

## DEVELOPING METHODS

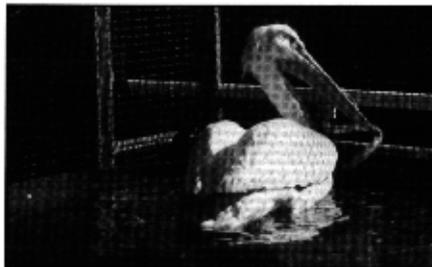
Goal: Increase effective methods available for wildlife damage management.

### BIRD RESEARCH PROGRAM

#### ***Title: Economic Impact and Management of Bird Predation at Aquaculture Facilities in the Southeastern United States***

***Goal: Determine the magnitude of and develop methodology to reduce damage by cormorants, wading birds, and pelicans on southern catfish, baitfish, and crawfish farms.***

**Double-Crested Cormorant Satellite Telemetry**—During 2001, NWRC biologists continued studies using satellite radio transmitters to investigate the continental movements of double-crested cormorants in North America. One study involved monitoring the movements of 25 radio-transmitter-equipped cormorants that had been captured adjacent to catfish farms in Alabama, Arkansas, Louisiana, and Mississippi between 1999 and 2001. The results will permit determining the migratory behavior of these cormorants. A second satellite telemetry study also involving 25 satellite transmitters installed in each of the 2000 and 2001 breeding seasons at a cormorant colony on an island in Lake Ontario, NY, is enabling NWRC researchers to better understand the foraging distribution and subsequent migratory behavior of these breeding cormorants in the Northeast.

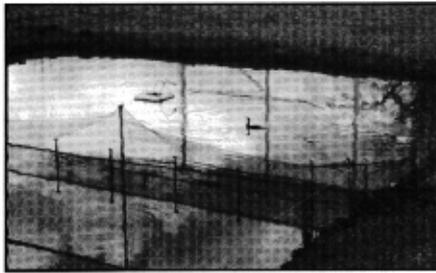


**American White Pelican Disease Ecology**—NWRC researchers, in collaboration with parasitologists at two State universities, have initiated a study to determine the species of trematode currently infecting commercially grown catfish in the mid-South, and to determine if fish-eating birds can serve as hosts for this parasite. Biologists at the NWRC Mississippi field station artificially infected four captive American white pelicans with larvae of candidate *Diplostomula* spp. trematodes that were isolated from infected catfish collected from commercial ponds. Adult specimens of



this parasite were later found in three of the four pelicans, indicating that American white pelicans definitely have the potential to transmit this disease among catfish ponds.

Morphology of whole specimens, sections of the specimens, and molecular analyses of this DNA are being used to identify the trematode species. No other parasites were present in the test subjects. Additional study is planned to investigate the potential of double-crested cormorants and great blue herons to serve as hosts for these trematodes.



**Abundance and Distribution of Cormorants on Mississippi Catfish Ponds**—In April 2001, NWRC biologists successfully completed the field phase of a study to evaluate the distribution and abundance of double-crested cormorants on catfish aquaculture ponds in the delta region of Mississippi. Preliminary evidence from aerial surveys indicated that cormorants foraged daily on an average of more than 25 percent of the surveyed ponds between February and April 2001, after which the cormorants began migrating north. The average numbers of birds observed per pond ranged from 5 to 46, depending on the month of the survey.

NWRC researchers will use producer surveys, geographic information systems (GIS) technology, and satellite imagery to relate the distribution and abundance of cormorants to the type and condition of the ponds and the health status of fish in them. Results will help relate economic loss estimates to the type or stage of catfish production and will also provide a basis for estimating the greater economic losses of catfish to cormorants in the delta region of Mississippi and lead to management strategies to alleviate these impacts.



**Catfish Consumption by American White Pelicans**—A controlled foraging experiment was recently completed in 2001 that determined the number of catfish consumed by captive American white pelicans at the NWRC Mississippi field station. Daytime videography and nocturnal observations (via night vision equipment) revealed that pelicans actively forage during both day and night hours. One pelican consumed 20 catfish in 69 minutes and 47 catfish between 4 and 10 p.m. NWRC biologists will develop bioenergetic and economic predictions regarding the foraging ecology and impacts of pelicans associated with aquaculture facilities in the mid-South.

