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Economic Research of Wildlife-caused Agricultural, Public Health and Natural Resource Impacts

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National Wildlife Research Center Scientists Conduct Benefit-cost Analyses to Assess Wildlife Damage, Disease and Management Impacts

The Wildlife Service's (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 scope of wildlife damage management activities continues to expand as conflicts with humans and wildlife increase. New wildlife diseases (e.g., hantavirus, bovine tuberculosis, and chronic wasting disease) may cause risks to human health, livestock production, and wildlife populations. Many municipalities throughout the United States face nuisance and contamination problems posed by increased populations of urban, resident Canada geese. Predators can deter recovery efforts for certain endangered and threatened species, such as the California least tern.

NWRC seeks to quantify the benefits and costs of new and traditional wildlife management activities. NWRC's economists seek to quantify the potential savings (benefits) and costs derived from mitigating the impacts of wildlife diseases, wildlife damage to agriculture, property and natural resources and wildlife risks to public health and safety.

Major Research Accomplishments:

- WS conducted a comprehensive economic analysis of WS operational activities in California. Assuming that replacement programs were used and damage from wildlife would increase 25% to 100% in the absence of WS activities, it was projected that the value of WS operations in California ranged from $12.4M to $19.2M. In other words, for every $1 California counties invest in WS, they save $6.50 to $10.00 in wildlife damage and replacement program costs.
- WS performed an economic assessment of urban Canada goose damage and control efforts in the Puget Sound area. Results showed that lethal removal and egg addling were cost effective methods of reducing goose-related damage, but hazing of geese never proved cost effective. Non-discounted, benefit-cost projections yielded positive returns on investments whenever goose damage exceeded $200 per incident.
- 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 annually to the local economy and NWRC's annual budget alone created 88 non-NWRC jobs.
- WS determined the potential economic impacts to Hawaii if the invasive brown treesnake were to become established on the Hawaiian Islands. Results estimated annual expenditures to Hawaii for medical treatments, electrical outages, and tourism to be $351,706, $335 to $454 million, and $137.5 million to $1.4 billion, respectively.

Applying Economics and Expertise to the Challenges of Wildlife Damage Management

Economics Associated with Wildlife-transmitted Diseases—NWRC scientists are conducting benefit-cost analyses to quantify the potential savings and costs associated with selected wildlife diseases and disease mitigation methods. Collaboration with the WS Rabies Coordinator and Rabies Economic Team has led to empirical estimates of direct post-exposure rabies prophylaxis, public health costs and animal control expenses, as well as indirect patient expenses linked to wildlife rabies. Current research includes the analyses of potential benefits derived from the use of oral rabies vaccination (ORV) campaigns to control a domestic dog-coyote variant of rabies in south Texas. Results from these economic analyses provide an economic basis for government decision-making and serve as a guide for future ORV baiting campaigns in the U.S. and other countries.

Identify, Assess, and Quantify the Benefits and Costs of WS Operational Activities—Research is underway to develop benefit-cost and modeling procedures to quantify WS program activities. Approaches

integrate economic, biological and demographic data into profiles of local or regional (e.g., county-by-county) savings and costs attributed to WS activities. Four areas of potential benefits and costs have been identified: 1) agricultural protection (e.g., crop, livestock), 2) public health and safety (e.g., wildlife disease prevention, aircraft bird strike reduction), 3) natural resource protection (e.g., threatened species conservation through local predator management, archeological site preservation through rodent management), and 4) property protection (e.g., impoundment maintenance through rodent control, building safeguards through rodent management). Data is used to identify common "Species X Complaint" activities under each of the four factors. The approaches then 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, (3) conducting "input-output modeling" to provide an analysis and estimation of regional, state, or county economic impacts and (4) defining "scenarios" to characterize best-worst case outcomes using WS or no WS programs. Additionally, novel vector-analysis and regression procedures are under development to quantify interactions between wildlife damage management methods (e.g., relocation, hazing, population reduction) and the timing of policy decisions (e.g., how and when to control populations of wild animals)

Benefits and Costs of Predator Management for Wildlife Protection—NWRC scientists are conducting studies to quantify the potential savings or increased revenues associated with predator management agreements aimed at protecting threatened and endangered species or enhancing game populations. Research efforts have focused on predator management agreements in several states, including California, Florida, and Wyoming, and the commonwealth of Puerto Rico. Studies have quantified the economic benefits of predator management as part of recovery programs of threatened California least terns and endangered Puerto Rican parrots. Current research involves the economic analyses of recovery efforts to Western snowy plover, sea turtles and Key Largo wood rats. Much of this work relates to data needed for National Environmental Policy Act (NEPA) compliance documents and requirements set forth in The Government Performance and Results Act.

Economic Surveys and Analyses to Quantify Wildlife-caused Damage—NWRC staff are engaged in collaborative efforts with private and municipal organizations to design and analyze economic impact surveys. For example, livestock organizations in several Eastern states have provided data to help estimate losses of newborn calves caused by black vultures. Ginseng producers in the midwest have provided data on crop losses caused by wild turkey.

Novel Wildlife Abundance Indices and Damage Assessment Methodology—New, time-/labor-saving methods are being developed to document wildlife damage. Efforts are focused on brushed-dirt-plot indices for relatively quick, easy, and inexpensive estimates of wildlife abundance and the effectiveness of WS management activities. These methods have resulted in rapid, reliable indices that show removing raccoons aids in sea turtle hatching success and that rodent ingestion of toxic baits correlates with lower population numbers.

Groups Affected by These Problems:

- Agricultural producers
- State county agricultural commissioners
- State public health agencies
- State natural resource agencies
- Wildlife Services managers
- U. S. citizens

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 Research Advisory Committee (California)
- WS Operations Personnel

Selected Publications:

Sterner, R. T. and G. C. Smith. 2006. Modelling wildlife rabies: Transmission, economics and conservation. Biological Conservation, 131:163-179.

Shwiff, S. A., R. T. Sterner, J. W. Turman, and B. D. Foster. 2005. Ex post economic analysis of reproduction-monitoring and predator-removal variables associated with protection of the endangered California least tern. Ecological Economics, 53:277-287.

Engeman, R. M., H. T. Smith, R. Severson, M. A. Severson, J. Woolard, S. A. Shwiff, B. U. Constantin and D. Griffin. 2004. Damage reduction estimates and benefit-cost values for feral swine removal from the last remnant of a basin marsh system in Florida. Environmental Conservation, 31:207-211.