

## Learning from Quarantine Successes

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Among U.S. states, Hawaii stands out for its very high rate of colonization by non-indigenous species. During the period 1942–72, the number of new species of insects and mites colonizing Hawaii was 40 per thousand square miles, 500 times greater than for the continental U.S. (McGregor 1973). Unfortunately, the rate of colonization has not declined, and there is some evidence it may have even increased (e.g., Beardsley 1979). McGregor (1973) recognized that important factors contributing to Hawaii's high rate of invasion were the generally moderate and stable overall climate, lack of competition from native fauna, and the proximity of highly diverse habitats to the port of entry (at that time, only Honolulu).

Hawaii's needs for prevention and management of invasive species are arguably greater than for the rest of the United States, because both tourism and agriculture (now diversifying) require a relatively pest-free environment in order to flourish. Hawaii's tourism benefits from the scarcity of biting, stinging arthropods and absence of snakes in a tropical setting in which such pests could thrive. The continued development of diversified agriculture, currently thriving, could be slowed or reversed by pest incursions which increase the difficulty and/or expense of crop production. In addition, Hawaii's highly endemic biodiversity, several spectacular national parks, and about one-third of all federally listed endangered species in the United States are also at risk and threatened primarily by current and future invasions (Loope 1998, Loope et al. 2001).

Hawaii's defense against plant pest incursion depends upon the functioning of two distinct quarantine entities—one federal and one state—Customs and Border Protection (CBP) (a branch of the Department of Homeland Security), with technical support from the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS); and the State of Hawaii's Department of Agriculture (HDOA-Plant Quarantine branch). CBP/APHIS is responsible for enforcing regulations related to imports from foreign countries, while HDOA enforces regulations related to foreign and domestic imports. (APHIS is mandated also to inspect material and passengers leaving Hawaii for the U.S. mainland.) A complex of federal and state laws and regulations mandate the federal and state quarantine systems. (See TNCH/NRDC 1992 for an introduction to how the two systems operate and relate to one another; and HDOA 2002 for a good overview of the state system.) For example, import of plant material may be permitted if it is apparently free of quarantine pests and if the plant itself is not classified as a noxious pest, but there are many qualifications to this generality. Commercial plant shipments from foreign destinations must be screened by APHIS-PPQ (Plant Protection and Quarantine) at the Plant Inspection Station, and they require official documentation—a “phytosanitary certificate”—that indicates that a foreign inspector examined the material and found no pests of concern. Plant material from domestic and foreign locations also may require a State certificate of origin, phytosanitary certificate, and/or containment in an approved quarantine facility, depending on what type of plant or plant part is being imported. For plants that are the same as or closely related to an important crop plant in Hawaii, it is more likely that a phytosanitary certificate will be required. In some cases, for example grasses and orchids, a post-entry quarantine period

in an approved facility will also be required, during which time the plant can be inspected to ascertain that it is not harboring any pests or diseases.

The responsible quarantine authority for inspecting items carried by arriving aircraft passengers also depends on origin. CBP inspectors are responsible for foreign arrivals. HDOA handles domestic ones, although HDOA inspectors might assist in foreign arrivals if more inspectors were available (HDOA 2002). In most cases, HDOA does not inspect the baggage of arriving passengers. However, it gathers quarantine information on an agricultural declaration form that must be completed by each arriving passenger (or family group) while still in the air. These forms are distributed by flight attendants, and the completed forms are collected by the attendants prior to landing. HDOA inspectors (depending on their availability) will meet the plane upon arrival, inspect any declared agricultural items, and examine cargo as it is being placed onto the baggage belt by baggage handlers. Suspicious items (such as coolers) might be tagged and inspected after being retrieved by passengers. Dog teams are occasionally used in baggage claim areas to sniff out fruits and vegetables (HDOA 2002).

