

United States  
Department of  
Agriculture

Animal and  
Plant Health  
Inspection  
Service

FY 2006

## Methods and Strategies to Manage Invasive Species Impacts to Agriculture in Hawaii

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### National Wildlife Research Center Scientists Develop Methods to Reduce Damage Caused by Invasive Species to Agriculture, Natural Resources, and Human Health and Safety

Wildlife Services' (WS) National Wildlife Research Center (NWRC) is the only Federal research facility devoted exclusively to resolving conflicts between people and wildlife through the development of effective, selective, and acceptable methods, tools, and techniques. NWRC's field station in Hilo, HI, is ideally located to allow research biologists to develop methods needed to control invasive species damage to Hawaiian agricultural crops and native ecosystems, as well as other areas throughout the Pacific.

Oceanic islands like the Hawaiian chain are more susceptible to invasive species than mainland areas because islands have few predators or competitors, have a lot of air and sea traffic, and typically provide a favorable climate for many species. Further, native species on the islands have evolved in the absence of many introduced threats and usually respond poorly to invasive animals or disease.

Invasive species are the single greatest threat to Hawaii's agricultural economy and natural environment and to the health and lifestyle of Hawaii's people. Invasive vertebrate species cause millions worth of crop losses, the extinction of native species, the destruction of native forests, and the spread of disease, and also reduce the health and safety of residents. NWRC scientists at the Hilo, HI, field station are investigating a variety of methods to reduce damage caused by invasive species, such as rodents, Coqui frogs, brown treesnakes, mongoose and invasive birds.



### Applying Science and Expertise to Wildlife Challenges

**Alternative Baits**—To manage rodent damage in a more ecologically sound manner, NWRC scientists are identifying and evaluating alternative rodenticide baits. As part of this process, NWRC scientists are compiling the necessary data to Federally register these baits. Field tests are being conducted on roof rats, a species that decimates native ecosystems as well as agricultural crops throughout the Pacific region. Preliminary results show that some rodenticides are not as effective for wild mice and rats.

**Introduced Invasive Species**—The negative impacts of introduced species on island ecosystems are severe. In Hawaii, a species of tree frog was recently introduced from the Caribbean. In addition to its propensity for reproducing quickly and its piercing loud nighttime call, the species eats the insects and snails that native forest birds rely on for survival and may have significant effects on forest dynamics. NWRC scientists are

### Major Research Accomplishments:

- WS continued to develop tools to manage invasive tree frogs. Over the past three years, NWRC's Hawaii Field Station has developed the registration data for the use of caffeine, citric acid, and hydrated lime to reduce invasive tree frog populations.
- WS obtained the data for the registration of aerial broadcast of rodenticides for use in conservation areas and to protect native ecosystems.

studying ways to manage frog populations, determine the effects of frogs on native ecosystems, and minimize their effects on agriculture. Current efforts are focused on the development and testing of toxicants, such as citric acid, that can be sprayed on frogs. The effects of these pesticides on plants and non-target animals are also studied.

There is also a serious concern about the introduction of Indian mongoose to other mongoose-free locations in the Pacific area. NWRC scientists are identifying candidate bait substrates, lures, and/or attractants that would elicit a strong attraction response from mongooses in the field. Preliminary results show that food-based baits are more effective than animal- or food-scents. Fish-based food baits were the most effective. Findings could aid in optimizing current detection and capture strategies for mongoose or be used in the development of toxicant baits specific for mongoose.

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**Groups Affected By These Problems:**

- Wildlife managers
- Farmers
- Horticulture industry
- Natural resource managers
- Macadamia nut producers

**Major Cooperators:**

- Hawaii Agriculture Research Center
- US Fish and Wildlife Service
- Hawaii Department of Land and Natural Resources
- Hawaii Department of Agriculture
- University of Hawaii
- Kamehameha Schools Bishop Estate
- Tropical Fruit Growers of Hawaii
- MacFarms of Hawaii

**Selected Publications:**

Pitt, W. C. and G. W. Witmer. 2006. Invasive predators: a synthesis of the past, present, and future. In A. Elewa (ed.). Predation in organisms- A Distinct Phenomenon. Springer Verlag

Beard, K. H., and W. C. Pitt. 2005. Potential consequences of the coqui frog invasion in Hawaii. Diversity and Distributions. 11:427-433.

Johnston, J. J.; Pitt, W. C.; Sugihara, R. T.; Eisemann, J. D.; Primus, T. M.; Holmes, M.; Crocker, J.; Hart, A. 2005. Probabilistic Risk Assessment For Birds, Snails and Slugs in Diphacinone Rodenticide Baited Areas on Hawaii. Journal of Environmental Toxicology and Chemistry 24:1557-1567.