

The Science of Wildlife Damage Management

Notable Examples of Significant Research

Wildlife Services (WS) is a science-based program that relies on research and other independent reviews 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 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. Chemical repellents for reducing crop damage by blackbirds.

Avery, M. L.; Cummings, J. L. 2003. In: Linz, G. M., ed. Management of North American blackbirds. Proceedings of a special symposium of the Wildlife Society 9th annual conference. 27 September 2002; Bismarck, ND. Fort Collins, CO: U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, National Wildlife Research Center: 41-48.

Avery and Cummings (2003) discussed the use of various repellents to reduce blackbird damage to crops and presented a review of recent results from cage and field studies across the United States. The authors provided information on the effectiveness of a number of candidate materials, including clay-coated rice seed, copper-based fungicide (Kocide® SD), insecticide carbaryl (Seven®), methyl anthranilate (Bird Shield® and Rejex-it®), dimethyl anthranilate, 9,10-anthraquinone (Flight Control®), methiocarb, and caffeine. Results of caffeine were particularly promising as a low-toxicity repellent and the authors recommended more pen and field trials to further investigate its potential for management of blackbird damage.

2. A review of pathogens of agricultural and human health interest found in Canada Geese.

Clark, L. 2003. In: Fagerstone, K. A.; Witmer, G. W., eds. Proceedings of the 10th wildlife damage management conference; 6-9 April 2003; Hot Springs, AR. Fort Collins, CO: The Wildlife Damage Management Working Group of The Wildlife Society: 326-334.

Clark (2003) highlighted the role of waterfowl in disseminating and transmitting viral and bacterial diseases, such as avian influenza, newcastle disease, foot and mouth disease, avian pox, campylobacter, coliform bacteria, and salmonella. In addition to basic biological information about each disease and its origins, Clark also discussed economic impacts and potential transmission of each disease among waterfowl, domestic poultry, and humans.



Existing evidence suggested that waterfowl can play a major role in disease dissemination and transmission, although in most cases, definitive data were lacking. Clark noted the need for more directed studies before quantitative risk assessments can be made.

3. Double-crested Cormorant Movements in Relation to Aquaculture in Eastern Mississippi and Western Alabama.

Dorr, B.; King, D. T.; Tobin, M. E.; Harrel, J. B.; Smith, P. 2004. *Waterbirds* 27(2): 147-154.

As the number of cormorants increases in the southeastern United States, so do conflicts and concerns over the economic impacts associated with cormorant predation on catfish farms. In this study, Dorr et al. (2004) used radio telemetry to document movements of 25 cormorants from all known night roosts in the aquaculture producing areas of eastern Mississippi and western Alabama. The main objective of the study was to evaluate cormorant movements from known night roosts with respect to their foraging activities in nearby catfish farms.

Researchers observed that cormorants foraged in relatively close proximity to their night roosts, with over 95% of cormorant day locations within 19 km of their night roosts. As expected, cormorants roosting near catfish farms usually foraged in them and cormorants roosting near natural waterways tended to forage there. Dorr et al. suggest that roost harassment efforts be focused on specific roost sites located in close proximity to catfish ponds and recommend that some roost sites be left alone to serve as unharrassed refugia from which cormorants can forage in more natural habitats.

4. Avoidance of plant secondary compounds by European starlings: citronellyls

Hile, Arla G. 2004. *Crop Protection* 23: 973-978.

Hile (2004) studied the effectiveness of six citronellyl compounds for use as environmentally safe vertebrate repellents. Citronellyls are plant secondary compounds developed for the human-flavor and fragrance industry.

Tests were conducted on the European starling (*Sturnus vulgaris*), an invasive bird species in North America. All six compounds tested were highly repellent to the birds. Experiments revealed that two of the six compounds, citronellyl acetate and citronellyl butyrate, were effective at repelling birds at lower concentrations. Hile concluded that some plant derivatives were suitable for use as bird repellents and many other plant secondary compounds showed promise as new and safe vertebrate repellents.

5. GonaCon, a versatile GnRH contraceptive for a large variety of pest animal problems.

Miller, L. A.; Rhyan, J.; Killian, G. J. 2004. In: Timm, R. M.; Gorenzel, W. P. eds. *Proceedings of the 21st Vertebrate Pest Conference*; 1-4 March 2004, Visalia, CA. University of California, Davis, CA: 269-273.

