

Economic Research of Human-Wildlife Conflicts: Methods and Assessments



Contact Information:

Dr. Stephanie Shwiff
Supervisory Research Economist
NWRRC Headquarters
4101 LaPorte Avenue
Fort Collins, CO 80521

Phone: (970) 266-6150

Fax: (970) 266-6089

E-mail:

stephanie.a.shwiff@aphis.usda.gov

Web site: www.aphis.usda.gov/wildlifedamage/nwrc/

[wildlifedamage/nwrc/](http://www.aphis.usda.gov/wildlifedamage/nwrc/)

Groups Affected:

- Agricultural producers
- International wildlife conservation organizations
- State county agricultural commissioners
- State game and fish agencies
- State natural resource agencies
- State public health agencies
- Wildlife Services managers
- U.S. citizens

Major Cooperators:

- California Department of Agriculture, Vertebrate Pest Control Research and Advisory Committee
- Colorado State University
- Cornell University
- Global Alliance for Rabies Control
- Michigan State University
- Ontario Ministry of Natural Resources, Canada
- Texas A&M University
- Texas Department of State Health Services
- The Ohio State University
- University of Hawaii
- USDA National Rabies Management Program
- WS Operations

National Wildlife Research Center Economists Use Benefit-Cost Analyses to Quantify Economic Impacts of Human-Wildlife Conflicts

The Wildlife Service's (WS) National Wildlife Research Center (NWRRC) is the only Federal research organization devoted to resolving human-wildlife conflicts through the development of effective, selective, and socially responsible methods, tools and techniques.

Economic assessments of management tools and techniques, as well as cost estimates for a variety of wildlife damage issues remain an important need of wildlife managers. Economics research at NWRRC seeks to meet this need and to satisfy The Government Performance and Results Act of 1993 by acquiring accounting-type, outcome-based data of program efficiency.

NWRRC economists conduct research to determine the potential benefits (savings) and costs involved in reducing the impacts of introduced invasive species, emerging wildlife-transmitted diseases, and traditional wildlife-caused damages to agriculture, property, and natural resources, as well as wildlife-posed risks to public health and safety.

Applying Economic Expertise to the Challenges of Wildlife Damage Management

Feral Swine Damage Costs \$190M Annually. — In 2015, NWRRC partnered with the National Agricultural Statistics Service to survey more than 9,500 producers about feral swine damage to crops in 11 states: Alabama, Arkansas, California, Florida, Georgia, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, and Texas. Approximately 4,300 producers of corn, soybeans, wheat, rice, peanuts and sorghum responded to the survey. Results showed that peanut and corn farmers in the Southeast and Texas experienced the highest yield loss from feral swine. However, the economic burden from feral swine was not limited to just crop damage. Producers also spent a great deal on damage management and control costs. Many growers reported using a suite of control methods including shooting and trapping. The costs of employing control measures, as well as losses in yield, were substantial for crop producers, many of which typically operate on very small profit margins. Survey results indicate that feral swine damage to crops exceeds \$190 million in the United States annually. Though large, this number likely represents only a small fraction of the total damage by feral swine because it includes damage to only six crops in the 11 surveyed states.

Modeling Economic Impacts of Cormorants to a Recreational Fishery. — The double-crested cormorant population in the Great Lakes region increased from 32,000 breeding pairs in the 1970s to more than 226,000 pairs in the 1990s. This is good news for the birds, but the impacts, if any, to the economy in the region are still being explored. NWRRC economists looked at the costs associated with reduced fishing opportunities and nonresident angler tourism spending (i.e., licenses, lodging, food, gas) in the Oneida Lake region of New York. The overall cost estimate was based on the assumption that real and perceived cormorant impacts on fish stocks play a role in the number of nonresident fishing licenses sold. Fewer licenses mean fewer anglers around to spend money. Researchers used an IMPLAN model to create a mathematical representation of the regional economy, including all the links among economic sectors (e.g., agricultural, retail, service, manufacturing, and industrial). The model allowed them to estimate the total economic impact of cormorant damage to the fisheries. Results showed that the economic loss was on average \$5 million to \$66 million per year, as well as 66 to 929 job-years annually from 1990 to 2009. This approach to calculating wildlife damage's economic impacts can be applied to other wildlife to provide a more accurate estimate of total economic impacts.

Economic Impacts of Birds to Sweet Cherry Production. — The United States is the world's second-largest cherry producer, accounting for 15 percent of the world's total cherry production. Bird damage is a common and costly problem for cherry and other fruit producers. In 2012, NWRRC economists used survey data from producers in five U.S. States to estimate bird damage to sweet cherry (*Prunus avium*) crops with and without the use of bird management. Respondents reported American robins and European starlings as the most damaging bird species. Growers also reported using bird management methods such as repellents, shooting, trapping, exclusion netting, and scare

devices; they identified shooting and exclusion netting as the most effective methods. By producers' estimates, average yield loss due to bird damage was 13 percent. Using bird management methods reduced losses by about 21 percent. For those who did not manage bird damage, yield losses increased by a predicted 26 percent.

