Wildlife Services

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National Wildlife Research Center

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Economic Research of Human-Wildlife Conflicts: Methods and Applications

Contact Information:
Dr. Stephanie Shwiff
Research Economist
NWRC Headquarters
4101 LaPorte Avenue
Fort Collins, CO 80521
Phone: (970) 266-6150
Fax: (970) 266-6157
stephanie.a.shwiff@aphis.usda.gov
www.aphis.usda.gov/wildlife_damage/nwrc/

Major Cooperators

- California Department of Agriculture
- Departments of Economics and Ecology, University of Hawaii
- Economics Department, Colorado State University
- National Rabies Coordinator
- Texas Department of State Health Services
- Vertebrate Pest Control Research and Advisory Committee (California)
- USDA/APHIS Wildlife Services Operations

Groups Affected By These Problems

- 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

NWRC Scientists Use Benefit-Cost Analyses to Quantify Economic Impacts of Human-Wildlife Conflicts

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

The 2006 Research Needs Assessment of WS ranked economic assessments of diverse management techniques, products, and programs third among the 13 most frequently cited data requirements by WS programs and staff. Economics research at NWRC 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.

Quantification of economic factors involved in mitigating human-wildlife conflicts began at NWRC in 2000. Current studies seek 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, natural resources, as well as wildlife-posed risks to public health and safety.

Applying Economic Expertise to the Challenges of Wildlife Damage Management

Surveys and Impacts of Invasive Species—In 2007, NWRC scientists and collaborators conducted a survey to project the total annual damages likely to be associated with potential introduction of the invasive brown treesnake to the Hawaiian Islands. Estimated damages for medical-related incidents, power outages, and tourism ranged between $622 million and $2.2 billion dollars. Decreased tourism alone was estimated to cause between 1,339 and 13,000 lost jobs. Survey results indicated that 20% of visitors would select a different vacation spot if the brown treesnake was established in Hawaii.

This study is one of many recent collaborations between NWRC and other groups to obtain data on economic impacts. Previous studies have also addressed costs related to livestock losses from black vulture predation in several Eastern states, blackbird damage to rice in the Mississippi Delta, and wild turkey damage to ginseng crops in the mid-west.

Modeling Benefits and Costs of WS Programs—Current NWRC research studies are developing and using novel benefit-cost and modeling procedures to quantify savings by WS programs. Approaches integrate economic, biologic, and demographic data into profiles of local or regional (e.g., county-by-county) savings and costs attributed to WS activities. The approaches also involve (1) estimating "replacement" costs for WS (i.e., what will it cost to acquire/perform similar wildlife damage management services privately), (2) creating "projections" of hypothetical increases in damage in the absence of WS, and (3) defining "scenarios" to characterize best-worst case outcomes using WS or no WS programs. For example, Impact Analysis for Planning (IMPLAN) models are being used to estimate potential impacts of feral-swine-transmitted foot and mouth disease to livestock in several states. IMPLAN provides an input-output model which projects potential economic benefits of wildlife and disease management by estimating the economic value of disease-caused damages in certain sectors of local or state economies.

Wildlife-Transmitted Diseases and Savings of Oral Vaccination—NWRC scientists are also conducting benefit-cost analyses to quantify the potential savings and costs associated with selected wildlife-transmitted diseases and potential disease mitigation methods. Assessments of certain agricultural and public health impacts of wildlife rabies in raccoons, foxes, coyotes, skunks, and vampire bats throughout North America have been published. Collaboration with the WS Rabies Coordinator, Rabies Economic Team, and scientists at the Centers for Disease Control and Prevention has yielded improved

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methodologies for quantifying the impacts of wildlife rabies and its control via oral rabies vaccination (ORV) technologies.

