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# NWRC Research Areas: Economics

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Our scientists conduct economic research of human-wildlife conflicts involving damaging wildlife populations, invasive species and wildlife-transmitted diseases and develop improved methods for assessing the benefits and costs of NWRC products and WS operations.

The scope of wildlife damage management activities continues to expand. For example, increased populations of urban, resident Canada geese pose nuisance or contamination problems in many municipalities throughout the United States. New wildlife diseases (e.g., hantavirus, bovine TB, chronic wasting disease) pose risks to human health, livestock production and wildlife populations. Predators (i.e., red fox) can deter recovery efforts for certain endangered/threatened species (i.e., California

least tern).

Essentially, four parameters characterize the economics of wildlife damage management activities:

- crop (resource) value,
- crop (resource) damage,
- cost of the wildlife-management method (i.e., both personnel and materials) and
- effectiveness of the damage reduction.

This project seeks to quantify benefits and costs of new, and traditional, wildlife management activities. What are the “real” costs and returns of intervening with repellents, relocations, removals, rodenticides, etc. to limit the effects of certain wildlife upon agriculture, natural resources, or public health?

## **Project Goals and Objectives**

**Goal:** To conduct economic research of human-wildlife conflicts involving damaging wildlife populations, invasive species and wildlife-transmitted diseases; and, to develop improved methodology for assessing the benefits and costs of NWRC products and WS operations.

### **Objectives:**

1. Quantify bird/rodent damage to agriculture and infrastructure.
2. Quantify economic impacts of invasive wildlife, including feral hogs and reptiles.
3. Quantify economic impacts associated with vampire bat rabies and other priority wildlife diseases.
4. Quantify the benefits and costs of USDA/Wildlife Services and damage management activities for predators (to protect threatened & endangered species) and other priority species.

5. Develop improved economic analytical methodology for assessing wildlife damage, including input-output modeling.
6. Transferring technology: Conduct studies and empirical analyses in cooperation with Wildlife Services personnel, NWRC scientists and other scientific partners.

## **Accomplishments**

NWRC economic research seeks to quantify the benefits and costs of new and traditional wildlife management activities. The Center's current studies are aimed at determining the potential benefits (resource savings) and costs involved in reducing the impacts of introduced invasive species; emerging wildlife-transmitted diseases; traditional wildlife-caused damages to agriculture, property, and natural resources; and wildlife-posed risks to public health and safety.

Goal: Quantify the benefits and costs of National Wildlife Research Center (NWRC) products and Wildlife Services activities that aim to mitigate the impacts of wildlife diseases, wildlife damage to agriculture and natural resources, and wildlife risks to public health/safety.

## **Economic Impacts of Brown Treesnakes to Hawaii**

Hawaii and other islands tend to be susceptible to invasion by introduced plant and animal species because these locations often have few predators or competitors, experience a high volume of air and sea traffic, and typically provide a favorable habitat and climate for the introduced species. A prime example of this problem is the invasion of the brown treesnake (BTS) on the Pacific island of Guam. The snake arrived on Guam shortly after World War II, probably as a stowaway on U.S. military cargo ships from another island. Without any natural predators on Guam, and with an abundant prey base, the snakes dramatically increased in number and have caused numerous snake bite incidents and power outages, as well as the extirpation of 10 of 13 endemic forest bird species. Although there has been extensive research on BTS and efforts to control its spread in Guam, few studies have measured its economic damages, and none have evaluated the potential economic damages if the snake was introduced to Hawaii. Like Guam, Hawaii has no endemic terrestrial

snakes, and despite intensive cargo-screening measures to prevent the snake from leaving Guam, eight BTS have hitch-hiked on aircraft from Guam to Oahu since 1981.

