

Wildlife Services

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FY 2008

Leader in Nonlethal Solutions to Wildlife Damage



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USDA Scientists Apply Expertise to Wildlife Conflicts

The 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 human-wildlife conflicts related to agriculture, human health and safety (including wildlife diseases and aviation), invasive species, and threatened and endangered species. In 2008, approximately 75 percent of NWRC's funding was spent to develop or improve nonlethal wildlife damage management tools and methods. 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. 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 the many chemicals tested, GWN-4770 showed the most promising results. In fact, one private company has since applied for a U.S. patent to use the active ingredient of GWN-4770 as an avian repellent.

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. NWRC scientists and collaborators have identified a biomarker in the skin that is a predictor of age in double-crested cormorants. This information may lead to a rapid and cost effective technique for identifying age of cormorants and many other species of birds. This technique will help provide a better understanding of the demographics of cormorants that are impacting commercial and natural resources in the United States.

Foraging wildlife 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 gelatin, have great potential as repellants to reduce rodent and rabbit consumption of seedlings, ornamental plants and food crops. NWRC researchers also studied the effectiveness of more than 20 tree seedling protectors to deter mountain beavers from damaging Douglas-fir seedlings. Of those tested, 11 products protected 95% or more of seedlings from damage. Tree shelters and fabric shelters provided the most protection with 98% and 95% of seedlings undamaged, respectively.

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 certain colors and the importance of motion detection to birds,



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there is potential for integrating light-based techniques, such as color, pulse rates, and wave lengths, in reducing bird collisions with aircraft. In a behavioral study, NWRC biologists monitored bird responses to specific lighting treatments and an approaching ground-based vehicle. Recorded images were played back to determine the time and distance over which individual birds reacted to specific lighting. Researchers found that ambient light affected how quickly the birds responded to the approaching vehicles under different lighting treatments. This new information presents an opportunity for WS and its partners to work with industry to design aircraft lighting systems that detect ambient light conditions and then tailor the lighting to one more readily discerned by birds under those conditions. More research is forthcoming, but the scientists have presented their most recent findings before representatives of a major aircraft manufacturer and already seen their initial findings employed by a commercial airline in a field trial.

Earthworms on airports often emerge from underground due to heavy rains and crawl onto airport runways where they attract foraging flocks of birds such as gulls, blackbirds, and European starlings. NWRC scientists are evaluating the use of physical and chemical barriers to prevent earthworms from moving onto runways and posing a threat to aviation safety. One method being studied is the use of fertilizers that earthworms find chemically irritating. Fertilizers can alter soil pH which can drive worms away from the affected area. Another barrier being tested is recycled glass or remnants from coal burning facilities crushed to the size of large, sharp sand particles. When placed on the soil surface, the materials create an abrasive, dry, and acidic layer that earthworms avoid.

As goose and pigeon populations in urban areas expand, these birds are often considered a nuisance and potential health problem (fouling land and water, colliding with and damaging aircraft, etc.). NWRC scientists partnered with Innolytics, LLC, a California-based company, to develop an oral contraceptive bait called OvoControl for geese and pigeons. Final regulatory approval and registration of the bait was granted in 2005 for Canada geese (registration # 80224-5) and 2007 for pigeons (registration # 80224-1) by the U.S. Environmental Protection Agency. 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 and pigeons, 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. OvoControl provides wildlife managers with a new and humane tool for managing resident Canada goose and pigeon flocks. NWRC was the 2009 Governor's Research Impact Award in Colorado for their part in the development of OvoControl.

Current NWRC research also protects human health by developing methods to reduce or eliminate disease transmission among wildlife, domestic animals, and humans. NWRC researchers and partners recently completed their third year of evaluating and validating the first live rectal-tissue biopsy method for detecting chronic wasting disease (CWD) in captive and wild elk. To date, researchers have collected over 1,500 biopsies from captive elk in Colorado and used the technique to find 15 elk that were positive for CWD. As compared to proven post-mortem diagnostic tests, this live test appears to be nearly as accurate. The key advantage to the rectal biopsy test is that it can be performed on live animals. Until now, there was no practical live test for CWD in elk. With this technique, researchers can detect CWD in animals not showing any signs of the disease and, thus,

remove them so they are not left to infect other individuals and further contaminate the environment. The research is a collaborative effort between APHIS' WS and Veterinary Services programs, the Agricultural Research Service, and the Colorado State University Veterinary Diagnostic Laboratory within the College of Veterinary Medicine and Biomedical Sciences. The use of this new live test in the initial screening, surveillance, and monitoring of CWD will greatly aid in the management and control of the disease in the wild, as well as in captive settings.

