISCOURAGING.”

PAUL HIGASHINO, MAUI TARO FARMER



DIRE FUTURE FOR FARMERS



Since fruit flies have made their way to Hawai'i, restrictions have been placed on the export of papaya, mango, and other produce to fruit fly-free markets like California and Japan. The agriculture industry values these lost potential markets at \$300 million per year.



The papaya ringspot virus weakens the papaya tree and ruins the fruit. The virus could bring an end to large-scale papaya production on the Big Island, valued at \$16 million annually and employing 1,200 farmers. The fall of papaya, the fifth largest commodity in the state, could mean a \$50 million loss in an economy already suffering from the decline of the sugar industry.

ALIEN PESTS ARE THE #1 THREAT TO 0



“EACH TIME WE LOSE ANOTHER HAWAIIAN PLANT OR BIRD OR INSECT OR FOREST, WE LOSE A LIVING PART OF OUR ANCIENT CULTURE. STOPPING ALIEN PESTS IS ABOUT CHOOSING OUR FUTURE AND SAVING OUR PAST.”

**NAINOA THOMPSON,
POLYNESIAN VOYAGING SOCIETY**

HAWAII IS HOME TO 38% OF THE NATION'S THREATENED AND ENDANGERED PLANTS AND 41% OF ITS ENDANGERED BIRDS.

Hawaii is also home to the only tropical rain forests in the 50 states; half of these rain forests are already gone. The single greatest threat to the survival of Hawaii's remaining forests and the native wildlife they support is the destruction caused by non-native species. Non-native species prey upon and destroy habitat for native species, compete with them for food and habitat, and spread foreign diseases to native plants and animals.

State, federal, and private managers of Hawaii's nature reserves spend more than 75% of their resources to prevent the spread of these pests and repair the damage they cause. The flow of new pests into the state is a constant threat to the survival of Hawaii's precious natural resources.



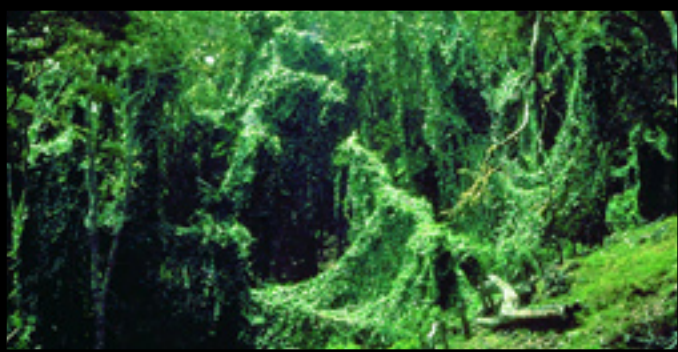
Saved from feral goats and pigs by a decade of fencing and hunting, the Haleakala silversword is now threatened by the Argentine ant, which probably hitched a ride to Hawaii in foreign cargo. In parts of the silversword's last stronghold on Maui, these ants are wiping out the native bees and other insects that this spectacular plant depends on for pollination.

HAWAII RELIES ON ITS RAIN FORESTS FOR ALMOST ALL OF ITS FRESH WATER. AS ALIEN PIGS, WEEDS, AN

OUR WATERSHEDS AND NATIVE WILDLIFE



Introduced mosquitoes spread avian malaria and other diseases that have devastated Hawaii's native birds in many lowland areas. Although the mosquitoes we have now do not commonly survive above 5,000 feet elevation in Hawai'i, there are many mosquito species in the world that could spread into these last, high-elevation forest refuges. At stake for these birds is the survival of their entire species.



Hawaii's forests and other natural areas have been and continue to be invaded by non-native weeds which choke out and compete for sunlight with native species. Banana poka, an attractive non-native vine introduced to Hawai'i from South America, has smothered over 70,000 acres of prime native forest. Hardest hit have been the state's precious koa forests, which supply Hawaii's most renowned cabinetry wood and support many rare birds and plants.



Non-native pigs, goats, deer, and sheep have spread into virtually every watershed in the state. Where they root and trample, they destroy native vegetation, accelerate erosion and pollute the water supply with eroded silt, feces, and foreign diseases. Pigs eat the nestlings of ground-nesting birds, and their wallows create breeding sites for foreign mosquitoes, which spread deadly diseases to Hawaii's endangered forest birds.

OTHER PESTS DEplete THESE FORESTS, THEY PUT OUR FUTURE WATER SUPPLIES INCREASINGLY AT RISK.

HAWAII IS BEING OVERRUN BY ALIEN PESTS DUE TO FOUR MAJOR FACTORS

1 HUB OF THE PACIFIC

Hawaii is the primary shipping link between the mainland U.S., Asia, and other Pacific Rim ports, handling nearly 19 million tons of cargo each year. Honolulu International is the 17th busiest airport in the world, averaging one arriving flight every 1.3 minutes. Hawaii itself is reliant on these links; over 80% of the goods consumed in Hawaii are imported.

