USDA

United States Department of Agriculture

Animal and Plant Health Inspection Service

The Science of Wildlife Damage Management

Notable Examples of Significant Research

Wildlife Services (WS) is a science-based program that relies on research to assess the need for wildlife damage management, the potential impacts of field work, and the costs and benefits associated with program work. Below are a several notable studies and economic evaluations compiled by WS and several independent organizations that highlight the importance and need for WS' assistance in resolving wildlife conflicts.

1. Economics of Predation Management in Relation to Agriculture, Wildife, and Human Health and Safety

Bodenchuk, M.J., J.R. Mason, and W.C. Pitt. (2002). Pages 80-90 in Larry Clark, Jim Hone, John A Shivik, Richard A. Watkins, Kurt C. VerCauteren, and Jonathan K. Yoder, editors. Human Conflicts with Wildlife: Economic Considerations. Proceedings of the 3rd NWRC Special Symposium. National Wildlife Research Center, Fort Collins, CO.

Bodenchuk et al. (2001) assessed the benefit-to-cost ratio of WS' predator management efforts to protect agriculture, big game, threatened and endangered species, and human health and safety. Direct benefits and costs of predation management, and indirect costs incurred by livestock producers, rural communities and consumers were all examined. When properly applied, predation management results in benefit-to-cost ratios from 3:1 to 27:1 for agriculture, and 2:1 to 22:1 for wildlife protection. Activities performed to protect human health and safety show the greatest return on investment although they are perhaps impossible to quantify. Overall, it is clear from this study, that the benefits of WS' damage management assistance far outweigh the costs.

2. Cost-Effectiveness of Predator Damage Management Efforts to Protect Sheep in Idaho

Collinge, M.D., and C.L. Maycock. 1997. Proceedings of the Thirteenth Great Plains Wildlife Damage Control Workshop. 13:33-41.

Collinge and Maycock (1997) assessed the cost-effectiveness of predator control efforts to protect sheep in southern Idaho. Their conservative estimate of the benefit-to-cost ratio of WS' predator damage management assistance was approximately 3 to 1 for overall sheep protection. Estimates of the benefit-to-cost ratio for aerial operations ranged from approximately 5:1 to 7:1. For example, by spending an additional $16,500 in cooperator-supplied dollars for helicopter work in the winter of 1994-95, losses to coyote predation were about $89,000 lower than they had been the previous summer. The numbers of sheep present were similar during both summers.

This suggests that for every additional dollar spent by sheep producers for preventive management, they saved $5.40 in sheep and lamb losses.

These findings fall generally within the range of those discussed by other authors.

3. Economic Analysis of a Large-Scale Oral Vaccination Program to Control Raccoon Rabies

Kemere, P., M.K. Liddel, P. Evangelou, D. Slate, and S. Osmek. 2001. Proc. Human Conflicts with Wildlife: Economic Considerations Symposium. Fort Collins, CO.

Kemere et al. (2001) conducted a detailed analysis of the expected costs compared with the expected benefits of establishing a barrier from Lake Erie to the Gulf of Mexico in order to prevent the westward spread of raccoon rabies. The barrier would combine natural geographic features, such as the Appalachian Mountains, with oral rabies vaccination (ORV) zones. Benefits were assessed in terms of avoided costs. The types of costs that would be avoided by preventing the westward spread of raccoon rabies, include post-exposure vaccination treatments for humans, the need for increased livestock vaccinations, and the costs of increased surveillance and monitoring for rabies in wildlife and domestic animals (laboratory diagnostic costs, preparing samples for testing, and animal bite investigations). The analysis did not factor in an economic benefit for lives saved.

The costs of establishing and maintaining the raccoon rabies barrier are estimated to total $58 million to $148 million while the estimates of net benefits range from $48 million to $496 million. The analysis indicates that a large scale ORV program should be economically feasible and that net economic benefits would most likely be substantial.

4. A New Approach to Understanding Canid Populations Using an Individual-Based Computer Model: Preliminary Results

Pitt, W.C., F.F. Knowlton, and P.W. Box. 2001. Endangered Species Update, Vol. 18, No. 4.

A population model developed by Pitt et al. (2001) assessed the impact of removing a set proportion of the coyote population in one year and then allowing the population to recover (pulse removal). In the model, all populations recovered within 1 year when less than 60 percent of the population was removed. The population recovered within 5 years when 60 percent to 90 percent of the population was removed. In reality, the study states that natural populations would recover more quickly than those in the model. This is because in the model, territories remained even at low densities meaning animals were not allowed to move out of their territories to mate, and animals were not allowed to move in from surrounding areas. The model did not allow for a reduction in natural mortality rates at low population densities.

