



NWRC headquarters in Fort Collins, CO.

## About Wildlife Services' National Wildlife Research Center

NWRC is a leader in providing science-based solutions to the complex issues of wildlife damage management as related to agriculture, property, human health and safety, invasive species, and threatened and endangered species. NWRC scientists strive to find solutions that are biologically sound, environmentally safe, and socially acceptable for use in resolving wildlife damage-management problems throughout the United States and abroad. Often, the WS program's operational personnel assist NWRC scientists in developing and evaluating new management tools and methods.

NWRC employs more than 160 scientists and support staff at its headquarters in Fort Collins, CO, and at field stations throughout the United States. NWRC's scientists have expertise in a wide range of disciplines, including animal behavior, wildlife biology, wildlife sensory biology, chemistry, immunology, epidemiology, statistics, population modeling, genetics, toxicology, and veterinary medicine.

***“Solutions to problems depend upon knowledge which only research can provide.”***

*Edwin R. Kalmbach, first Director for the predecessor of the NWRC (1940–54)*



## More Information

NWRC's Economic Research Project was created in 2001 and consists of two scientists and a technician. For more information on the use of economics in wildlife damage management, or to consult with an economist on incorporating economics into a research study, contact the NWRC Economic Research Project at (970) 266-6000 or visit our Web site at <[http://www.aphis.usda.gov/wildlife\\_damage/nwrc/index.shtml](http://www.aphis.usda.gov/wildlife_damage/nwrc/index.shtml)>.

### WS Office Phone Numbers

For assistance on wildlife damage issues in your State, please call the WS program's toll-free number at 1-866-4USDAWS (1-866-487-3297) or one of the numbers listed below.

At headquarters (Riverdale, MD):

- Operational Support Staff (301) 734-7921

In the field:

- NWRC headquarters (Fort Collins, CO) (970) 266-6000
- Eastern Regional Office (Raleigh, NC) (919) 855-7200
- Western Regional Office (Fort Collins, CO) (970) 494-7443

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Program Aid No. 1931

## Solutions Through Science



Wildlife Services  
**NWRC**  
National Wildlife Research Center

## The Problem

Wildlife is a public resource greatly valued by all Americans. As the stewards of this valuable resource, wildlife managers plan management actions based upon the best biological information available. Often, though, they do not clearly explain the economic benefits of their actions. Thorough economic analyses can aid in the prioritization of management efforts. Additionally, as more citizens request increasing fiscal responsibility from government agencies, wildlife managers can turn to economics to provide information on the financial benefits and costs associated with their management activities.

Within the National Wildlife Research Center (NWRC)—the research arm of the U.S. Department of Agriculture’s Wildlife Services (WS) program—economics is emerging as an exciting and valuable new tool for quantifying the benefits and costs associated with wildlife damage management. NWRC economists partner with WS employees, State and local governments, and universities to develop economic research and applications. This leaflet describes some of the methods used and strategies for integrating economic analyses into daily wildlife damage-management and research activities.

## Science-Based Solutions

Benefit–cost analysis (BCA) is a common tool used by NWRC economists and others to evaluate projects and programs. In a BCA, the monetary benefits and costs of actions are identified and compared.

BCAs can assign monetary values to wildlife damage-management actions, measure economic impacts, and determine the cost-effectiveness of government programs. Incorporating BCAs into research studies helps biologists justify expenditures to protect resources and human health and safety and identify ways to do so more efficiently.

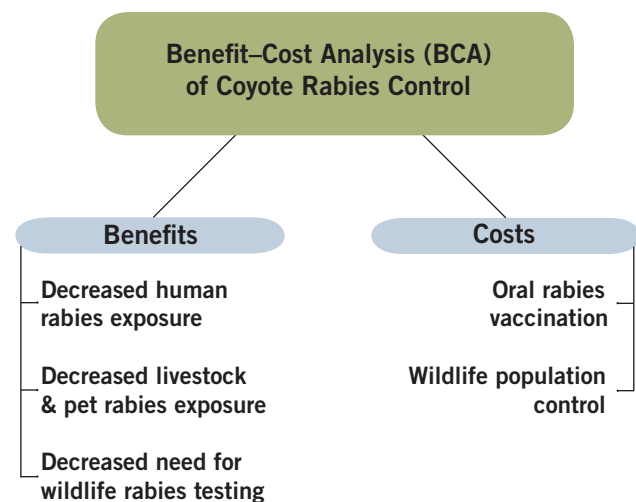
### Identifying and Assigning Values to Benefits and Costs

To ensure an effective and insightful BCA, an economist must first identify and assign values to all associated benefits and costs of the management activity of interest. In wildlife damage management, costs are often easier to identify than benefits.