Inevitably, cargo shipments, passenger flights, military transports, mail, and other traffic entering Hawaii bring with them living plants, animals, and microbes that would have been unable to reach the islands on their own. During 1994, for example, state and federal inspectors intercepted alien insects and other invertebrates at our borders 2,275 times. Of these, 16% were found in ship cargo, 39% in air cargo, 40% in baggage from passenger flights, and 5% in mailed parcels and other miscellaneous pathways. **About 48% originated in foreign countries, while 52% were sent to Hawaii from the U.S. mainland.** Many of these were inverte-

As a result of this gentle environment, many native species lost their natural defenses because they had no need to escape or protect themselves from predators. For example, most native plants have no poisonous saps or thorns, and several birds lost their ability to fly.

But now a new pest reaches Hawaii once every 18 days on average. Like other species, they, too, benefit from Hawaii's lush environment. Free of the competitors and natural diseases that kept them in check in their own native environments, **these foreign pests sometimes explode in Hawaii**, overwhelming native species, harming valuable crops, and sometimes threatening the islands' people as well.

3 LACK OF PUBLIC AWARENESS

Most pest introductions occur quite innocently. The majority of Hawaii's residents and visitors simply are not aware that foreign plants and animals pose a significant threat. They don't know how easy it is to accidentally bring in

WHY ARE WE BEING INVADED? WHY?

brates that already occur in Hawaii, but at least 259 were species not known to occur here.

2 AN EXCEPTIONALLY VULNERABLE ENVIRONMENT

The same natural circumstances that have made Hawaii such a paradise now make the islands exceptionally vulnerable to new pest species. For millions of years, Hawaii was isolated from the rest of the world by 2,000 miles of open ocean. Plants and animals succeeded in crossing the ocean and colonizing Hawaii very infrequently, perhaps as seldom as once in 50,000 years. Those that did survive this incredible journey found a pleasant climate, fertile soils, few competitors, and fewer diseases or predators.

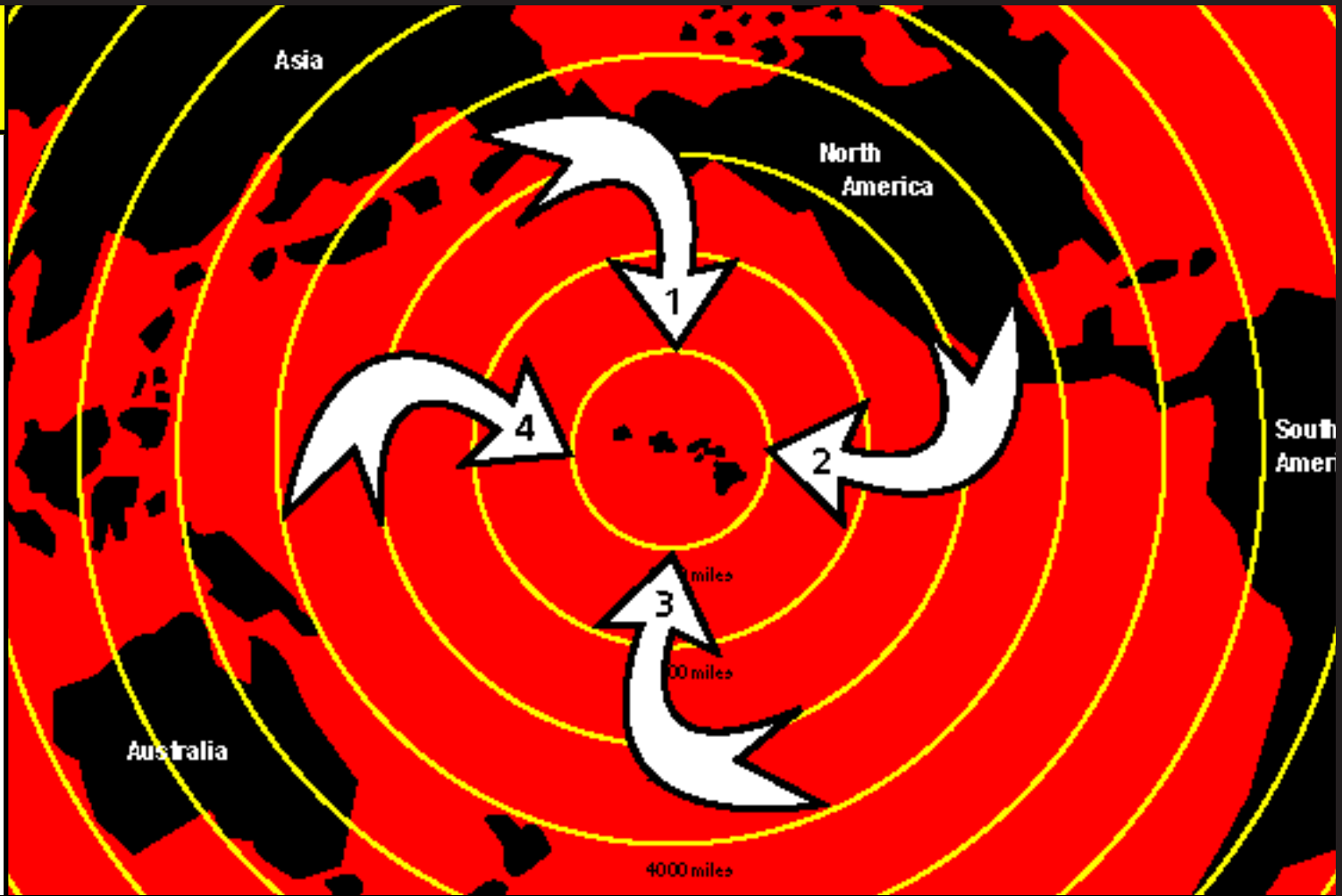
The first Polynesian navigators to arrive in Hawaii found an especially gentle and fertile land. Even today, the islands are free of most tropical diseases, dangerous predators, and nuisance pests. Many crops thrive here, free of the pests and diseases that limit their growth elsewhere.

