United States Department of Agriculture

Animal and Plant Health Inspection Service

FY 2006

Wildlife Services National Wildlife Research Center

Leader in Nonlethal Wildlife Damage Solutions

USDA Scientists Apply Wildlife Biology Expertise to Wildlife Conflicts

The Wildlife Services National Wildlife Research Center (NWRC) is a world leader in providing science-based solutions to complex issues of wildlife damage management. As the research arm of the Wildlife Services (WS) program, NWRC works with WS operations staff to provide Federal leadership and expertise to resolve wildlife conflicts related to agriculture, livestock, human health and safety (including wildlife diseases), invasive species, and threatened and endangered species. In 2006, approximately 75% of NWRC's funding was spent on efforts to develop or improve nonlethal wildlife damage management tools and methods. In fact, many of the nonlethal methods used today by Federal, State, and private sector wildlife professionals stem from research conducted at or through the Center.

Protecting Agricultural Crops, Aquaculture, and Natural Resources

NWRC is committed to finding nonlethal solutions to reduce wildlife damage to agricultural crops, aquaculture, and natural resources. In the 1980's, NWRC scientists showed that "decoy" plantings of sunflower could significantly reduce bird damage to nearby commercial sunflower fields. For a variety of logistical and economic reasons, however, decoy sunflower

fields did not become widespread. Over the last decade, new Federal farm programs have placed more emphasis on wildlife conservation leading to a renewed interest in the use of decoy fields. Recent studies showed blackbird and nonblackbird densities were greater in decoy fields versus commercial sunflower or small-grain fields. Wetlands were positively related to blackbird density, while shelterbelts and some weed plants were positively related to non-blackbirds. Producers seeking to maximize decoy use by blackbirds should keep weeds to a minimum in decoy plots and place the plots near wetlands. NWRC researchers are continuing to gather data to support the use of decoy fields as a broad-based, dual-purpose wildlife management strategy that not only reduces blackbird damage but also provides habitat for wildlife.

NWRC is also working with numerous partners to reduce bird damage to rice crops and increase profitability to growers. NWRC scientists conducted tests with both captive and free-ranging blackbirds to identify and develop nonlethal repellants for reducing bird depredation on seeded and ripening rice. Of many chemicals tested, GWN–4770, GWN–4140, caffeine, and Tilt® EC have shown the most promising results.

In addition to damaging agricultural crops, birds can also cause a great deal of damage at fish farms and other aquaculture facilities. Currently, NWRC is studying the migratory movements and feeding behavior of fish-eating birds, especially double-crested cormorants. With this knowledge, NWRC is perfecting the use of low-powered, nonlethal lasers to disperse cormorants from night roosts near fish farms.

Foraging wildlife, such as deer, can damage forest resources in many ways, such as reducing productivity or disrupting re-vegetation efforts. NWRC researchers discovered that certain food-grade materials, such as milk casein and egg albumen, have great potential as repellants to reduce deer consumption of desirable resources. Chemical analyses further demonstrated that proteins, which deter browsing deer, share the attribute of containing the amino acid methionine in their structures. A study evaluated several methionine-containing proteins by applying them to desirable plants and offering them to captive deer. The results of these experiments suggest that a repellant formulated with purified hydrolyzed casein used for nutritional and health applications effectively reduces browsing damage and is a promising tool for protecting seedlings in reforested areas.

Protecting Human Health, Safety and Property

NWRC works to protect human health and property by developing wildlife damage management tools that help reduce wildlife hazards. Wildlife that linger around airport runways are an ongoing concern for many airport managers. Given avian responses to signal colors and the importance of motion detection to birds, there is potential for the integration of light-based techniques (i.e., via specific wavelengths or colors, pulse rates, or combinations thereof) in reducing bird collisions with aircraft. In an experiment to study avian avoidance behavior, NWRC biologists monitored avian responses to specific lighting treatments and an approaching ground-based vehicle by using a complex video surveillance system. The recorded images were played back to determine the time and distance over which individual birds reacted to specific lighting treatments. Results will aid in the development of new light-based scare devices for birds.