To put this in larger context, the economists applied a model to the survey data to estimate changes in cherry production costs when bird management is absent. Results showed that a lack of bird damage management increases the cost of cherries to society by as much as \$238 million in the short-term and, as producers and consumers adjust to the new market over time, reach \$29 million in the long-term, annually.

Benefits and Costs of Disease Management. — Disease transmission at the wildlife-livestock interface can significantly impact human health, threaten global trade and tourism, cause significant economic loss, and provide a potential mechanism for bioterrorism. Yet, given budget limitations, resource managers often must seek to maximize the benefits and minimize the costs of disease mitigation efforts. To address this issue, NWRC, APHIS Veterinary Services, and Texas A&M University researchers and economists developed a benefit-cost analysis decision framework. It helps managers make informed choices about whether and how to target disease management efforts in wildlife and livestock populations.

Specifically, the framework offers a way to identify, assemble, and measure the components that are most vital to animal disease mitigation efforts. Benefits or damages avoided cover such areas as consumption demand, human health, livestock production, and wildlife losses. Costs include not only the operational costs of disease mitigation, but also the impacts of disease spillover, such as reduced agricultural production or lost recreational opportunities. The framework can also be applied to commercially raised and free-ranging species at various levels of management—from detailed intervention strategies to broad programmatic actions. The ability of the framework to illustrate the benefits of disease management projects per dollar spent helps managers evaluate their options. This framework is useful to natural resource managers who wish to maximize financial and other returns invested in wildlife and livestock disease management programs.

High Cost of Canine Rabies. — The World Health Organization estimates that, on average, about 60,000 people die of rabies each year, and 99 percent of these deaths are attributable to canine rabies in Asia and Africa. To provide a more complete assessment of canine rabies' global impact, NWRC economists extended current economic estimates to include the cost of human death risk. Human death risk is quantified by how much people are willing to pay to reduce their chances of dying or, conversely, how much people must be paid to tolerate increased risk. Researchers also accounted for both direct and indirect costs of rabies post-exposure prophylaxis, dog vaccination and control, rabies diagnostic testing, and cattle deaths. Using computer simulation models, they estimated the global burden of canine

rabies to be about \$124 billion per year. The results also highlighted important regional differences. Researchers found that the global burden from canine rabies falls most heavily on Asia, which accrues more than 80 percent of the nonhuman death costs. Africa, on the other hand, accounts for only 3 percent of nonhuman death costs but 45 percent of human deaths. This study illustrates the potential benefits of canine rabies elimination and provides an important benchmark for comparing rabies elimination campaign costs.

Selected Publications:

Anderson, A. and S.A. Shwiff. 2015. The cost of canine rabies on four continents. *Transboundary and Emerging Diseases* 62:446-452. doi: 10.1111/tbed.12168.

Anderson, A., C. Sloodmaker, E. Harper, J. Holderieath, and S.A. Shwiff. 2016. Economic estimates of feral swine damage and control in 11 US states. *Crop Protection* 89:89-94. doi: 10.1016/j.cropro.2016.06.023.

Elser, J.L., A. Anderson, C.A. Lindell, N. Dalsted, A. Bernasek, and S.A. Shwiff. 2016. Economic impacts of bird damage and management in U.S. sweet cherry production. *Crop Protection* 83:9-14. doi: 10.1016/j.cropro.2016/01/014.

Shwiff, S.A., K.A. Kirkpatrick, T.L. DeVault, and S.S. Shwiff. 2015. Modeling the economic impacts of double-crested cormorant damage to a recreational fishery. *Human-Wildlife Interactions* 9(1):36-47.

Shwiff, S.A., S.J. Sweeney, J.L. Elser, R.S. Miller, M.L. Farnsworth, P. Nol, S.S. Shwiff, and A.M. Anderson. 2016. A benefit-cost analysis decision framework for mitigation of disease transmission at the wildlife-livestock interface. *Human-Wildlife Interactions* 10(1):91-102.

Major Research Accomplishments:

- WS economic studies showed feral swine damage to six crops (corn, soybeans, wheat, rice, peanuts and sorghum) in 11 surveyed states exceed \$190 million annually.
- WS research estimated the total economic impact of double-crested cormorant damage to the Oneida Lake region of New York was \$5 to \$66 million annually.
- WS economic analyses showed that in the absence of bird damage management, sweet cherry production costs increase as much as \$29 million annually.
- WS and partners developed a benefit-cost analysis decision framework to help managers make informed choices concerning wildlife and livestock disease mitigation efforts.
- WS economists estimated the global burden of canine rabies to be about \$124 billion per year.