These procedures play a vital role in keeping out quarantine pests, directly (through interceptions) and indirectly (through their psychological deterrent effect). However, there are many gaps in Hawaii's quarantine net. For example:

- HDOA does not currently have enough inspectors to inspect all imported agricultural commodities, which consequently may be inspected minimally or not at all before being released. Also, ports do not have adequate facilities for inspecting or holding agricultural cargo (and preventing pest escape) upon unpacking for the purpose of inspection (HDOA 2002). A more thorough inspection could be done with limited inspection staff if commodities were taken to a central inspection facility, unpacked by the importer, and presented for inspection, rather than requiring inspectors to find and unpack containers at the airport to conduct inspections. More thorough inspection would initially result in a higher rejection rate of imported commodities, perhaps motivating exporters to exercise greater care in excluding pests.
- Baggage arriving with passengers from the mainland is generally not inspected in an overt fashion, a practice that might act as a smuggling deterrent. In contrast, APHIS uses x-ray to look for fruits and vegetables in checked bags destined for the mainland.
- CBP/APHIS will take action (treating, destroying or sending back the commodity) only for pest species listed as "federally reportable" that are not already present in the state, or on unknown species taxonomically related to pests on this list. State inspectors have more latitude, and may take action for any commodity infested with species categorized as "Not known to occur" (NKO) in Hawaii, and also for commodities with moderate to heavy infestations of any organism, whether established in Hawaii or not.
- There is insufficient space in plant quarantine facilities to hold all high risk plant propagative material imported from foreign countries. Instead, material is sometimes placed with the grower after inspection with the understanding that the material will be held in "post-entry quarantine" for a period, during which time additional inspections can be made. Presumably pest escape is much more likely using this method of "post entry quarantine" compared to using a certified post-entry quarantine facility or a pre-clearance program.
- Emergency responses to new pest incursions and enforcement of inter-island quarantines are particularly hampered due to the shortage of HDOA personnel.

The quarantine gaps in the list above emphasize pest interception through inspection activities, and associated deterrent effects on potential smugglers or careless exporters. It should be noted that the efficacy of the total quarantine system depends on the functioning

of a series of integrated steps: commodity inspection, pest identification, pest surveillance and legislation. Although we have emphasized inspection, it can be argued that Hawaii's quarantine system is weak in all of these areas in comparison to certain other US states such as California. For example, the Plant Quarantine Branch of HDOA (PQ-HDOA) has no survey entomologist. Before PQ-HDOA can exercise its authority to establish inter- or intra-island quarantine, it must establish the scope of the problem by determining where new, invasive pests are distributed. Although HDOA's Plant Pest Control Branch does have a survey entomologist, recent pest emergencies involving aster yellows disease on watercress, gall wasp on *Erythrina* and a rust disease on Ohia have shown that personnel resources for survey activities within PQ-HDOA itself are inadequate to the task at hand.

A report describing a study called the "Kahului Airport Risk Assessment" (KARA) provides a valuable overview of state quarantine functioning and assessment of how the state's quarantine surveillance system could be improved (HDOA 2002). The study was undertaken by the Plant Quarantine Branch of the Hawaii Department of Agriculture to evaluate the risks of the entry of pests and illegal plants and animals into Maui through direct overseas flights landing at Kahului Airport. Quarantine personnel carried out seven inspection blitzes between September 2000 and July 2001, each three to four weeks in duration. KARA involved intensive inspections of checked and carry-on-baggage by inspectors and detector dog teams; inspections of aircraft cabins and cargo holds of mainland flights; and (initially) 100% inspections of agricultural products shipped by air cargo. Prior to the risk assessment, five HDOA inspectors were assigned to the Kahului airport. During the risk assessment, HDOA inspectors from other islands were flown in to provide assistance, resulting in a level of inspection which would require at least 14 full-time workers to maintain (HDOA 2002).

The KARA report identified agricultural cargo as a high risk pathway for the entry of pests into Maui. A total of 1,401 insect interceptions (representing 279 different species) were made on agricultural commodities during the 130-day "blitz." These were comprised of 279 different species, 125 of which were not known to occur in Hawaii. An average of 10.8 interceptions was made each day in the KARA; this compares to an average of 2.1 quarantine pest interceptions per day on a statewide basis for the years 1995–2001.

The KARA report developed methodology, produced meaningful data, and made recommendations for increasing the effectiveness of border inspections. This would be accomplished by a combination of hiring more inspectors, improving inspection facilities and targeting high risk cargo for 100% inspections. The report is remarkable for its transparency and use of interception data to support its recommendations. This report may ultimately serve as a watershed development or "tipping point" toward upgrading of HDOA's ability to protect Hawaii from harmful new invasions. What additional sources of information might be useful to those with an interest in improving Hawaii's quarantine?