NWRC has been active in the development and testing of wildlife rabies vaccines. Though rabies is well controlled in domestic animals, its spread among wildlife populations is still cause for concern. Since 1995, WS has been involved in a national rabies prevention and oral rabies vaccination (ORV) effort. In support of this program, NWRC scientists helped to identify an effective, easy-to-use biomarker that allows for noninvasive identification of animals that have been exposed to ORV baits. The ORV program currently uses tetracycline, an antibiotic deposited in growing bone and teeth. Tetracycline has proven to be reliable, but evaluating this biomarker is invasive and expensive. Research conducted at NWRC examined rhodamine B as a possible alternative. Rhodamine B is a chemical dye that, when ingested, stains the oral cavity and is absorbed systemically into growing tissues such as hair and whiskers, producing fluorescent orange bands under ultraviolet (UV) light. Researchers monitored the whiskers and fur of exposed raccoons for fluorescence for 15 weeks to evaluate the effectiveness of rhodamine B as a biomarker. Results showed that rhodamine B is a safe and effective biomarker that can be used to assess the success of the ORV program.

Protecting Threatened and Endangered Wildlife

The Gambian giant pouched rat (GGPR) is an invasive species of concern for the State of Florida. In 2006-2007, NWRC worked with WS Operations in Florida to eradicate a breeding population of GGPR that had become established on the Grassy and Crawl Keys. 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. Key studies involved the testing of various toxicants and attractants for use with GGPR and the design and development of bait stations especially designed to exclude native species.

Bald eagles, once endangered in the lower 48 states, have increased exponentially since DDT was banned in the United States in 1972. In 2007, bald eagles were removed from the Federal List of Endangered and Threatened Wildlife and Plants. Unfortunately, this growth has resulted in increased incidences of collisions between bald eagles and aircraft. NWRC biologists collaborated with the WS Operations in Minnesota to evaluate the effectiveness of relocating bald eagles away from the St. Paul Downtown Airport as a method of reducing the risk of eagle-aircraft collisions. Initial results from the study indicate that translocated eagles remain within 50 miles of their release site and, for at least for a couple of months, are not likely to return to the airfield where they were captured. Information from this study will be used to develop effective methods for reducing the risk of collisions between bald eagles and aircraft.

The swift fox is a species of concern in several states and

is classified as endangered in Canada. Current swift fox conservation and management plans to bolster declining or recovering fox populations might require reduction of coyote populations to decrease predation. However, the role of coyote predation in swift fox population dynamics is not well understood. To better understand the interactions of swift foxes and coyotes, NWRC researchers compared swift fox population demographics (survival rates, dispersal rates, reproduction, density) between areas with and without coyote population reduction. Results showed that coyote predation was responsible for the majority of swift fox mortalities, but concluded that the ultimate mechanism behind the mortalities was exposure to predation due to lack of adequate shrub cover and density.

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. Monk parakeets often build their large, bulky nests of twigs and other materials on electric utility structures, frequently resulting 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. NWRC scientists are monitoring nesting behavior and reproductive success, and results so far look promising.

Attracting feral swine to traps and bait stations while avoiding capturing nontarget wildlife species such as raccoons can be tricky. Corn and other grains are widely used as bait in feral swine management and research. Unfortunately, many other wildlife species are attracted to this bait. Identifying a more species-specific attractant for feral swine would greatly improve trapping efficiency and selectivity. In recent studies, NWRC scientists compared species-specific visitation and contact rates of mammals to 11 different attractants at scent stations. Of all the attractants tested, strawberry had the most contacts by feral hogs and the fewest contacts by nontarget species. Future studies may look at other attractants, such as grape, diesel fuel, and sow urine, as well as the efficacy of the strawberry attractant in trapping situations.