something via cargo, a box of fruit, or even on their hiking boots. Air passengers do not appreciate the importance of the airline agricultural declaration form. Most people do not know how to identify or report foreign species they may spot.

4 GAPS IN THE SYSTEM

Over the past 100 years, agency programs have arisen as needed to address specific pest concerns (e.g., preventing rabies from entering the state, stopping pests of coffee, sugar, and other major crops, or controlling pest species on a particular nature reserve). **The result is a set of programs that are generally effective within their own jurisdictions but which, taken together, leave many gaps and leaks for pest entry and establishment.** In some cases, better pest prevention is a matter of more funds for inspectors and equipment; in others, jurisdictional gaps or conflicts must be overcome so that agencies can work better together to get the job done.

RS:

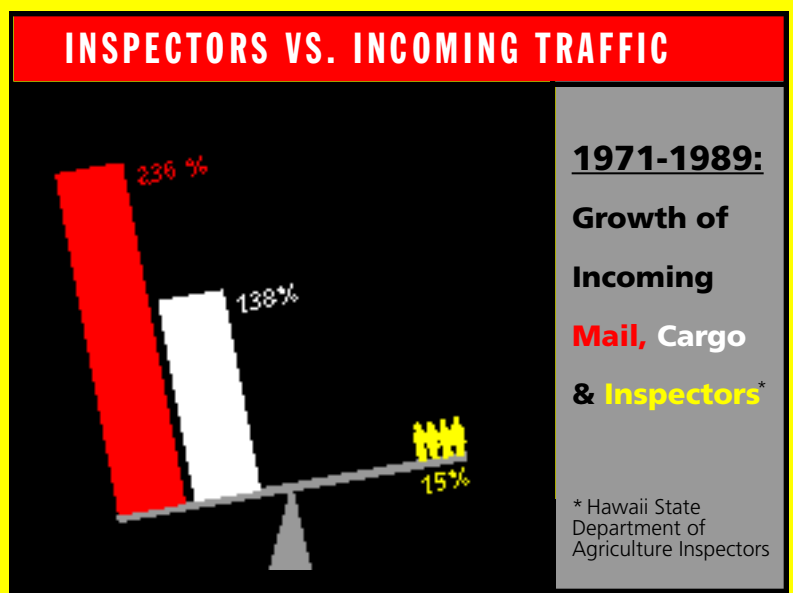


WHY IS HAWAII SO VULNERABLE?

A DAY IN THE LIFE OF THE ALIEN PEST INVASION OF HAWAII

EACH DAY, PESTS HAVE MILLIONS OF OPPORTUNITIES TO REACH HAWAII

- EVERY DAY BY AIR**
 68 Commercial Flights
 192 Interisland Flights
 21,992 Passengers
 11 Military Flights
 260,000 Pounds of Cargo
 15,575 Parcels
- EVERY DAY BY SEA**
 30,964,000 Pounds of Cargo
 20,888 Parcels
 222 Passengers
- EVERY DAY BY MAIL**
 614,000 Pounds of Mail
 1,171,384 Parcels



1971-1989:
 Growth of
 Incoming
 Mail, Cargo
 & Inspectors*

* Hawaii State Department of Agriculture Inspectors

GAPS IN HAWAII'S PEST PREVENTION

Hawaii has been actively involved in alien pest prevention since 1888, when King David Kalakaua declared a quarantine on imported coffee to prevent the introduction of coffee rust and other diseases. Today, at least 20 state, federal, and private organizations and a number of volunteer groups dedicate a major part of their resources to design, implement, and improve alien pest prevention and control programs. This system relies on four lines of defense to protect Hawaii from harmful pests.

FOUR LINES OF DEFENSE

Pre-Entry Prevention.....Port-of-Entry Prevention.....New Pest ControlLong-Term Pest Control

Pre-entry defenses include international trade agreements which prohibit trade in harmful pests, and other mechanisms that prevent pests from leaving the foreign port en route to Hawaii. Port-of-entry prevention is focused on inspections of arriving passengers and cargo to prevent pests from crossing Hawaii's borders.

The objective of new pest control is to prevent any pest that slips through our borders from spreading. Where this fails, long-term control is required to reduce the damages caused by pests that we will have to live with for many years. Currently, there are important gaps in each of these four lines of defense.