**Nonlethal Techniques To Minimize Cormorant Impacts to Southern Aquaculture**—Rapidly increasing populations of double-crested cormorants over the past two decades are a growing concern for aquaculture producers in the Southeastern United States. These birds often congregate at night in

groups of several thousand or more and forage at nearby catfish farms during the day. To date, the most effective method for limiting cormorant damage to aquaculture has been to move cormorants away from roost sites near aquaculture facilities. Traditionally, biologists and farmers have used using nonlethal pyrotechnic noisemakers to disperse cormorants from their night roosts. However, there is increasing concern that such activity might disturb nontarget species, such as waterfowl. Researchers at NWRC's Mississippi field station evaluated the use of low-powered lasers for moving cormorants from roost sites near southern aquaculture farms. The low-powered lasers were found to be as effective as pyrotechnics in moving cormorants from their night roosts without harming the target birds or disturbing other, nontarget species. This research has added an additional tool to be used as part of an integrated effort for managing double-crested cormorant damage to aquaculture.

## ***Title: Development of Methods To Manage Depredation and Nuisance Problems Caused by Vultures***

***Goal: Understand the relationships between various habitat and land-use variables and problems caused by vultures and develop effective management techniques for reducing predation losses and property damage.***

**Management Methods To Disperse Vulture Roosts on Communication Towers**—Communication towers provide attractive roost sites for black and turkey vultures. This roosting behavior creates problems, however, for tower operators, nearby businesses, and owners of adjacent homes. To alleviate these problems, NWRC scientists evaluated the effectiveness of suspending vulture carcasses or taxidermic

effigies from towers to disperse vulture roosts at six sites in northern Florida. At each site, vulture numbers decreased immediately after installation of the stimulus, and roosting at the study sites completely ceased within 10 days. The effect was independent of the composition of the roost and occurred regardless of which vulture species was used as the carcass or taxidermic effigy. At one site, the roost was even substantially reduced using a commercial

plastic goose decoy painted to resemble a turkey vulture. At three sites, the deterrent effect persisted up to 5 months even after the carcass or effigy was removed from the tower. Hanging a vulture carcass, taxidermic effigy, or even an artificial decoy, from a tower creates an unfavorable roosting environment for vultures and offers a simple, effective means to manage problem roost situations.

## ***Development and Evaluation of Management Techniques for Reducing Blackbird Damage to Ripening Sunflower Crops and Feedlots***

***Goal: Develop new and/or improved methods to reduce blackbird damage to ripening sunflower crops and feedlots.***

**Avian Use of Ripening Sunflower Fields in North Dakota**—NWRC and university scientists conducted intensive nontarget bird surveys in 12 sunflower fields located in a few counties in North Dakota during August through October 2000. The objective was to document birds that could be negatively affected by applications of DRC-1339-treated rice, when used to reduce blackbird damage to sunflowers. The 12 test fields were visited 7 times, for a total of 84 field surveys. All birds were identified as to species, sex, and age, if possible. Thirty seed-eating nontarget birds (excluding the blackbird family) were observed in the sunflower fields, including 16 species of

sparrows and 3 species of finches. Nontarget members of the blackbird family that were observed and are sensitive to DRC-1339 included one bobolink and two western meadowlarks.

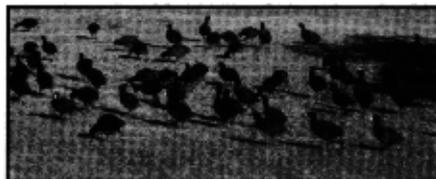
**Habitat Characteristics Around Fall Blackbird Roosts**—Blackbirds in the northern Great Plains congregate in large flocks during the late summer and often roost overnight in cattail marshes and cause significant damage to nearby sunflower fields during the day. Wetland managers might be able to predict likely locations of blackbird roosts if they know their habitat characteris-

tics. During 2000, NWRC biologists analyzed aerial photographs to quantify the habitat around 11 major (>10,000 blackbirds) and 9 minor (<10,000 blackbirds) roosts in the sunflower-growing region in North Dakota. The availability of various habitats around these major and minor roosts was similar, although the mean distance to the closest sunflower field was marginally greater for major roosts than minor roosts. Additional research is warranted to elucidate the possible relationship between roost location and sunflower fields.