Protecting Livestock

Protecting livestock from predators and disease is an important part of WS' mission. For example, 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 scientists and partners continually work to develop new aversive conditioning devices to keep predators away from livestock. Currently, one study is examining the use of electrified fladry that combines an animal's fear of a novel stimulus with conditioning from an unpleasant electric shock. Fladry is simply a line of flags hung along the perimeter of a pasture. It has a long history of use in Europe to deter wolves. Because wolves are often wary of new or novel items in their environment, they are cautious of crossing the fladry. Studies have shown normal fladry effectively keeps wolves from pastures for up to 60 days. This is useful during the calving season, but NWRC researchers want to go one step further and increase the tool's long-term effectiveness. Research has shown that wolves often bite at fladry when they first investigate it. If the fladry were electrified, wolves could potentially receive a very negative first impression and, therefore, be less likely to cross the barrier. In an initial study, NWRC scientists tested electrified fladry on 36 wolves in 10 groups. Eight of the groups crossed the normal fladry barrier,

but only 2 crossed the electrified fladry. Additional field studies are planned in Montana and will be conducted with the help of the Montana WS state office and Montana Fish, Wildlife and Parks.

Bovine tuberculosis (bTB) is a contagious, bacterial disease primarily affecting the respiratory tract of both animals and humans. In the U.S. today, the threat of humans contracting bTB from animals is extremely remote. At risk, however, are deer and other wildlife species and livestock. NWRC scientists tested the theory that livestock protection dogs raised and bonded with cattle could help reduce the risk of bTB transmission between white-tailed deer and cattle by minimizing contact between the two species and the use of cattle feed by deer. Results of studies showed guard dogs were highly effective in preventing deer from using cattle feed and from approaching cattle in core areas of pastures. In areas where the disease is present in deer, it may be possible to reduce the potential for bTB transmission by employing livestock protection dogs.

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

- AVERY, M. L., K. L. KEACHER, AND E. A. TILLMAN. 2008. Nicarbazin bait reduces reproduction by pigeons (*Columba livia*). *Wildlife Research* 35:80-85.
- BYNUM, K. S., J. D. EISEMAN, G. C. WEAVER, C. A. YODER, K. A. FAGERSTONE, AND L. MILLER. 2007. Nicarbazin OvoControl G bait reduces hatchability of eggs laid by resident Canada geese in Oregon. *Journal of Wildlife Management* 71:135-143.
- ENGEMAN, R. M., G. W. WITMER, J. B. BOURASSA, J. W. WOOLARD, B. CONSTANTIN, P. T. HALL, S. HARDIN, AND N. D. PERRY. 2007. The path to eradication of the Gambian giant pouched rat in Florida. Pages 305-311 in G. W. Witmer, W. C. Pitt, and K. A. Fagerstone, editors. *Managing invasive vertebrate species: proceedings of an international symposium*. USDA/APHIS/National Wildlife Research Center, Fort Collins, Colorado, USA.
- FRY, T. L., AND M. R. DUNBAR. 2007. A review of biomarkers used for wildlife damage and disease management. *Proceedings of the Wildlife Damage Management Conference* 12:217-222.
- FIGUEROA, J. A., B. A. KIMBALL, AND K. R. PERRY. 2008. Lagomorph and rodent responses to two protein hydrolysates. *Crop Protection* 27:851-854.
- HAGY, H. M., G. M. LINZ, AND W. J. BLEIER. 2008. Optimizing the use of decoy plots for blackbird control in commercial sunflower. *Crop Protection* 27:1442-1447.
- KARKI, S. M., E. M. GESE, AND M. L. KLAVETTER. 2007. Effects of coyote population reduction on swift fox demographics in southeastern Colorado. *Journal of Wildlife Management* 71:2707-2718.
- REIDY, M. M., T. A. CAMPBELL, AND D. G. HEWITT. 2008. Evaluation of electric fencing to inhibit feral pig movements. *Journal of Wildlife Management* 72:1012-1018.