GAPS IN THE SYSTEM

1. International trade agreements and other federal programs do not protect Hawaii from the full range of pests.

Many plants and animals which pose little threat in the temperate climates of the mainland U.S. are severe threats in Hawaii's tropical environment. For this reason, federal regulations currently provide inadequate protection against many of the pest species of concern to Hawaii. Recent efforts to enhance international trade have raised further concerns, as Hawaii laws are now being pre-empted by federal trade agreements to allow import of known pests despite formal objections from Hawaiian authorities. Hawaii's special vulnerability must be recognized by federal agencies, both to protect our islands and to reduce the risk of pests reaching the mainland after infesting Hawaii.

2. A large proportion of the total passenger, cargo, and other traffic entering Hawaii is currently uninspected, including materials known to be significant sources of new alien species.

Due to limited financial and personnel resources, and because the state tries to be as accommodating as possible to visitors, inspection agencies rely heavily



Many potentially damaging pests arrive in Hawaii through the U.S. Mail.



In 1995, just 133 state and federal inspectors and 10 dogs were responsible for inspecting over 25,000 flights, 6 million tons of cargo, and nearly 8 million visitors and residents coming to Hawaii.

Source: Hawaii Department of Agriculture Planning and Development Branch

PREVENTION AND CONTROL SYSTEM

on self-reporting and voluntary inspection; domestic (U.S.) flights and cargo, especially, are very lightly inspected. Even high-risk Guam flights—the most likely source of introduction for the brown tree snake—sometimes go uninspected due to staff shortages. Limited resources and the U.S. Postal Service's mandate to deliver the mail without delays greatly limit the inspection of Hawai'i-bound mail, in spite of evidence that the mail is a common pathway for live animals, insects, and weed seeds. Public awareness programs to encourage voluntary compliance are also inadequate.

3. Penalties for illegal introductions are inadequately enforced.

State and federal laws allow for significant fines and imprisonment penalties, but because the court system seems to be poorly informed about the seriousness of illegal importations, and because of an already busy court schedule, stiff penalties are rarely imposed.

4. The current process for determining which species are to be prohibited or controlled as pests is complex and cumbersome, and allows some known pests to be imported, sold, or spread to new areas.

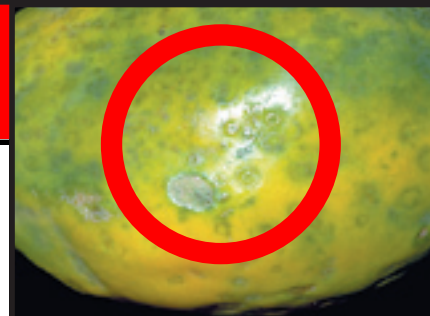
State and federal prohibited lists do not match, and import rules are different for animals vs. plants, making it more difficult for a potential importer to know clearly what is allowable. Many alien species do not prove to be pests until after they are imported. The lengthy requirements for adding a new species to the prohibited list prevents quick pest-control action, allowing new pest problems to spread while official review procedures are underway. Some known pests—like apple snails and Jackson's chameleons—can be kept and even sold if they were imported before the species was officially declared a pest, even while money is being spent elsewhere in the state to control the same species.

5. Response to new infestations is frequently delayed by jurisdictional or organizational problems, allowing pests to become established and, in some cases, to spread beyond control.

There is no reliable system for reporting most pests, and it is often unclear which agency has jurisdiction over a particular pest. Few contingency plans are in place to prepare for rapid control of pests that could potentially enter the state. The ranges of most of the serious, established pest species in Hawai'i have not been mapped; without this information, it becomes more difficult to plot strategies for pest control and track their effectiveness.

6. Interisland spread is a major, largely unregulated problem.

Few controls are in place to prevent the spread of serious pests from one island to another. Virtually all available inspection resources are taken up by inspection of overseas traffic. As a result, the damaging impacts of serious farm and forest pests are spreading throughout the state.



Quick containment versus long-term control: On Kaua'i, the first infestations of papaya ring-spot virus were eradicated for under \$25,000. On the Big Island, where early eradication efforts failed, costs in crop losses and control programs have already exceeded \$10 million.

Source: U.S. Department of Agriculture and Animal and Health Inspection Service



Estimated costs to homeowners to control termite damage has grown from \$60 million in 1986 to \$150 million in 1995.

Source: College of Tropical Agriculture and Human Resources, University of Hawai'i Department of Entomology

WE MUST TAKE ACTION NOW.

WHAT CAN WE DO???

In 1995, 14 state, federal, and private organizations came together to form the Coordinating Group on Alien Pest Species (CGAPS). Formation of this unprecedented partnership **is the first step in an Alien Species Action Plan designed to close gaps** in the pest prevention system. Senators Akaka and Inouye and Governor Cayetano, especially, have recognized the alien pest invasion as a social issue of the highest priority. Implementation of the other elements of this plan—outlined below—is now under way. **Success, however, depends heavily on support from elected officials and the general public** for these critical improvements.