NWRC conducted an economic analysis on the potential introduction of BTS to Hawaii. The analysis collected information on medical incidents and power outages on Guam and used it to guide estimates of potential damage to Hawaii. Data on the potential impacts to Hawaii tourism were collected through a survey conducted on Oahu in January 2008. The results showed that the total estimated damage from medical incidents, power outages, and decreases in tourism to Hawaii would range from approximately \$593 million to \$2.14 billion annually. The results also showed a loss of between approximately 1,400 to 13,000 jobs within the regional economy related to decreased tourist spending. This study revealed that a BTS invasion and establishment on Hawaii could have potentially permanent and costly economic consequences.

## **Economic Assessment of Beaver Damage in Mississippi**

It has become essential for groups involved with wildlife policy formulation and decisionmaking to examine the economic benefits and costs derived from the management of nuisance wildlife species. Beavers (*Castor canadensis*) in Mississippi have seen significant population fluctuations over the last 150 years, as their status has changed from a game species to protected species to nuisance species. To determine the overall value of APHIS Wildlife Service's Mississippi beaver control assistance program (BCAP), NWRC economists assessed beaver-caused economic impacts to Mississippi's timber industry and estimated the damages avoided due to BCAP activities from 2005 to 2009. The total BCAP costs averaged \$1.1 million annually over the study period. An analysis of six combinations of possible timber savings showed a range of \$25 million to \$57 million on average for annual direct program benefits. To estimate the potential secondary impact to the regional economy from these timber losses, the economists utilized an input-output model. The additional loss in annual economic activity in the region ranged from \$19 million to \$42 million. Using these estimated values of potential beaver damage, all calculated benefit-cost ratios indicated that BCAP was an economically efficient expenditure of resources during the study period.

## **Economic Analysis of Ontario Red Fox Oral Rabies Vaccination Program**

Ontario has had a red fox (*Vulpes vulpes*) oral rabies vaccination (ORV) program in place since 1989. To determine if the program is cost effective, economists from the NWRC, Ontario Ministry of Natural Resources, and Texas A&M University conducted a benefit-cost analysis. Between 1979 and 1989, prior to ORV baiting, there were annual averages of 2,248 human post-exposure treatments; 1,861 positive red fox rabies diagnostic tests; and \$246,809 in indemnity payments for livestock lost to rabies. After baiting, from 1990 to 2000, there were 35% , 66% and 41% decreases in post-exposure treatments, animal rabies tests, and indemnity payments, respectively. Researchers viewed these reductions as benefits of the ORV program, whereas total costs were those associated with ORV baiting. Using several statistical techniques, researchers quantified a range of total estimated benefits from approximately \$35 to \$98 million. The annual mean ORV program cost was approximately \$6 million, with total program costs of \$77 million. The average benefit-cost ratios over the analysis period were 0.49, 1.06, 1.27, and 1.36, indicating overall program efficiency in three of the four conservative scenarios.

## **Cost Effectiveness of OvoControl-G® To Manage Nuisance Canada Geese**

OvoControl-G is an oral contraceptive bait for Canada geese (*Branta canadensis*). When fed to geese during their breeding season, the bait's active ingredient—nicarbazin— reduces the hatching success of eggs. When it is withdrawn from the diet, egg production and hatchability return to normal within a few days.

NWRC's economist modeled the cost effectiveness of using OvoControl-G versus egg addling, oiling, or other nest-destruction techniques to manage nuisance Canada geese at two locations in Oregon. Assuming that the biological effects of egg oiling, addling, and destroying nests are similar to those of OvoControl G, researchers used a cost-effectiveness analysis (CEA) to evaluate the costs associated with the different methods and determine which method minimizes those costs. The model also evaluated the effects of the presence of nontargets, alternative foods, and public support on cost efficacy. Results showed that at low goose densities (less than 35 pairs of geese), fixed labor was a significant portion of costs. As goose densities increase, OvoControl-G becomes more cost effective than other methods,

such as egg oiling or addling.

The analysis provides useful information for wildlife managers, as they can use this model to determine whether OvoControl-G will provide a successful and cost-effective tool for controlling populations of Canada geese in specific management areas.

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