For an activity such as the control and prevention of wildlife rabies, total costs may include the cost of vaccine baits and their distribution and the labor costs of vaccinating or removing wildlife. Benefits usually accrue from a reduction in wildlife rabies over time.

Several types of benefits exist:

- Direct (e.g., fewer people requiring vaccinations due to rabies exposure),
- Indirect (e.g., fewer pets needing to be quarantined or euthanized due to exposure), or
- Intangible (e.g., people experiencing less fear of exposure to rabid wildlife).



Evaluating cormorant damage at fish farms.

Once benefits are identified, a monetary value must be assigned. This is the most difficult and sophisticated part of the BCA and is where economists play an important role. Some resources that are bought and sold regularly (e.g., market goods such as cattle or corn) are easily assigned a value. It’s more difficult to determine the value of a wild antelope or an endangered Puerto Rican parrot, a decrease in the spread of a disease, or enhanced wildlife viewing opportunities. When markets do not exist, valuation must be estimated using nonmarket techniques.

Economists can estimate nonmarket value by employing monetary figures derived from the following:

- Civil penalties (e.g., fines levied for killing an endangered species),
- Consumptive uses (e.g., hunting licenses, lodging, guide services, travel costs),
- Replacement costs (e.g., captive breeding costs per individual of a threatened species),
- Contingent valuation studies (e.g., individual willingness to pay to preserve an endangered species), or
- Damage avoided (e.g., decreases in predation or crop losses).

### Collecting the Data

Proper collection of data, such as time-series data, is imperative for conducting a BCA. Time-series data, or continuous data over time, allow economists to identify trends and reveal relationships among variables that influence costs and benefits. It is preferable that NWRC economists be consulted by wildlife managers or researchers before a study begins to help identify potential economic questions to be asked and the types of data needed to be collected.

For example, if a cormorant management program (e.g., harassment and removal) is used to protect fish at aquaculture facilities, population counts of birds and fish must be determined before and after management. The benefit of the management program can then be calculated using the value of fish saved as “damage avoided.” If the purpose of cormorant management is to increase numbers of fish popular with anglers, an additional indirect benefit to the community would be the consequent increase in local tourism. It follows that data for another variable should be collected—the number of anglers (represented by the number of fishing licenses issued)—before and after management is implemented. This information can then be incorporated into a mathematical model to determine the final impact on the tourism sector of the economy.

### Benefits of Economic Analysis

Collecting the right data and identifying and valuing costs and benefits are the foundation for credible economic analysis. NWRC economists work with biologists and managers to provide an overall picture of the costs and benefits of wildlife damage management and research. In short, economics is one of many tools that wildlife managers everywhere can use to enhance decisionmaking, look at long-term successes and trends, and maximize government efforts in resolving human–wildlife conflicts.

## Case Study

*In 2003, NWRC economists began collaborating with the California Department of Health Services to determine the direct and indirect economic costs of human rabies exposure in two California counties and to conduct a BCA of the potential use of skunk oral rabies vaccination (ORV) baits to reduce the occurrence and spread of the disease. Skunk rabies is endemic in California, causing direct economic impacts through medical examinations and postexposure prophylaxis (PEP) treatments, as well as indirect impacts such as time off work and animal testing costs. Economists gathered and analyzed data relating to these variables for the years 1998 to 2002. Results indicated that the average total (direct + indirect) cost of a single suspected rabies exposure was approximately \$4,000 (2007 U.S. dollars). Using these identified costs, NWRC economists then conducted a scenario-based study to assess the potential benefits and costs of ORV baiting to eliminate or prevent the spread of skunk rabies in California.*

*Potential costs for ORV were derived for multiple bait densities, varying numbers of annual bait campaigns, and air v. ground delivery of baits. Benefits were viewed as savings resulting from fewer rabid animal encounters: decreased number of PEPs administered, animals tested, and indirect costs. The benefits calculated included multiple levels of prevention or abatement (100 percent, 75 percent, and 50 percent). Benefit–cost ratios (BCRs) were then computed for multiple combinations of prevention, bait density, and bait campaigns. These BCRs ranged from 0.16 to 6.35. That means for every dollar invested in wildlife rabies control and prevention, the return value in benefits can be as high as \$6.35.*

*Results from this economic analysis provide an economic basis for decisionmaking and serve as a guide for future ORV baiting campaigns in the United States and other countries.*