For some of the following actions, programs are in place but need further funding, added expertise, or better coordination. For others on the list, new and innovative programs need to be initiated. **All of these actions will require political and community support of the highest order.**

Further **delay will** only increase the costs associated with containment and damage and will **increase the risks to Hawaii's** economy, natural resources, and the health and lifestyle of its people.



BEFORE IT'S TOO LATE...

THE TEN POINT ACTION PLAN

1 STOP THE BROWN TREE SNAKE

The brown tree snake is the most frightening and dangerous pest currently threatening Hawai'i. It must be stopped at the border, for if it succeeds in entering the state and establishing a breeding population, there is no known means of eradicating it. State and federal agencies need additional funding and manpower to a) inspect all aircraft and ships leaving Guam to be sure they are snake-free, b) inspect again on their arrival in Hawai'i, c) conduct ongoing surveys near harbors and airports to detect any snakes that succeed in entering Hawai'i as early as possible, and d) train and maintain Snake Watch Attack Teams on each island to be ready to respond in the event snakes are found in the islands. Additional research is needed to develop more effective snake control methods.

2 DRAMATICALLY INCREASE PUBLIC AWARENESS OF ALIEN PEST PROBLEM

More than any other factor, improved pest prevention depends on greater involvement by individual travelers and residents in Hawai'i. An ongoing campaign (beginning with this report) is needed to heighten general public awareness of pests to watch out for, how to report them to authorities, and how to avoid accidentally introducing them to the islands. People within the transportation and public safety industries must receive special training in detecting, handling, and reporting pests, and a reliable system for responding to pest reports must be established. Professional assistance from the communications industry is needed to make this campaign as powerful as possible.

3 PREVENT PEST INTRODUCTIONS BY THE MAIL

Experienced inspectors believe that the mail may account for as much as 20% of the pests reaching Hawai'i each year, some mailed innocently out of ignorance and others mailed in an attempt to evade the law. Until the mail is actually inspected, we cannot

know the full extent of the pest threat. While federal agents inspect Hawaii's mail bound for California under a special program, mainland mail is not inspected before being delivered in Hawai'i. State and federal inspectors need trained dogs, equipment, and statutory authority to enable inspection of suspicious parcels in First Class and private carrier mail bound for Hawai'i without slowing the overall mail delivery. The existing U.S. Customs Service and U.S. Department of Agriculture programs that inspect foreign mail need stable and adequate funding.

4 PREVENT PEST INTRODUCTIONS VIA AIRCRAFT

In 1994, nearly 80% of the alien species intercepted at Hawaii's borders arrived via aircraft—as cargo or in passenger baggage, or as hitchhikers in the aircraft itself. Aircraft are an especially easy means of travel for brown tree snakes and disease-bearing insects like mosquitoes. The challenge is to inspect flights and passengers more thoroughly without ruining the Hawai'i visitor experience or clogging traffic at airports. Full participation by the airlines and travel industry is needed to inform visitors before they leave home and during their flight of the prohibitions against bringing plants, animals, or soil to the islands, and the stiff penalties for violations. State and federal agriculture inspectors need additional staff and equipment to efficiently inspect all arriving commercial, military, and private flights and baggage without inconveniencing travelers.

5 PREVENT PEST INTRODUCTIONS VIA SHIPPED CARGO

Ships and shipped cargo accounted for about 15% of the alien species intercepted in 1994. Much of the shipped cargo entering the state is not inspected, however, because of staff shortages and the sheer volume of traffic. To address this gap, inspectors need access to improved technologies for identifying high-risk cargo. By working closely with shippers and harbor personnel, inspectors can then intercept pests without unnecessarily detaining low-risk shipments.

5



THE TEN POINT ACTION PLAN

...TO ARREST

9



10



6**DEVELOP MORE EFFECTIVE SYSTEMS TO DETECT, CONTAIN AND ERADICATE NEW PEST INFESTATIONS BEFORE THEY BECOME WIDESPREAD.**

When a new disease, a noxious weed, or other pest does slip past inspectors, it becomes critically important to detect and eradicate it quickly before it spreads beyond control. To succeed, the biologists doing this work need a) strong technical support to quickly determine whether a detected species is a threat, and b) the immediate funding, trained personnel, and equipment to carry out the eradication and ensure that it was effective. Too often, one or both of these is lacking, and the result is millions of dollars in costs for long-term treatment as the pest becomes widespread, without any hope of complete eradication. Needed improvements include a user-friendly public hotline and education program to encourage reporting of top-priority pests; increased surveillance of airports, harbors, farms, and other high-risk sites to detect pests before they cause a serious problem; and a mapping system to track pests of greatest concern. Some of this work is already under way, but most remains to be done.

8**ENSURE STIFF PENALTIES FOR DELIBERATE PEST INTRODUCTION**

Too often, violators of pest prevention laws receive mild penalties or none at all, and the general public is left to pay the full costs of damage to the environment and economy. The U.S. Department of Justice has been tasked with identifying steps to strengthen enforcement of federal laws under a directive authored by Hawaii's Congressional delegates, and there is work under way nationwide to develop stronger protections against this biological pollution. In addition, the Hawai'i judiciary must send a strong message that violations of quarantine laws are taken seriously.