## **Title: Management of Bird Damage to Rice**

**Goal: Develop new or improved management strategies for reducing bird damage to rice.**

Blackbirds cause millions of dollars of damage to seeded and ripening grain crops each year in the United States. NWRC biologists evaluated Flight Control™, which contains the active ingredient anthraquinone and is registered with the Environmental Protection Agency (EPA) as a bird repellent for Canada geese on turf, for reducing blackbird depredations on newly planted rice seed and on ripening rice. Both the number of blackbirds using treated fields and the damage to newly planted rice seed were reduced in fields where the seed was treated with Flight Control at a 2-percent concentration just before planting. Counts of rice seedlings in treated and untreated enclosures suggested Flight Control was not phytotoxic to rice seed. To determine chemical residues at harvest, NWRC scientists initiated a 2-year study following the EPA Residue Chemistry Test Guidelines, which required evaluation of 12 field trials (6 each year) in the region where Flight Control will be used, i.e., Louisiana, Arkansas, Texas, and Missouri. Results from the first year's trial were very favorable. All 36 samples of rice collected at harvest from the 6 field trial sites and milled to the brown rice stage were below the minimum limit of detection of 0.05 p/m. These results will be part of a data package to obtain an Experimental Use Permit to test Flight Control as a rice seed treatment on a large scale in Louisiana.



**Potential Repellent for Coot Damage to Sprouting Rice**—American coots consume considerable amounts of sprouted rice seed from farmers' fields in Louisiana. One possible method of combating these losses is through the use of a seed treatment repellent, such as anthraquinone-based Flight Control. NWRC scientists conducted large pen tests at a university research station to evaluate the repellency of Flight Control to coots. Four groups of three birds were placed in pens for 3 days. Each pen was constructed over planted rice and divided into a treated and untreated plot. Following the 3-day test, coots were removed and the remaining seeds allowed to germinate. While there was a trend for increased sprout density in the treated plots, the rice sprout counts revealed no statistical difference between treated plots and untreated plots. Although not conclusive, these results are encouraging and suggest that further evaluation is warranted.

**Nontarget Bird Use of DRC-1339 Bait Sites**—Blackbird damage to newly planted rice is an economically important problem for many producers in Louisiana, Texas, Arkansas, and Missouri. DRC-1339 avicide has been used on staging areas to reduce blackbird populations prior to rice planting. To evaluate potential impacts on nontarget birds, NWRC scientists monitored nontarget use of DRC-1339 bait sites on 35 sites in Louisiana and 8 sites in Texas during operational baiting programs. Savannah sparrows were the predominant nontarget bird observed on about 90 percent of the bait sites. Snow geese and white-fronted geese occurred in the greatest numbers but were observed only on a few sites. The remaining nontarget birds, meadow larks, mourning doves, and cardinals, were observed on only a few sites and in very low numbers. To determine the effects of DRC-1339 on these nontarget species, NWRC scientists initiated a laboratory feeding trial using 2-percent DRC-1339-treated brown rice diluted 1:25 with untreated brown rice. Trials on savannah sparrows and Canada geese showed no mortality after a 5-day exposure to the bait. Even if mortality should occur, the numbers of nontarget birds observed on these bait sites is sufficiently low to not have an adverse effect on overall populations. Further evaluations will be conducted in 2002 on the other species observed using bait sites.

## ***Title: Defining and Reducing Wildlife Hazards to Aviation***

***Goal: Provide a scientific foundation for WS programs at airports throughout the USA to reduce wildlife hazards to the aviation industry.***

**Aircraft Collisions With Gulls Reduced 48–99 Percent at a New York Airport, 1991–2000**—In 2000, the WS program successfully completed its 10th year of assistance to State agencies and a New York airport in a program that has annually reduced laughing gull collisions with aircraft by 76 to 99 percent compared to baseline years, 1988–90. Strikes by other gull species were reduced 48 to 76 percent over the same time period. In this joint operational and research program, biologists have removed 58,000 laughing gulls and 6,000 other gulls at the airport. During this time, the nearby nesting colony on Federal land that is the source of the bird strike problem has declined by about 65 percent, from 7,600 nests in 1990 to 2,700 nests in 2000.

An analysis of data from leg bands recovered from 610 gulls shot at John F. Kennedy International Airport (JFKIA) indicated that many gulls hatched in colonies in New Jersey >60 miles from JFKIA have immigrated to the colony next to JFKIA to nest as adults. Because many Atlantic coast colonies of laughing gulls have been increasing, there has been a large cohort of birds available to replace birds removed at JFKIA. Therefore, an annual shooting program at JFKIA, while effective in reducing the number of gull–aircraft collisions, has not eliminated the nearby nesting colony or caused a decline in the regional breeding population.