- RUNDE, D. E., D. L. NOLTE, W. M. ARJO, AND W. C. PITT. 2008. Efficacy of individual barriers to prevent damage to Douglas-fir seedlings by captive mountain beavers. *Western Journal of Applied Forestry* 23:99-105.
- SEAMANS, T. W., S. C. BARRAS, G. E. BERNHARDT, B. F. BLACKWELL, AND J. D. CEPEK. 2007. Comparison of 2 vegetation-height management practices for wildlife control at airports. *Human-Wildlife Conflicts* 1:97-105
- VERCAUTEREN, K. C., M. J. LAVELLE, AND G. E. PHILLIPS. 2008. Livestock protection dogs for deterring deer from cattle and feed. *Journal of Wildlife Management* 72:1443-1448.
- WERNER, S. J., J. L. CUMMINGS, P. A. PIPAS, S. K. TUPPER, AND R. W. BYRD. 2008. Registered pesticides and citrus terpenes as blackbird repellents for rice. *Journal of Wildlife Management* 72:1863-1868.
- WITMER, G., J. GIONFRIDDO, AND M. PIPAS. 2008. Evaluation of physical barriers to prevent prairie dog colony expansion. *Human-Wildlife Conflicts* 2:206-211.
- YODER, C. A., M. L. AVERY, K. L. KEACHER, AND E. A. TILLMAN. 2007. Use of DiazaCon™ as a reproductive inhibitor for monk parakeets (*Myiopsitta monachus*). *Wildlife Research* 34:8-13.

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Notable Examples of Significant Research



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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 a several notable studies compiled by WS and partners that highlight the importance and need for WS' assistance in resolving conflicts involving wildlife.

Economic costs of rabies exposure

Shwiff, S.A.; Sterner, R.T.; Jay, M.T.; Parikh, S.; Bellomy, A.; Meltzer, M.I.; Rupprecht, C.E. Slate, D. 2007. Direct and indirect costs of rabies exposure: a retrospective study in southern California (1998-2002). *Journal of Wildlife Diseases* 43:251-257.

The cost of detection, prevention, and control of rabies in the United States is approximately \$300 million annually. In this paper, Shwiff et al. estimated the direct and indirect costs of suspected human rabies exposure for San Luis Obispo and Santa Barbara counties, California. Clinic, hospital, and county public health records (1998-2002) were examined to determine the direct costs for postexposure prophylaxis (PEP) and former patients were contacted to voluntarily provide estimates of their indirect costs associated with receiving PEP. Additional costs due to public health and animal control personnel responses to rabid animals were also collected. The mean total cost of suspected human rabies exposure was \$3,688. About one-third of the total cost was attributed to indirect costs (e.g., lost wages, transportation, and day-care fees), most of which were not reimbursable to the patient. The findings confirmed that suspected rabies exposures exert sizable economic burdens on local municipalities and county governments in rabies endemic areas.

Relationships between wolves, coyotes and pronghorn

Berger, K.M.; Gese, E.M.; Berger, J. 2008. Indirect effects and traditional trophic cascades: a test involving wolves, coyotes, and pronghorn. *Ecology* 89:818-828.

The presence or absence of large carnivores can shape the structure and function of ecological communities. Results from this study showed a strong negative correlation between coyote and wolf densities and coyote densities and pronghorn fawn survival rates. These results support the hypothesis that increased coyote populations as a result of the extirpation of wolves throughout much of North America contributes to high rates of coyote predation on pronghorn fawns. Thus, from both management and conservation perspectives, wolf restoration holds promise for reducing coyote predation rates on young pronghorn, mule deer, and white-tailed deer.

Repellants for rodents and rabbits

Figueroa, J.A.; Kimball, B.A.; Perry, K.R. 2008. Lagomorph and rodent responses to two protein hydrolysates. *Crop Protection* 27:851-854.