9**CLARIFY WHICH SPECIES ARE PROHIBITED AND SIMPLIFY PERMIT REVIEW SYSTEMS**

Ideally, every new species in Hawai'i would be "by invitation only" to ensure we only receive desirable plants and animals. Permits are currently required for importation of many organisms, but the system is confusing and time-consuming. Federal and state lists of prohibited

STOP THE INVASION OF ALIEN PESTS

7**STOP THE INTERISLAND SPREAD OF KNOWN PESTS.**

A number of major farm, forest, and health pests are currently restricted to one or a few islands in the state; preventing their spread to uninfested islands is a top priority. Because these pests—like banana poka, brucellosis, and papaya ring-spot virus—are already well-known for their destructive abilities in Hawai'i, we can be sure that they will cause major additional harm if allowed to spread to more islands. They can be stopped through heightened public awareness and improved containment efforts when new infestations are discovered (numbers 2 and 6 above). In addition, interisland inspectors are needed to ensure that passengers are not accidentally or purposefully carrying dangerous pests.

species don't match, for example, and many plants can be imported without any review of their potential to become weedy pests. Research is needed to improve our ability to quickly assess the pest potential of imported species. The permit process must be streamlined to minimize confusion, unnecessary delays, and paperwork.

10**ENSURE FEDERAL SUPPORT OF HAWAII'S PEST PREVENTION SYSTEMS**

Additional federal assistance is needed, both to protect our islands and to reduce the risk of pests reaching the mainland after infesting Hawai'i. To achieve this, Hawai'i must receive the same kind of federal attention that California has received in its program to stop fruit fly invasions from Hawai'i and foreign sources. A comprehensive package is needed to bring state and federal programs into harmony and maximize the use of available resources to stop pest invasion.



1



2



3



4



5

THE 10 MOST UNWANTED

1. Brown tree snake (*Boiga irregularis*)

- Up to 10 feet in length, greenish-brown and scaly, with bulging eyes;
- Responsible for weekly power outages and more than 200 snakebite cases on Guam;
- Found in Hawai'i on six occasions, on or associated with aircraft from Guam;
- Chances of becoming established in Hawai'i: HIGH, unless prevention measures are dramatically improved.

2. Biting sand flies and midges (*Lycoconops*, *Simulium*, and other genera)

- Can inflict 1,000 to 10,000 bites per human per day if skin is fully exposed;
- Have had detrimental effect on visitor resorts in Tahiti, Caribbean and the Marquesas;
- Breed in beach sand or streams in many areas of the world;
- Almost arrived in Hawai'i via open-hulled canoes in 1995;
- No eradication effort has been fully successful;
- Most likely pathway to Hawai'i: uninspected private yachts or planes carrying illegal soil and plant material in which these flies breed.

3. Malaria-carrying mosquitoes (*Anopheles* species)

- No malaria-carrying mosquito is yet established in Hawai'i;

- Transmit malaria to humans and could increase the disease threat to our remaining native birds;
- Spread much more rapidly than most mosquitoes, making eradication unlikely;
- If established, residents and visitors to Hawai'i would require malaria shots or pills;
- Control of new malaria outbreak in Hawai'i could be extremely difficult.

4. Queensland fruit fly (*Bactrocera tyroni*)

- Breeds in wide variety of crops, limiting their export to major markets;
- Would greatly hinder Hawaii's efforts to diversify its agriculture industry;
- Most likely pathway to Hawai'i via fruits or vegetables from Australia.

5. Miconia—The "Green Cancer" (*Miconia calvescens*)

- A Latin American tree that has spread from garden plantings into watershed forests where it casts a dense shade, killing other plants;
- Has invaded 70% of Tahiti's native rain forest;
- Now found on the Big Island, Maui, Kaua'i and O'ahu, where containment projects are underway. Must be kept off of Moloka'i and Lana'i.

STOP THEM ON THE WATER. STOP THEM IN



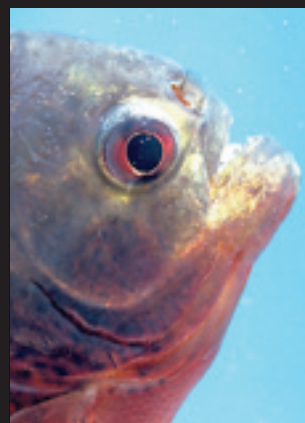
6



7



8



9



10

6. Fire ant (*Solenopsis invicta*)

- Sent more than 20,000 people in the southern U.S. to doctors and resulted in 32 deaths in 1989, due to allergic reactions to the ants' toxic stings;
- Devastates native and beneficial farm insects, and damages seeds, flowers, fruit of many crops;
- Capable of killing ground-nesting birds, small animals, and may kill trees by girdling their trunks;
- Attracted to electrical equipment and well manured turf grasses (such as golf courses), and destructive to drip irrigation systems;
- Intercepted at Honolulu post office in package from Florida in 1991.
- Risk of further introductions by mail or cargo: HIGH.