As goose populations and urban areas expand and overlap, Canada geese are often considered a nuisance and potential health problem (fouling land and water, colliding with and damaging aircraft, etc.). Nonlethal and humane means of managing the size of Canada goose flocks in urban areas are needed. In 2006, NWRC received final regulatory approval and registration by the Environmental Protection Agency (EPA) for OvoControl-G, an oral contraceptive bait for Canada geese. The contraceptive bait was developed by NWRC in cooperation with Innolytics, LLC, a California-based company and manufacturer of the product. OvoControl contains nicarbazin, an active ingredient traditionally given to broiler chickens to prevent the disease coccidiosis. A side effect of nicarbazin is decreased egg production and hatching rates. When fed to Canada geese during their breeding season,

OvoControl effectively reduces the hatching success of eggs. When it is withdrawn from the diet, egg production and hatchability return to normal within a few days. NWRC received the Notable Technology Development Award in 2005 from the Federal Laboratory Consortium (FLC), Mid-Continent Region for their part in the development of OvoControl. OvoControl provides wildlife managers with a new and humane tool for managing resident Canada goose flocks.

Black bears that damage property and enter homes or businesses in order to get food are a significant concern for wildlife managers in suburban areas. NWRC is partnering with the Colorado Division of Wildlife and Colorado State University to better understand how the movement, behavior and to ecology of black bears in these areas relate to the management of human-bear conflicts. In 2005, bears were captured, fitted with Global Positioning System (GPS) collars, and monitored 24 hours a day to gather information on their movements and ecology. Subsequent years will focus on how management activities influence bear movement, behavior and ecology. In particular, researchers plan to evaluate the effectiveness of public education programs for reducing human-bear conflicts. One of the more long-term and sustainable strategies for reducing human-bear conflicts seems to be the elimination of human-related food sources, such as trash, birdfeeders, and pet food. This study will provide managers with a better understanding of how bears have altered their ecology to take advantage of human food sources and how managers can most effectively invest their time and resources to reduce problems.

As the number of vultures increases throughout the southeastern United States so does the number of vulture-human conflicts. Black vultures damage vinyl, plastic, and other synthetic construction and insulation materials. Additionally, black vultures prey on newly-born livestock and, in association with turkey vultures, form roosts that not only are nuisances to people but also contribute to human health and safety problems. To help alleviate these problems, NWRC researchers successfully tested the effectiveness of an artificial vulture effigy in dispersing birds from roosting sites in Florida. Following the installation of the effigies at several sites, vulture populations decreased by 84%. NWRC researchers also tested the effectiveness of several commercially available perching deterrents. Four of these —an electrical track; sharp, dense metal spikes; a cylindrical rolling perch; and a motion-activated sprinkler—proved very effective in preventing vultures from perching on roofs in test pens.

Current NWRC research also protects human health by developing methods to reduce or eliminate disease transmission among wildlife, domestic animals, and humans. For example, NWRC scientists have been testing potential chronic wasting disease (CWD) inactivating enzymes in collaboration with two private sector partners, PrionTech, Ltd., and Novozymes Biotech, Inc. CWD is a fatal neurological disease that infects captive and wild cervids (e.g., deer, elk and moose). A study using a mouse model of prion disease was conducted to determine whether treatments that eliminate detectable prions using in vitro diagnostics also eliminate infective potential. Two of the enzymes tested were capable of destroying the infectivity of abnormal prions. Much work remains to be done in the development of enzymatic deactivation of prions; however, the research has led to some promising avenues for improvement. Developing an enzyme-based method for prion inactivation will provide a versatile tool for decontamination that may be useful for environmental, laboratory, animal-facility, food-processing, and medical situations.