Benefits and Costs of T&E Protection—NWRC scientists have quantified the potential savings or increased revenues associated with predator management agreements aimed at the protection of threatened and endangered (T&E) species. The Steller's eider (Polysticta stelleri) is federally listed as a threatened species. In Alaska, these birds are highly susceptible to predation during nesting season in late spring and early summer. Control of arctic fox (Alopex lagopus) on the Barrow Steller's Eider Conservation Planning Area began in 2005. Prior to fox control, the nesting success averaged 16%. Since fox control (2005-2007), nest success has increased to about 50% per year. The annual cost of control has been about $29,000. Detailed economic analyses of these results are in progress, but it is clear that monetary benefits alone in eider production will be orders of magnitude greater than the costs.

Bird and Rodent Economic Impacts to California Crops—California ranks first in the nation for the production of dozens of crops, such as avocados, grapes, and processing tomatoes, and is the sole producer of many U.S. crops, such as almonds, artichokes, figs, olives, and walnuts. In 2006, California's gross value of agriculture production was nearly $38.9 billion. The 20 top California crop and livestock commodities accounted for more than 80% of the State's cash farm receipts, and eight of these commodities grossed over $1 billion in receipts.

As part of a cooperative agreement with the California Vertebrate Pest Control Research and Advisory Committee, NWRC economists are evaluating the impacts of bird and rodent damage to selected county economies. Bird and rodent pests of California agriculture include crows, ground squirrels, house sparrows, and cottontail rabbits. To date, a 3–step process has been used to select ten of 58 counties for input-output (IO) modeling. Economists have identified counties that: (1) led the State in total agricultural production, (2) had the highest valued cash receipts from a set of 25 key crops, and (3) had the highest percentage or concentration of targeted crops as compared to total agricultural cash receipts. Based on this empirical scheme, the ten counties receiving the greatest cumulative ranks in order are Monterey, Fresno, Ventura, Riverside, Kern, Tulare, San Joaquin, San Diego, Stanislaus, and Napa Counties. Scenarios of rodent- and bird-caused damages to these counties and crops are under development. These will provide a range of likely impacts and benefits attributed to pest control activities in the counties.

Selected Publications:

Sterner, R. T. 2008. Reducing the uncertainty of IPM economics. Pages 163-181 in E. N. Burton and P. V. Williams, editors. Crop Protection Research Advances. Nova Science Publishers, Hauppauge, New York.

Shwiff, S. A., K. A. Kirkpatrick and R. T. Sterner. 2008. Economic evaluation of a Texas oral rabies vaccination program for control of a domestic dog-coyote rabies epizootic: 1995-2006. Journal of the American Veterinary Medical Association 233(11):1736-1741.

Engeman, R. M., B. U. Constantin, S. A. Shwiff, H. T. Smith, J. Woolard, J. Allen, and J. Dunlap. 2007. Adaptive and economic management methods for feral swine control in Florida. Human-wildlife Conflicts 1:178-185.

Major Assistance Activities:

- WS and collaborators conducted a survey to project the total annual damages likely to be associated with a hypothetical introduction of the invasive brown treesnake to the Hawaiian Islands. Estimated damages for medical incidents, power outages, and tourism ranged between $622 million and $2.2 billion dollars. Decreased tourism alone was estimated to cause between 1,339 and 13,000 in lost jobs in this and other sectors of the State's economy.
- WS economists performed retrospective studies of wildlife rabies impacts in California and Texas. The California data showed that the average suspected human rabies exposure cost $3,688, with indirect (out-of-pocket, non-reimbursable) expenses to patients accounting for $1,124(2006 USD). For Texas, benefit-cost analysis showed that the use of an oral rabies vaccination (ORV) program to control an outbreak of canine-variant rabies in coyotes between 1995 and 2006 was cost efficient. Total estimated benefits of the program ranged from approximately $98 to $354 million, with total program costs reported as $26 million for the study period. This yielded benefit-cost ratios ranging from 3.70 to 13.44 for varying projections of case frequency levels.
- WS studies documented the economic impact of the National Wildlife Research Center (NWRC) on the local economy. Construction expenditures at the NWRC created a temporary economic impact of $152 million throughout the State of Colorado. As this spending flowed through the economy, approximately 1,120 non-NWRC jobs were created. Non-construction expenditures added $9.6 million to the local economy and NWRC's annual budget alone created 88 non-NWRC jobs.