Researchers also evaluated the impact of removing a set proportion of the population every year for 50 years (sustained removal). When the removal rate was less than 60 percent, the model population size was the same as that of an unexploited population. There was, however, a shift in population structure. For example, the population with 50 percent removal had fewer transient animals, a younger age structure, and higher reproduction. Sustained removal rates of more than 70 percent of the population, resulted in removal of the entire population after 7 years. But the authors acknowledged that annual removal of 70 percent of the population would become increasingly difficult at low densities.

These simulations suggest that coyotes and other canid populations are very resilient to change. Because of the model limitations described above for pulse removal, natural populations are probably able to withstand greater levels of harvest. Connolly (1995) suggests coyotes could withstand an annual removal of 70 percent and still maintain a viable population. Pitt et. al. (2001) and other studies provide evidence that WS= cumulative impacts on coyote populations would be of a low magnitude based on the Program's annual take, other harvest information, and population data.

5. Effect of Preventive Coyote Hunting on Sheep Losses to Coyote Predation

Wagner, K.K. and M.R. Conover. 1999. *Journal of Wildlife Management* 63(2):606-612.

Wagner and Conover (1999) found that total lamb losses on grazing allotments declined 25 percent when coyotes were removed by winter aerial operations 5 to 6 months ahead of summer sheep grazing. Confirmed losses to coyotes declined by 7 percent on allotments with aerial operations, but increased 35 percent on allotments without aerial operations. This study provides evidence that coyote removal, even several months ahead of the arrival of livestock, can be effective in reducing predation losses. It also confirms that such removal does not result in increased losses.

6. Aspects of Coyote Predation on Angora Goats

Windberg, L.A., F.F. Knowlton, S.M. Ebbert, and B.T. Kelly. 1997. *Journal of Range Management* 50:226-230.

Windberg et al. (1997) found no statistically significant proportional differences in predation levels of Angora goats by territorial and transient coyotes. Based on these findings, the researchers concluded that management measures to protect highly vulnerable kid goats or lambs during periods of exposure may be best directed at local coyote populations rather than at particular cohorts or individuals. This study supports the belief

that removal of coyotes from a local population without regard for age or territoriality is advisable in many situations and does not result in a worsening of predation problems on vulnerable livestock, such as Angora goats.

7. Wildlife Strikes: A Growing and Costly Problem for Civil Aviation in the USA

Wright, S.E. and R.A. Dolbeer. Proceedings of the 45th Annual Corporate Aviation Safety Seminar. April 25-27, 2000, San Antonio, TX. Pages 35-52.

Wildlife strikes, defined as aircraft collisions with birds or other animals, are a serious safety and economic concern in the United States and elsewhere. As a result of studies at three major airports, the Federal Aviation Administration estimates that less than 20 percent of all strikes are reported. Based upon reported wildlife strike data and using the 20 percent of all strikes being reported, an estimated 461,165 hours in down time and more than $470 million in monetary losses are incurred each year by the aviation industry. In addition, liability issues related to wildlife strikes are a growing concern for airports and aircraft operators. Rapidly increasing wildlife populations, greater air traffic, and the development of quieter aircraft increase the likelihood of wildlife strikes. Damage and loss of life, however, can be minimized by developing comprehensive and professionally implemented wildlife hazard management plans to prevent wildlife strikes.

8. Wildlife Impacts on Forest Resources.

Nolte, D.L. and M. Dykzeul. 2002. Pages 163-168 in Larry Clark, Jim Hone, John A Shivik, Richard A. Watkins, Kurt C. VerCauteren, and Jonathan K. Yoder, editors. Human Conflicts with Wildlife: Economic Considerations. Proceedings of the 3rd NWRC Special Symposium. National Wildlife Research Center, Fort Collins, CO.

The negative impacts of wildlife on forest resources can be extensive. One of the most thorough measures of wildlife damage to forests in the Pacific Northwest was initiated in 1963 and 1964 by the Committee on Animal Damage Survey of the Western Forestry and Conservation Association. This study estimated that 30 percent of the tree seedlings planted would be damaged if no preventive practices were implemented; stocking rates on unprotected sites were 75 percent of those on protected sites; and trees protected from animal damage were 33 percent taller than unprotected trees after 5 years. Updating these economic numbers to reflect present day values, results in an annual financial loss in Oregon of $333 million. The total predicted reduction in value of the forest assets in Oregon, if no animal damage management was practiced, was estimated to be $8.3 billion. Additionally, results from a recent survey conducted by the Oregon Forestry Industry Council provides insight into economic losses due to damage by selected species: mountain beaver ($6.8 million) and bear ($11.5 million).