In addition, NWRC has been active in the development and testing of wildlife rabies vaccines. Though rabies is well controlled in domestic animals, it is still cause for concern among wildlife populations. Since 1995, WS has been involved in a national rabies prevention and oral rabies vaccination effort. In support of this program, NWRC scientists conducted a pen study to determine the longevity of the oral V-RG (Merial, Ltd.) rabies vaccine that is currently being used by WS to combat rabies in raccoons. Results showed that the vaccine prevented rabies infection in many raccoons up to 18 months post-vaccination.

Protecting Threatened and Endangered Wildlife

West Nile virus (WNV) entered the United States in 1999 and has spread across the country since that time. WNV is a vector-borne disease that amplifies in birds. While not all birds die if they become infected, WNV is caused by an extremely virulent pathogen. There is concern how this pathogen might affect threatened and endangered species. Researchers at NWRC carried out experimental infection tests on greater sage grouse (a potential species for listing under the Endangered Species Act) to determine their susceptibility to the disease and initiated pilot studies on new vaccines that might offer protection against the disease.

Prior to the initiating the studies, the investigators were required to house wild greater sage grouse in captivity for an extended period of time. This had never been accomplished. NWRC researchers were successful in keeping grouse for more than 7 months in captivity in the Center's flight pens. The success was even more remarkable in that the grouse showed lekking (reproductive) behavior in captivity and successfully bred. This has profound implications for conservation and captive-breeding efforts for this species.

Unfortunately, the experimental infection studies confirmed that sage grouse are highly susceptible to infection, dying within three days of exposure to WNV. However, earlier vaccine trials suggest some protection against infection, offering the hope that small threatened sage grouse populations might be captured and vaccinated against the disease.

Protecting Against Invasive Species

NWRC develops innovative strategies to minimize the impacts and spread of invasive wildlife species in the continental United States, its territories and nearby countries or islands. For example, the monk parakeet, an invasive species from South America, has become established in Florida and several other states. For unknown reasons, monk parakeets often select electric utility facilities as sites to build their large, bulky nests of twigs and other materials. This behavior frequently results in power failures as nest materials and birds come into contact with conductors. NWRC is investigating the potential use of DiazaCon (an oral contraceptive) as a nonlethal method for reducing monk parakeet populations. Results so far look promising, and nesting behavior and reproductive success are currently being monitored. NWRC researchers are also investigating the use of reproductive inhibitors to reduce the brown treesnake population on Guam where an overabundance of the invasive snakes has decimated native birds, bats, and reptiles.

The Gambian giant pouched rat (GGPR) has become an invasive species of concern for the State of Florida. In 2006, NWRC worked with Florida WS to develop information for planning the species' eradication from Grassy and Crawl Keys, where it is currently established. In addition to having negative impacts on agricultural crops and native habitats, GGPRs could negatively impact populations of some threatened and endangered species, especially the endangered Key Largo woodrat, the Key Largo cotton mouse, and the Lower Keys marsh rabbit. A pilot eradication campaign on Crawl Key, employing population monitoring methods developed by NWRC, was carried out in spring of 2006. Recent camera surveys indicated no GGPR survival following Hurricane Wilma and the pilot eradication effort. As a result, eradication efforts will now focus on the primary population on Grassy Key. The first step in the eradication process will be to monitor Grassy Key using a camera-indexing methodology. This setup will determine current GGPR distributions and relative abundances throughout the island. Subsequent steps will include the construction and deployment of bait stations especially designed to exclude native species.

In 2006, NWRC completed the construction of a new APHIS WS Invasive Species Research Building located at NWRC's headquarters site on the Foothills Research Campus of Colorado State University in Fort Collins, CO. The building expands and enhances NWRC's ability to study the ecology, biology, behavior and physiology of invasive wildlife species and to develop management tools and strategies for mitigating damage and controlling

the spread of invasive species. The 25,000-square-foot building has the ability to simulate temperature and humidity ranges from temperate to tropical ecosystems. The flexibility of the environmental controls allows for the year-round study of invasive vertebrate species from all types of climates. Examples of invasive species that will be studied include brown treesnakes from Guam, Coqui frogs from the Caribbean, GGPR from western Africa, Monk parakeets from South America, roof rats from Southeast Asia, and nutria from South America.