A long-term alternative to shooting would be a program of harassment, habitat alteration, or nest destruction at the colony site itself to relocate the colony away from the airport.

However, a relocation program has not been possible because the nesting colony resides on a fully protected wildlife refuge.

**Comprehensive Report Published Summarizing 10 Years of Data on Wildlife Strikes With Civil Aircraft in the USA**—Biologists at NWRC's Sandusky, OH, field station, in cooperation with a staff wildlife biologist from another Federal agency, have published an analysis of the 28,150 reported bird and other wildlife collisions with civil aircraft in the United States for the 10-year period 1990–99. The 62-page report, published by the Federal Aviation Administration's (FAA) Office of Airport Safety and Standards, was distributed during February 2001 to 650 airports nationwide that are certified for passenger traffic and to all USDA WS State offices. This report summarizes the nature, characteristics and trends of strikes by phase of flight, altitude, aircraft type, engine configuration, wildlife species and other factors.

Birds were responsible for 97 percent of the reported strikes, and mammals and reptiles, the remaining 3 percent. Waterfowl (32 percent), gulls (30 percent), and raptors (15 percent) caused 77 percent of the aircraft-damaging bird strikes. Deer were responsible for 96 percent of the mammal and reptile strikes causing damage.

This analysis indicated that wildlife strikes cost the U.S. civil aviation industry more than \$389 million/year between 1990 and 1999. Nineteen aircraft were destroyed, and 91 human injuries and 6 deaths were reported as a result of wildlife strikes to civil aircraft. This

report, the most comprehensive analysis of wildlife strikes ever produced, provides objective data to define the extent and nature of wildlife problems with aviation so that research and management programs to reduce strikes can be properly focused, justified and evaluated. NWRC, through an interagency agreement with the FAA, has maintained the National Wildlife Strike Database for Civil Aviation since 1995.

**Coyote Hair Is Effective Deer Repellent**—The white-tailed deer population in the United States has increased from about 350,000 in 1900 to 26 million in 2000, creating many conflicts with public safety and agriculture. For example, about 500 civil aircraft collisions with deer were reported in the United States between 1990 and 2000. Direct removal of deer can reduce the potential for deer–aircraft collisions and agricultural damage. However, such action is often controversial and provides only short-term relief. An inexpensive, effective deer repellent would have many uses as part of integrated programs to lessen conflicts between deer and humans.

From January through March in 2000 and 2001, biologists at NWRC's Sandusky field station examined the effectiveness of coyote hair as a deer feeding repellent in experiments at the 5,400-acre Plum Brook Station of the National Aeronautics and Space Administration (NASA) in northern Ohio. Corn consumption was measured at five sites where mesh bags containing coyote hair and five sites where empty bags were hung near troughs of corn. In both winters, coyote hair dramatically reduced deer intrusions to the feeding troughs

and consumption of corn over 5-week treatment periods. For example, during 2001, deer intrusions into the five feeding sites with coyote hair remained below 24 percent of pretreatment levels for the entire 5-week test. In contrast, deer intrusions into the five control feeding sites increased more than twofold from pretreatment levels by

week 5 of the test. It is particularly noteworthy that these levels of repellancy were achieved under late-winter conditions with a high-density (>60 deer/m<sup>2</sup>) population.

Coyote hair might be used as an inexpensive method to help reduce deer activity on small airports that cannot afford deer-proof fencing