One possibility might be a systematic review of positive developments in the locations in the world that may have made the most striking improvements in border quarantine for joint protection of agriculture and natural environments over the past decade or two. Australia and New Zealand are generally recognized as the countries that have most fully recognized the need of providing a buffer against the potentially negative effects of globalization to their economies and environment (Baskin 2002). What might be learned?

We have been able to only scratch the surface in reviewing some of a wealth of information from Australia and New Zealand, but can recommend that one wishing to explore pertinent material might begin with the websites of the Australian Quarantine Inspection Service ([www.aqis.gov.au](http://www.aqis.gov.au)) and New Zealand's Ministry of Agriculture and Forestry ([www.maf.govt.nz](http://www.maf.govt.nz)).

The AQIS homepage states upfront: "Nature made Australia unique—quarantine keeps

it that way." The emphasis is on protecting the total environment, including but not limited to agriculture. The theme of AQIS's public awareness campaign, "Quarantine Matters," is central to the homepage, and reflects an emphasis on enlisting public support for quarantine, a central recommendation of a 1996 publication called the "Nairn Review." The Nairn Review was carried out by an independent team of experts commissioned by the Australian Government in response to serious quarantine breaches in early 1990s (Tanner and Nunn 1998).

Many recommendations in the Nairn Review have been followed up by the government, and one that may be particularly pertinent to Hawaii is that of bringing about a change in the culture of quarantine and engendering a strong sense of community ownership. The Australian government responded to this recommendation by providing A\$5.6 million over four years for the development and implementation of a suite of public awareness campaigns. Targets included inbound tourists/travel groups, outbound travelers, ethnic groups, international mail users, foreign students, import industry groups, primary industry groups and school students (Tanner and Nunn 1998). Another recommendation was for consultation with industry groups to engender a sense of community ownership in (and compliance with) quarantine protocols. The Australian government established an independent advisory body (the Quarantine and Exports Advisory Council) to provide regular external advice on quarantine policy and to maintain dialogue between AQIS, the industry and the community. This Council also provides advice on the effectiveness of AQIS's program delivery and helps AQIS evaluate its performance (Tanner and Nunn 1998).

A striking current observation of visitors to New Zealand is the relatively high public "quarantine literacy" and support for stringent quarantine measures (L. Loope, personal observation). New Zealand's border protection program received a great boost by passage of crucial legislation beginning with its Biosecurity Act of 1993, which among other things gave the Ministry of Agriculture and Forestry authority to prevent introduction of "new organisms" not already established in New Zealand by developing standards for the import of "risk goods"; other restrictive legislation and procedures for implementation followed (Baskin 2002). A high level report (Williams 2000), somewhat similar to Australia's Nairn Report, was especially influential in calling for greater attention to threats invasive species pose to native biodiversity, including marine ecosystems (Baskin 2002). The government conducted an extensive public process to develop a collaborative and expanded national biosecurity strategy in 2001–02, partly in recognition that the scope of biosecurity has increased from its traditional focus on protection of primary production and trade, to cover human health and indigenous environments. There was a perceived need to define and coordinate the respective biosecurity roles of central government, regional government, primary production industries, and landowners, to create a relatively seamless system. Numerous recommendations came out of that exercise with the aim of refining the biosecurity system over the next five years (Anon. 2005).

It is important to recognize that the main benefit of a good quarantine system is its deterrent effect (McGregor 1973), as it is considered impractical for inspectors to closely examine 100% of imported cargo. This underscores the importance of quarantine inspectors working cooperatively with plant importers and the general public, keeping out pests for the common good. While many scientists in Hawaii understand the damage to Hawaii's agriculture and environment resulting from continued introductions of exotic species, the general public and certain plant importers are less aware. If those who would be tempted to smuggle or ignore a quarantine regulation can be convinced that they also have a stake in keeping pests out, quarantine incursions are likely to drop due to self-regulation. Under-utilized possibilities for accomplishing this educational objective may include in-flight videos, increased use of educational programs in schools, news conferences and media

advertising. In the long term, the cost of funding such programs is likely to be much less than the amount of money that would otherwise have been spent dealing with the increased number of new pest incursions.

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