Protecting Livestock

Protecting livestock from predators is an important part of WS' mission. The need for acceptable and effective predator management tools is imperative in order to protect public safety and reduce livestock losses. Recent restrictions on the use of traps have led NWRC to test a wider array of nonlethal tools and methods that minimize predation on livestock.

NWRC's Logan field station and ML Designs of Goleta, CA, have developed Scare-Call, a new remotely activated, multisensory, programmable device that can be used either to frighten or call predators. The initial concept for the tool came from consultations with WS Operations in several States, but additional research added significant capabilities to the device. Currently, the device can be programmed weeks in advance and left in the field. It can also be triggered or remotely programmed from hundreds or yards away. Scare-Call uses high-quality digital audio files and can respond to inputs, such as motion detectors, or use external outputs, such as lights and external speakers. The use of the device near pastures could potentially reduce predation on livestock by wolves, coyotes and other large predators.

The scientists working at NWRC are dedicated to resolving conflicts that arise between people and wildlife. Through their efforts, NWRC scientists provide WS field biologists, and those who struggle with wildlife damage, an array of tools and methods that they can employ and adapt to resolve wildlife conflicts. NWRC scientists are concerned about the welfare of all animals, and they look for solutions that are biologically sound, environmentally safe, and socially acceptable. This critical research ensures that the broadest array of wildlife damage management tools will continue to be available for use by WS biologists, as well as State wildlife agency professionals, landowners, and others.

Selected Publications

• Breck, S. W.; Lance, N.; Callahan, P. 2006. A shocking device for protection of concentrated food sources from black bears. Wildlife Society Bulletin 34: 23–26.

• Engeman, R. M.; Woolard, J.; Perry, N. D.; Hardin, S.; Brashears, L.; Smith, H.; Muiznieks, B.; Constantin, B.; 2006. Rapid assessment for a new invasive species threat: the case of the Gambian giant pouched rat in Florida. Wildlife Research 33: 439-448.

• Kimball, B. A.; Nolte, D. L. 2006. Development of a new deer repellant for protection of forest resources. Western Journal of Applied Forestry 21: 108–111.

• Linz, G. M.; Homan, H. J.; Slowik, A. A.; Penry, L. B. 2006. Evaluation of registered pesticides as repellants for reducing blackbird (Icteridae) damage to sunflower. Crop Protection 25: 842–847.

• Shivik, J. A. 2006. Tools for the edge: what's new for conserving carnivores. BioScience 56: 253–259.

• Bynum, K. S.; Yoder, C. A.; Eisemann, J. D.; Johnston, J. J. Miller, L. A. 2005. Development of nicarbazin as a reproductive inhibitor for resident Canada geese. In D. L. Nolte; K. A. Fagerstone, eds. In: Nolte, D. L.; Fagerstone, K. A., eds. Proceedings of the 11th Wildlife Damage Management Conference; 16–19 May 2005; Traverse City, MI. Fort Collins, CO: Wildlife Damage Management Working Group, The Wildlife Society: 179–189.

• Hagy, H. M.; Raetzman, J. M.; Linz, G. M.; Bleier, W. J. 2005. Decoy cropping methods for luring blackbirds away from commercial sunflower: USDA wildlife conservation sunflower plots. In: Nolte, D. L.; Fagerstone, K. A., eds. Proceedings of the 11th Wildlife Damage Management Conference; 16–19 May 2005; Traverse City, MI. Fort Collins, CO: Wildlife Damage Management Working Group, The Wildlife Society: 304–310.

Contact Information:

Richard L. Bruggers, Director

NWRC Headquarters

4101 LaPorte Avenue

Fort Collins, CO 80521-2154

Phone: (970) 266-6036 FAX: (970) 266-6040

E-mail: richard.l.bruggers@aphis.usda.gov

Web site: www.aphis.usda.gov/ws/nwrc