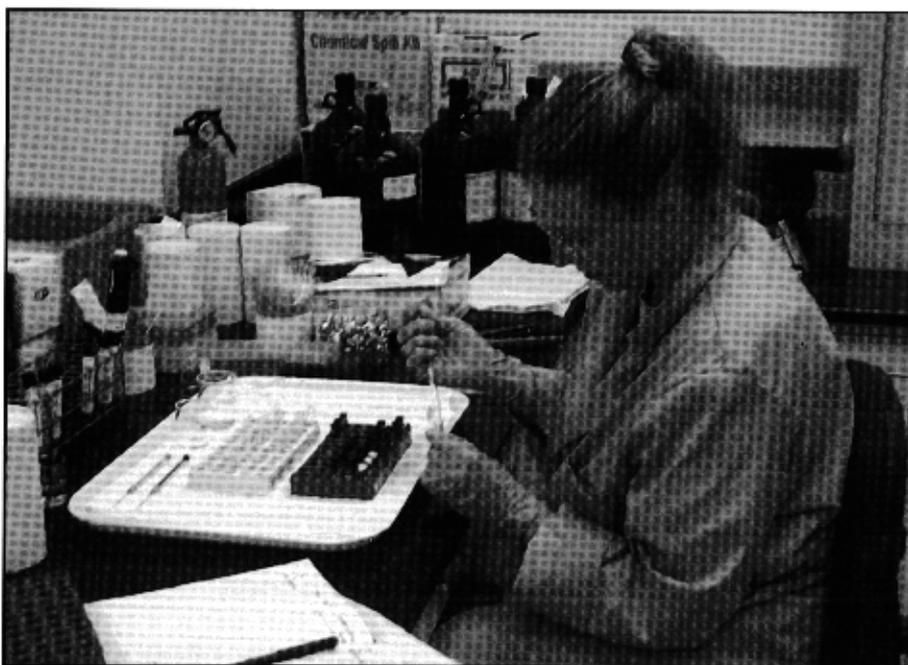
or to minimize deer movements through gates at larger airports. To make this technique more practical for airport use, tests are now planned to isolate the organic chemicals in the hair responsible for repellancy so that a synthetic repellent can be manufactured.

### ***Title: Emerging Technologies To Resolve Human–Wildlife Conflicts: Cell Culture, Repellants, Antisweet and Antinutrient, and Behavioral Methods***

***Goal: Discover new technologies and adapt existing methods for the development of nonlethal methods in the resolution of conflicts between humans and wildlife. Technologies will focus on identifying creative methods to screen repellants and enhance their efficacy to reduce crop depredation by birds. Technologies to be evaluated include cell culture for high through-put screening of candidate repellants, structure-activity relationships of terpenoid repellants, identification of antisweet and antinutrient agents, and behavioral methods to enhance hazing techniques.***

#### **Cell Culture Helps To Understand Mechanisms of Chemical Repellants—**

Previous behavioral work to screen and identify new chemical repellants has required the use of numerous animals. To reduce the number of animals required in the repellent discovery process, NWRC scientists in collaboration with scientists from private industry have perfected a cell-culture repellent-screening method for mammal and avian models (rat and chicken). Scientists are able to isolate and maintain trigeminal ganglion cells for use in tests to evaluate the repellent potential of chemicals. Five animals can yield approximately 3,000 usable cells, vastly expanding the capacity to conduct experiments without having to use a large number of animals during the discovery process. Scientists can now monitor cellular activity of up to 50 cells simultaneously. The cell-culture method also allows more precise characterization of the mediating mechanisms behind repellancy, and that improved characterization will ultimately lead to the design of more efficient and potent repellants.



In particular, NWRC and Monell scientists can now efficiently address the issues of whether laboratory models are good surrogates for wildlife species and explore the taxonomic

differences in how animals detect various repellants. This information will facilitate the design of target specific repellants.

***Title: Waterfowl as Disease, Parasite, and Noxious Weed Reservoirs in Urban and Agricultural Landscapes***

***Goal: Understand and develop management recommendations related to the contribution and impact of Canada geese as vectors for disease, parasites, and noxious weeds on human health and safety in urban landscapes and on animal health in agricultural landscapes.***

During 2000, fecal samples from Canada geese were collected throughout the year from a number of sites in Fort Collins, CO. This was the first study to exhaustively characterize the prevalence of *Escherichia coli* serogroups in any wildlife species. The overall prevalence for *E. coli* ranged from 2 percent during the coldest time of the year to 94 percent during the warmest months of the year. During March through July, when nonmigratory geese dominated the local goose population, the prevalence of enterotoxigenic (ETEC) forms of *E. coli* was 13.0 percent. During the same period, the prevalence of enterohemorrhagic (EHEC) forms was 6.0 percent, while prevalences for enteroinvasive (EIEC) and

enteroagglomerative (EAEC) forms were 4.6 and 1.3 percent, respectively. All samples positive for *E. coli* were examined for genes coding for virulence factors, including: SLT-I, SLT-II, eae, hly-A, K1, LT, STa, STb, CNF1, and CNF2. Three isolates were positive for human virulence factors, representing a 2-percent prevalence for feces containing potential human toxins. Genes for STb were isolated from ETEC strains O-8 and O-167, while the gene for K1 was isolated from an O-8 (ETEC) serogroup. These data will prove useful in focusing attention on the risks that increasing populations of urban Canada geese may pose to public health.