Proteins hydrolysates (proteins broken down by acid or enzymes into amino acids) are added to foods to serve various functions. They can be used as leavening agents, stabilizers (to impart body or improve consistency, for example), thickeners, flavorings, flavor enhancers, and as a nutrient (protein source). Recently, two protein hydrolysates have been shown to act as repellants to certain mammal species. For example, hydrolyzed casein (HC) significantly reduces browsing by deer, even when alternative food choices are minimized. Gelatin also is an effective repellant for laboratory mice. In this study, NWRC scientists test whether these two protein hydrolysates may serve as



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effective repellants for use with rabbits, pocket gophers, voles and mountain beavers. Results showed mountain beavers and pocket gophers strongly avoided diets containing HC. Rabbits showed a slightly higher avoidance to gelatin diets. However, HC and gelatin displayed little potential as repellants for voles as both products were readily consumed. Scientists note HC and gelatin may be useful in preventing mountain beaver damage to conifer seedlings and rabbit damage to nursery and food crops, respectively.

Immunocontraceptive vaccine for white-tailed deer

Miller, L.A.; Gionfriddo, J.; Fagerstone, K.A.; Rhyan, J.; Killian, G. 2008. The single-shot GnRH immunocontraceptive vaccine (GonaCon™) in white-tailed deer: comparison of several GnRH preparations. *American Journal of Reproductive Immunology* 60:214-223.

NWRC researchers provide an overview of the newly developed gonadotropin-releasing hormone (GnRH) vaccine and its use with captive, adult, female white-tailed deer. They also describe recent improvements to the vaccine including 1) development of a single-injection technology that provides a multi-year contraceptive effect, 2) development of a new adjuvant to replace Freund's™ adjuvant, and 3) replacement of keyhole limpet hemocyanin as a protein carrier molecule with a more cost-effective mollusk protein for conjugation with synthetic GnRH peptide. All of these improvements contributed to the development of a more effective and practical contraceptive vaccine for use in wildlife.

Repellants for blackbirds

Werner, S.J.; Cummings, J.L.; Pipas, P.A.; Tupper, S.K.; Goldade, D.A.; Beighley, D. 2008. Registered pesticides and citrus terpenes as blackbird repellants for rice. *Journal of Wildlife Management* 72:1863-1868.

Red-winged blackbirds, common grackles, and brown-headed blackbirds cause extensive damage to newly planted and ripening rice in the United States. In this study, Werner et al. conducted captive and field studies to evaluate the effectiveness of two natural compounds and two registered fungicides as avian repellants. For all candidate repellants, red-winged blackbirds discriminated between untreated and treated rice during preference-testing in captivity. Researchers observed a positive concentration-response relationship among birds offered rice treated with GWN-4770. Relative to pretreatment, blackbirds consumed 34% and 77% less rice treated with 11,000 ppm and 22,000 ppm GWN-4770, respectively. Gowan Company has since applied for a U.S. patent for the use of the active ingredient of GWN-4770 as an avian repellent.

Coyotes as sentinels for bovine tuberculosis

Atwood, T.C.; VerCauteren, K.C.; DeLiberto, T.J.; Smith, H.J.; Stevenson, J.S. 2007. Coyotes as sentinels for monitoring bovine tuberculosis prevalence in white-tailed deer. *Journal of Wildlife Management* 71:1545-1554.

Bovine tuberculosis (bTB) is a contagious bacterial disease capable of infecting a wide array of mammals, including humans. Atwood et al. investigated coyote movements and behavior relative to bTB prevalence in white-tailed deer in Michigan. The main goal was to evaluate the use of coyotes as sentinels for monitoring bTB occurrence. Study objectives examined: (1) general spatial ecology of coyotes relative to bTB prevalence, (2) the potential for transmission within and among social groups, and (3) the potential for behavior and landscape attributes to influence the distribution of bTB-infected coyotes. Results showed coyotes may effectively serve as sentinels to detect bTB prevalence at coarse spatial scales, such as townships or

deer management units. Future efforts may focus on the development of models to predict areas where coyotes are likely to acquire bTB from white-tailed deer.

Habitat modification at airports to prevent bird-strikes

Seamans, T.W.; Barras, S.C.; Bernhardt, G.E.; Blackwell, B.F.; Cepek J.D. 2007. Comparison of 2 vegetation-height management practices for wildlife control at airports. *Human-Wildlife Conflicts* 1:97-105.