Miller et al. (2004) provided an overview of the contraceptive and behavioral effects of the new single-injection immunocontraceptive vaccine, GonaCon™, on several species, including white-tailed deer, domestic and feral pigs, bison, wild horses, cats, dogs, and California ground squirrels. GonaCon™ provided contraceptive effects lasting 1-3 years. The vaccine also reduced aggressive behavior in males of some species. GonaCon™ has an APHIS-USDA patent-pending status.

6. Nonlethal Techniques for Managing Predation: Primary and Secondary Repellents.

Shivik, J. A.; Treves, A.; Callahan, P. 2003. *Conservation Biology* 17(6): 1531-1537.

Shivik et al. (2003) studied the behavioral effects of several nonlethal repellents on wild and captive wolves. The authors examined the effectiveness of fladry (using flagging to prevent intrusion into certain areas) and a light and sound scare device to deter consumption of deer carcasses by wild wolf packs in Wisconsin. Six wolf packs were identified and monitored. Results showed that the light and sound scare device prevented consumption of the deer carcasses more than the fladry.

Shivik et al. also compared the effectiveness of the light and sound scare device and an electronic training collar for keeping captive wolves from consuming dog food. The scare device effectively prevented captive wolves from consuming the food, but did not produce an aversion by the wolves to the food. The electronic training collar was not as effective. Although fur was trimmed and all collars were fitted to the same snugness, researchers observed a wide variability in response. Some wolves found the stimuli very noxious and immediately jumped, while others scratched at the collar but continued eating.

7. Economics in Wildlife Damage Management Studies: Common Problems and Some Solutions.

Shwiff, S. A. 2004. In: Timm, R. M.; Gorenzel, W. P. eds. *Proceedings of the 21st Vertebrate Pest Conference*; 1-4 March 2004, Visalia, CA. University of California, Davis, CA: 346-349.

Benefit-cost analyses are useful economic tools for evaluating research and operational efforts in wildlife damage management. Shwiff (2004) examined



common problems associated with benefit-cost analyses, including the absence of present value calculations, the misuse of market vs. non-market valuations, and the improper accounting of benefits and costs. In response to these problems, Shwiff noted simple solutions, such as calculating the present value of multi-year projects in order to determine values in today's dollars, providing a range of values for a species of interest, and listing all direct, indirect, and intangible benefits and costs.

8. Coyote-activated frightening devices for reducing sheep predation on open range.

VerCauteren, K. C.; LaVelle, M. J.; Moyles, S. 2003. In: Fagerstone, K. A.; Witmer, G. W., eds. *Proceedings of the 10th wildlife damage management conference*; 6-9 April 2003; Hot Springs, AR. Fort Collins, CO: The Wildlife Damage Management Working Group of The Wildlife Society: 146-151.

Domestic sheep ranching is an important agricultural industry in the United States and coyote (*Canis latrans*) depredation on lambs and ewes continues to challenge ranchers and agencies responsible for protecting sheep.

In this study, VerCauteren et al. (2003) evaluated the effectiveness of two animal-activated frightening devices in protecting lambs and ewes from coyote predation. The two nonlethal devices included: 1) an acoustic device, and 2) an acoustic device with a pop-up scarecrow and strobe light. The evaluation was conducted on open range in western Wyoming during the lambing season. No coyote kills were reported during 6,087 sheep-nights at 3 sites protected by the acoustic devices or during 6,598 sheep-nights at 3 sites protected by the acoustic scarecrow devices. These devices showed promise for reducing predation during the lambing season and merit further evaluation.

9. A coyote in sheep's clothing: predator identification from saliva.

Williams, C. L.; Blejwas, K.; Johnston, J. J.; Jaeger, M. M. 2003. *Wildlife Society Bulletin* 31(4):925-932.

In laboratory studies, Williams et al. (2003) used polymerase chain reaction-based RFLP (restriction fragment length poly-morphism) and microsatellite analyses to successfully identify canid species, gender, and individual genotype in mixed blood and tissue samples containing sheep and canid DNA. The technique was then used to test the feasibility of identifying predators from saliva on predation wounds. Predation wound samples from 19 sheep carcasses were analyzed. Coyote DNA was identified in 18 samples (95%), of which 17 contained male coyote DNA (94%). The study demonstrated that traces of DNA remaining on wounds can be useful for confirming the species, gender, and genotype of the predator. Genetic analyses of predation wounds may provide researchers, wildlife managers, and producers with a powerful tool to better understand predation and manage predators.