7. Africanized honey bee or "killer bee" (*Apis mellifera scutellata*)

- Very aggressive honeybees responsible for 1,000 human deaths and perhaps 200,000 attacks requiring medical treatment;
- Poses major threat to human safety, especially for native Hawaiians and others with high sensitivity to bee stings;
- Spreading rapidly into the southern U.S., and capable of reaching Hawai'i as stowaways aboard ships;
- Reached southern California in 1995, increasing the risk of invasion to Hawai'i.

8. Any new termite (any of 2,000 species)

- Small wood-and plant-eating insects that already cause \$150 million in treatment and repair costs annually in Hawai'i, yet we have only four of the world's 2,000 termite species;

- Especially destructive species are now active in Guam, Arizona, northern Japan, and other areas that send people and cargo to Hawai'i daily;

9. Piranha (*Serrasalmus species*)

- Often attacks and inflicts dangerous wounds to humans and large animals;
- Thirty-nine piranhas confiscated in Hawai'i in 1992 including two found in O'ahu waterways; all apparently mail-ordered from "dangerous pets" dealer on U.S. mainland, and shipped to Hawai'i through uninspected First Class mail;
- Same dealer sold scorpions, tarantulas and other species to Hawai'i customers.
- Chance of reaching Hawai'i: HIGH.

10. What's next?

- The most worrisome alien pests are those we may not even know about yet. In many cases, it is not possible to predict which foreign species will become pests if they reach Hawai'i.
- Many of our worst pests were introduced with good intentions but turned out to be terrible problems. Others—especially insects and diseases—hitchhiked aboard other harmless species.
- The only cost-effective approach is to choose very carefully those species we want here, and to strengthen prevention systems to stop unwanted introductions.

IN THE AIR. STOP THEM IN THEIR TRACKS.

WHAT YOU CAN DO TO HELP PRO

1

Watch out for foreign plants and animals. Report sightings of animals that don't belong in Hawai'i, such as snakes, alligators, parrots, or other exotic birds or animals which are unfamiliar to you. **Learn to identify Miconia, banana poka, and other major plant pests.** Call the state Department of Agriculture at 548-0844 or 586-PEST (7378) to report them.

2

Keep your pets (cats, dogs, rabbits, parrots, reptiles, fish) at home. It is illegal to release any non-native animal without a proper permit. Rabbits released into the wild destroy crops and native vegetation; cats prey on native birds; and aquarium fish, if released into streams, compete with and prey on native fish and shrimp. Escaped or *liberated* exotic birds carry disease, damage fruit and flower farms, and compete with endangered native birds. **Bring any unwanted pets to the Humane Society. If you or a friend have an illegal animal as a pet, turn it in voluntarily to the Department of Agriculture to avoid stiff fines**—just call 586-PEST and do the right thing.

3

Fill out your Department of Agriculture declaration form completely and honestly. The declaration form the flight attendant gives you is your opportunity to report anything you may have brought with you that could be a problem. Remember, just because you list the item doesn't mean it will be taken away from you. If necessary, it will be inspected and, if it poses a pest threat, it will be dealt with appropriately. You are not subject to a penalty if you voluntarily submit these items for inspection. **If you try to avoid inspection, the options are 1) a \$100-\$25,000 fine and/or one year in jail (depending on the violation) if you are caught, or 2) being the person responsible for introducing a new disease or other pest to Hawai'i.**

4

When coming to Hawai'i, don't bring plants, fruits, vegetables, or illegal animals with you. Fruits, vegetables, pets, and even muddy shoes are great *hitchhiking* vehicles for diseases, insects, and weed seeds, which can easily escape and establish themselves as new pests. Clean boots and camping gear before returning home to Hawai'i. **Insects can also hitch a ride to Hawai'i on illegally imported animals, such as snakes, or on cats and dogs smuggled to avoid quarantine.**

5

Mail-order wisely and ask friends and relatives not to send you plants or animals through the mail. Many catalogs offer plants and animals that become serious pests in Hawai'i. Even the desirable plant, fruit, or animal sent through the mail may have other pests growing on it. **To avoid problems, check with the state Department of Agriculture to be sure a particular catalog item is allowable in Hawai'i.** Obtain the state import permit required for all animals and microorganisms and many plants. Be sure parcels mailed to you are clearly marked *Contains Living Material: Please Open for Agricultural Inspection* to avoid any delays in delivery.

6

Landscape with native plants or non-pest ornamentals. There are many beautiful plants that are tempting to use in landscaping or to sell in garden or flower shops that are terrible pests once they escape into the wild. Seeds and spores from non-native plants in your garden can easily spread and establish themselves in our native forests or farms. **By growing native plants, such as `ilima, `a`ali`i, and wiliwili, you can help preserve native species and Hawaiian culture.** For dry areas, native plants also offer less *thirsty* landscapes, helping conserve our precious fresh water supply.