When mammals and birds collide with aircraft, they pose a serious safety hazard to people. Management techniques that reduce bird use of habitats on and around airports are critical for safe airport operations. In this study, NWRC researchers observed bird and mammal activity in vegetation plots to determine if plot use differs due to vegetation height. Results indicated little to no difference in bird or mammal use of plots maintained by mowing either at short (9-15 cm) or tall (15-30 cm) heights. Researchers suggest that each airport manage its vegetation based on the wildlife that uses the airport. For instance, airport biologists should focus on the plant species, vegetation height and plant density that will minimize the attractiveness of the airport to most hazardous wildlife species.

Nicarbazin used to reduce hatching success of Canada geese

Bynum, K.S.; Eisemann, J.D.; Weaver, G.C.; Fagerstone, K.A.; Miller, L. 2007. Nicarbazin OvoControl G bait reduces hatchability of eggs laid by resident Canada geese in Oregon. *Journal of Wildlife Management* 71:135-143.

In the late 1940s, the Canada goose (*Branta canadensis*) population in North America was estimated at 1.1 million birds. Today, the population has increased to nearly 6 million birds in the United States alone. About 4 million, classified as resident Canada geese, no longer migrate during the spring and fall. This increase coincides with more human-geese conflicts. Throughout the country, large populations of resident Canada geese are often considered a nuisance and potential health risk because they foul land and water with their droppings and can collide with and damage aircraft. Recent studies have also found bacteria strains associated with human disease in Canada goose feces. Although many communities want reductions in resident goose populations, often the use of lethal control is not considered an acceptable option. In this study, wild resident Canada geese were treated with OvoControl G (an oral contraceptive bait) consisting of nicarbazin immediately prior to and during the breeding season to study the effects on hatchability of eggs laid by treated geese. OvoControl G reduced the hatchability of eggs laid by resident geese by 36% and increased the number of nests with no hatching eggs by 93% as compared to control sites. Results showed OvoControl G to be a safe and effective management tool for reducing resident Canada geese populations.

Bait delivery for feral swine

Campbell, T.A.; Long, D.B. 2007. Species-specific visitation and removal of baits for delivery of pharmaceuticals to feral swine. *Journal of Wildlife Diseases* 43:485-491.

Burgeoning feral swine populations increasingly are coming into conflict with natural resource managers, agriculture producers, and ecologists. In particular, the livestock industry about the role feral swine play in the maintenance and transmission of diseases to domestic swine. Baits are often used to deliver toxicants or other chemicals, such as contraceptives or vaccines, to wildlife. In this study, field

trials compared feral swine and non-target species visitation and removal rates of fish-flavored and vegetable-flavored baits with and without a commercially available raccoon repellent. Results showed cumulative bait removal rates after four nights ranged from 93% to 98%; bait removal by feral swine, raccoons, and collard peccaries did not differ by treatment. Additionally, coyotes removed more fish-flavored baits and white-tailed deer removed more vegetable-flavored baits without raccoon repellent than expected. The observed removal rates illustrate bait attractiveness to feral swine. The diversity of native wildlife in the United States adds complexity to the development of a baiting system specific to feral swine.

Vaccine development for chronic wasting disease

Pilon, J.; Loiacono, C.; Okeson, D.; Lund, S.; VerCauteren, K.; Rhyan, J.; Miller, L. 2007. Anti-prion activity generated by a novel vaccine formulation. *Neuroscience Letters* 429:161-164.

Chronic wasting disease (CWD) is a fatal prion disease that infects elk, white-tailed deer, mule deer, and moose. A prion is an infectious protein particle similar to a virus but lacking nucleic acid. In this study, Pilon et al. tested the efficacy of several potential CWD vaccine candidates using a mouse model system and the Rocky Mountain Laboratory (RML) mouse-adapted scrapie prion strain. Vaccinated mice challenged with the RML scrapie prion strain revealed anti-prion activity by the vaccine formulations. This activity was measured by a delay in clinical disease onset and prolonged survivorship in the vaccinated mice. Though the authors demonstrated an ability to generate an anti-prion effect by the various vaccines, a fully successful CWD vaccine was not achieved.