Wildlife Services

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National Wildlife Research Center

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Methods and Strategies to Monitor and Manage Mammalian Invasive Species with Special Emphasis on Rodents

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Major Cooperators
- U.S. Fish and Wildlife Service
- U.S. National Park Service
- U.S. Department of Defense
- Florida Wildlife Commission
- Louisiana Department of Wildlife and Fisheries
- Island Conservation, Inc.
- Global Materials Technology, Inc.

Groups Affected By These Problems
- Urban citizens
- Farmers
- Livestock producers
- Natural resource managers
- Conservationists
- Military bases

NWRC Scientists Assess and Develop Methods to Manage or Eradicate Introduced and Invasive Mammals

Wildlife Services' (WS) National Wildlife Research Center (NWRC) is the only Federal research organization devoted exclusively to resolving conflicts between people and wildlife through the development of effective, selective, and acceptable methods, tools, and techniques.

The National Invasive Species Council has documented the serious threat to agriculture, property, natural resources, and human health and safety in the United States posed by invasive or introduced plants, invertebrates, disease agents, and vertebrates. Pimentel and others (2000) estimated that invasive species result in at least $120 billion per year in losses, damage, and control in the United States. About 300 species of invasive vertebrates have been accidentally or purposefully introduced into the United States, including about 20 species of mammals. These include omnivores (rats, feral pigs), predators (mongoose, foxes, feral dogs and cats), and herbivores (feral livestock, non-native deer).

WS has a long history of involvement in invasive species management, not only on the mainland United States, but in Hawaii, the Caribbean, South America, Africa, Indonesia, and the Philippines. Research continues to improve methods and strategies to 1) prevent introductions, 2) detect new introductions, 3) eradicate introductions, and 4) support sustained suppression of well-established invasive species where eradication is not feasible.

Applying Science & Expertise to Wildlife Challenges

Developing Methods to Eradicate Gambian Giant Pouched Rats—Introduced Gambian giant pouched rats have become established on Grassy Key, an island in the Florida Keys. If they reach the mainland, they could cause significant damage to agriculture and natural resources. Studies have been conducted to identify effective rodenticides for use in eradicating the rats. In pen studies at the NWRC in Fort Collins, CO, brodifacoum (a second generation anticoagulant) and zinc phosphide (an acute toxicant) were found to be effective rodenticides for use on Gambian rats. Diphacinone (a first generation anticoagulant) was not as effective. Trials were also conducted to identify attractants for use in Gambian rat eradication efforts. Of 15 materials tested, only Gambian rat urine and fecal material served as effective attractants.

Effects of High Vitamin K-containing Plants on Anticoagulant Rodenticides—Resource managers involved in invasive rodent control have wondered whether or not the presence of vegetation foods on islands that contain high amounts of Vitamin K (the antidote to anticoagulant poisoning) can reduce the effectiveness of rodenticides used for eradication of invasive rodents. To test this hypothesis, NWRC researchers fed Brussels sprouts or collards, both green leafy vegetables containing high levels of Vitamin K, to captive wild Norway and roof rats and wild house mice before and during exposure to the anticoagulant rodenticides brodifacoum or diphacinone. High levels of mortality occurred in all groups. Hence, it appears that resource managers do not have to worry about reduced effectiveness of anticoagulant rodenticides because of the presence of vitamin K-rich plant foods where rodent control is being conducted.

Developing a Multiple Capture Live Trap for Nutria—NWRC scientists designed and tested a large cage trap with a one-way door for use on invasive nutria in coastal Louisiana marshes. The traps were baited with food materials (corn, carrots, and sweet potatoes) or with fertilized marsh plants raised in a plant nursery. Both baits were very effective lures; as many as three nutria were captured overnight in a single trap. Importantly, very few non-target animals were captured. The traps are now being used in the Pacific Northwest as part of nutria control programs.

Developing Effective Rodent Barriers for Commensal Rodents—NWRC researchers tested the effectiveness of geo-textile (metal fiber) materials provided by a commercial company as barriers to openings used by wild Norway rats and wild house mice. When the material was tightly compacted and inserted into rat and mice holes, the barrier material was very effective in preventing access. When the material was used to cover a larger, square opening to a food box, however, it was not effective in preventing access by rats and mice. The company is now selling the material on the commercial market.

Selected Publications:

Witmer, G., J. Gionfriddo, and M. Pipas. 2008. Evaluation of physical barriers to prevent prairie dog colony expansion. Human-Wildlife Conflicts 2:206-211.

Witmer, G., R. Sayler, D. Huggins, and J. Capelli. 2007. Ecology and management of rodents in no-till agriculture in Washington, USA. Integrative Zoology 2:154-164.

Witmer, G., and M. Lowney. 2007. Population biology and monitoring of the Cuban hutia at Guantanamo Bay, Cuba. Mammalia 71:115-121.

Caut, S., J. Casanova, E. Virgos, J. Lozano, G. Witmer, and F. Courchamp. 2007. Rats dying for mice: modeling the competitor release effect. Austral Ecology 32:858-862.

Witmer, G. 2007. The ecology of vertebrate pests and integrated pest management. Pages 393-410 In: Prospectives in Ecological Theory and Integrated Pest Management, M. Kogan. and P. Jepson, eds. Cambridge University Press, Cambridge, UK.

Witmer, G., F. Boyd, and Z. Hillis-Starr. 2007. The successful eradication of introduced rats from Buck Island using diphacinone, followed by an irruption of house mice. Wildlife Research 34:108-115.

Witmer, G. and R. Engeman. 2007. Fossorial rodents as pests: the case of the pocket gopher. Pp. 287-299 in: Subterranean Rodents---News from the Underground, S. Begall, ed. Springer-Verlag, Berlin.

Pitt, W., and G. Witmer. 2007. Invasive predators: a synthesis of the past, present, and future. Invited book chapter. Pp. 265-293 in: Predation in organisms: a distinct phenomenon, A. Elewa, ed. Springer-Verlag, Berlin.

Major Assistance Activities:

- WS organized and hosted an international invasive vertebrate management symposium in Fort Collins, CO, in August 2007. The Symposium drew 160 attendees from seven countries. Approximately 60 oral presentations and posters were presented and published in the symposium's proceedings.
- WS identified effective attractants and rodenticides for Gambian giant pouched rat management.
- WS designed and tested a multiple-capture live cage trap for nutria control in Louisiana.
- WS evaluated a geo-textile barrier material to prevent rodent access to protected areas.

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