TECT HAWAI`I FROM ALIEN PESTS

7

Clean your hiking boots, running shoes, and other gear before you enter native forest areas or travel interisland. Many alien weeds are carried from one island to the next on muddy boots, camping gear, or farm equipment. **The simple precaution of scrubbing your gear can keep some of our worst pests from spreading to other islands or into the heart of our remaining pristine forests.**

8

Don't spread crop pests by sharing diseased plants. Banana bunchy-top disease, papaya ring-spot virus, and taro root aphid are all devastating pests that are spread by people giving diseased plants to their friends. **An act of generosity could be a deadly blow to your friend's garden or farm, and to the farmers of an entire island.** Ask the Hawai'i Department of Agriculture before sending or carrying plants interisland.

9

If you sail or fly, keep a clean ship. Don't be tempted to bring potted plants, animals, or other living material to Hawai'i on your sailboat or private plane. **As the crews of the Polynesian voyaging canoes discovered in 1995, these can carry the larvae of biting flies or other serious pests.** And remember that sand, soil, and plant products like wood carvings or mats can be full of pests. Ballast water, also, can carry foreign algae, jellyfish, mollusks and other potentially harmful species to Hawai'i. Keep a clean craft, **and show everything you do bring to Hawai'i to the Customs and Agriculture inspectors.**

10

Spread the word. Share this information with a friend. Protecting Hawai'i from pest invasion depends on what you and other individuals do. Encourage your friends and family to do the right thing.

STOP THE ALIEN INVASION

START RIGHT NOW.

Please copy this list and pass it on to family, friends, and co-workers.

- 1. Learn to identify the most threatening pests and report them.**
- 2. Don't release your pets into the wild.**
- 3. Fill out your Department of Agriculture declaration form completely and honestly.**
- 4. When coming to Hawai'i, don't bring plants, fruits, vegetables, or illegal animals with you.**
- 5. Mail-order wisely and ask friends and relatives not to send you plants or animals through the mail.**
- 6. Landscape with native plants or non-pest ornamentals.**
- 7. Clean your hiking boots, running shoes, and other gear before you enter native forest areas or travel interisland.**
- 8. Don't spread crop pests by sharing diseased plants.**
- 9. If you sail or fly, keep a clean ship.**
- 10. SPREAD THE WORD. Share this information with a friend.**

DO THE RIGHT THING!

REPORT SIGHTINGS OF ANIMALS, PLANTS, AND INSECTS THAT DON'T BELONG IN HAWAI'I TO THE DEPARTMENT OF AGRICULTURE AT 548-0844 OR 586-PEST (7378).

THE COORDINATING GROUP ON

CGAPS MEMBERS: Hawai'i Department of Agriculture • Hawai'i Department of Health • Hawai'i Department of

ALIEN PEST SPECIES (CGAPS) IS A

Land and Natural Resources • Hawai'i Department of Transportation • Hawai'i Farm Bureau Federation • Hawai'i

MULTI-AGENCY PARTNERSHIP TO

Visitors Bureau • National Park Service • The Nature Conservancy of Hawai'i • U.S. Customs Service • U.S.

COORDINATE MORE EFFECTIVE PRO-

Department of Agriculture • U.S. Fish and Wildlife Service • U.S. Navy • U.S. Postal Inspection Service • U.S.

TECTION FOR HAWAII'S ECONOMY,

Postal Service • Acknowledgements: CGAPS thanks the many individuals in Hawai'i and elsewhere who con-

ENVIRONMENT, HEALTH, AND WAY OF

tributed to this report. CGAPS thanks the many individuals in Hawai'i and elsewhere who contributed to this report.

LIFE FROM HARMFUL ALIEN PESTS.

Cover photo: Marc Schechter • Cover illustration: Harold Vance • Pages 1-2: tarantula, Marc Schechter • Pages 3-4: piranha, Marc Schechter; Mosquito, W. Ormerod/Visuals Unlimited • Pages 5-6: snake, Tom Fritts; Fire ants, USDA; Scorpion, Marc Schechter • Pages 7-8: arm, file photo; sand flies, Visuals Unlimited; rabid bat, HDOA; killer bees, USDA; mosquito, A. M. Siegleman; piranha, Marc Schechter • Pages 9-10: Brewbaker and Casey, Joe Solem; packages, Joe Solem; palm trees, HDOA • Pages 11-12: papaya farmer, Wayne Levin; taro farmer, Torri Higashino; fruit fly, Ken Kaneshiro; papaya, Stephen Ferreira • Pages 13-14: Nainoa Thompson, Monte Costa; apa-

pane, Jack Jeffrey; silversword, Kevin Doyle; banana poka, Sheila Conant; feral pig, Jack Jeffrey • Pages 15-16: mail box, Hib Frum; dog inspection, HDOA; papaya ringspot virus, Stephen Ferreira/ UH; termites, Kenneth Grace/UH • Pages 17-18: snakes layed out on ground, Earl Campbell; dog inspector, HDOA • Pages 19-20: ship inspection, HDOA; plant inspection, HDOA; U.S. Capitol, Architect of the Capitol • Pages 21-22: snake, Gordon Rodda; sand fly, Douglas Craig; mosquito, John Cunningham/Visuals Unlimited; fruit fly, Ken Kaneshiro; Miconia, Lloyd Loope; killer bee, USDA; fire ant, USDA; termites, Kenneth Grace/UH; Piranha, M. Yamamoto/DAR.