Wildlife Services

Protecting People
Protecting Agriculture
Protecting Wildlife

National Wildlife Research Center

FY 2012

Avian and Invasive Species Population Management

Contact Information:
Dr. Michael Avery
Supervisory Research Wildlife Biologist
Florida Field Station
2820 East University Avenue
Gainesville, FL 32641
Phone: (352) 375-2229
FAX: (352) 377-5559
michael.l.avery@aphis.usda.gov
www.aphis.usda.gov/wildlife_damage/nwrc/

Major Cooperators

- Florida Power and Light Company
- Innolytics, LLC
- National Park Service
- U.S. Navy
- U.S. Geological Survey
- U.S. Fish and Wildlife Service

Groups Affected By These Problems

- Airports
- Airlines
- Air travelers
- Homeowners
- Business owners
- City managers
- Military installations
- Electric utility companies
- Broadcast and communication tower owners and operators

National Wildlife Research Center Scientists Address Problems Associated with Invasive Species and Overabundant Bird Populations

Wildlife Services' (WS) National Wildlife Research Center (NWRC) is the only Federal research organization devoted exclusively to resolving conflicts between people and wildlife through the development of effective, selective, and socially responsible methods, tools, and techniques.Scientists at NWRC's field station in Gainesville, Florida, conduct research to resolve problems caused by invasive species, such as Burmese pythons and monk parakeets, and overabundant native bird species, such as vultures and crows. This research facility is a uniquely designed 26-acre site with large outdoor test pens and aviaries which allow research to be conducted under natural environmental conditions. As land-use patterns change and urban populations surge into previously uninhabited areas, wildlife conflicts, inevitably, increase. Of growing concern are problems associated with some abundant native bird species that have shown the capacity to readily adapt to residential settings. Additionally, populations of invasive or non-native species, such as feral pigeons, monk parakeets, Burmese pythons, and Nile monitors, continue to grow with increasing detrimental impacts to native ecosystems and human health and safety.

Applying Science & Expertise to Wildlife Challenges

Detection of Invasive Reptiles Using Environmental DNA—Molecular methods involving water-borne environmental DNA (eDNA) have proved useful for detecting various vertebrates. The Burmese python has quickly become the highest profile invasive reptile of the many established in Florida. The species has been breeding in the wild in extreme south Florida for over a quarter-century. In conducting control programs and assessing eradication efforts, methods to detect the presence of this invasive species in the environment would be of great value. To that end and given the species' affinity for water, NWRC researchers evaluated the use of eDNA to detect the presence of Burmese pythons. Using species-specific primers developed for this purpose, researchers demonstrated, for the first time, that reptile DNA can be detected in a water source and quantified the rate of degradation of the eDNA. Utilization of eDNA enables the detection and monitoring of this elusive species at reduced costs. The method may also be modified and used to detect other invasive reptilian species in natural water sources.

Monitoring Vulture Movements with Satellite Telemetry—Many wildlife management efforts require researchers to assess the location and movements of animals. NWRC researchers used Satellite Global Positioning System-Platform Transmitter Terminal (GPS-PTT) transmitters attached to vultures with a backpack harness to gather hourly data on the birds' altitude, speed, and heading in addition to position (latitude and longitude). These data were used to model the birds' movement patterns in relation to aircraft operations at the Marine Corps Air Station (MCAS) in Beaufort, SC. The 2-year study involved 22 vultures equipped with GPS-PTT transmitters and revealed that greater than 60 percent of vulture flight activity occurred from 4 to 9 hours after sunrise at altitudes below 200 meters. Black vultures consistently spent less time in flight (8.4 percent) than did turkey vultures (18.9 percent), and black vultures flew at higher altitudes than did turkey vultures in all seasons except summer when altitudinal distributions did not differ. NWRC researchers combined altitude of in-flight locations of vultures with three-dimensional flight patterns of aircraft to visualize where vulture-aircraft interactions were most likely to occur. This provides a novel method for airfield managers to assess bird-strike risk and to focus corrective actions. Continuation of aggressive harassment coupled with flexible training schedules to avoid times and altitudes of high vulture activity will decrease hazards to aircraft posed by these birds. Recently, the research approach developed for MCAS-Beaufort has been expanded to investigate vulture behavior and movements at Kennedy Space Center, Eglin Air Force Base, and Key West Naval Air Station in Florida.

United States Department of Agriculture
Animal and Plant Health Inspection Service

New Tools for Controlling Invasive Reptiles—Reducing populations of invasive snakes and lizards requires a variety of management tools. For instance, to improve the trapping efficiency of large constrictor snakes in Florida, NWRC researchers developed a live trap specifically designed to reduce the capture of non-target species. The trap is constructed of cage wire which allows small rodents and snakes to pass through the mesh. The trap is configured with two widely spaced adjustable weight-sensing levers. Each has an independent release mechanism and both must be depressed at the same time to spring the trap. Thus, only long, heavy snakes such as boas and pythons will spring the trap.

NWRC researchers also screened toxicants for use in the management of the invasive black spiny-tailed iguana. Of the compounds tested, zinc phosphide produced 100 percent mortality at dose levels as little as 25 milligrams per lizard. This is equivalent to about 0.5 percent zinc phosphide in bait, a rate lower than currently used in commercial rodenticide baits. Researchers conclude that zinc phosphide has potential as a useful tool for reducing populations of invasive lizards, such as the black spiny-tailed iguana, provided species-specific delivery methods are developed.

Quantifying Feral Swine Impacts to Archaeological Resources—Feral swine are well known as environmentally destructive invasive animals in many areas around the world where they degrade native habitats, harm rare plant and animal species, damage agricultural interests, and spread disease. NWRC scientists and colleagues are the first to quantify the potential for feral swine to disturb and destroy archaeological sites. The study was conducted in south-central Florida at Avon Park Air Force Range, a base comprising over 98,800 acres/40,000 hectares and containing many archaeological sites. Forty-two percent of the sites studied showed some level of swine disturbance, including 47 percent of the sites known to have artifacts within 8 inches/20 centimeters of the surface (well within swine rooting depths). Sites with shallow artifact depositions appeared highly vulnerable to disturbance by feral swine, threatening the historical origin, composition, arrangement, and location of the objects. The findings will aid land and resource managers in their efforts to protect archaeological resources from feral swine damage.

Management of Invasive Bird Species—Invasive bird species management often involves a combination of nonlethal and lethal methods for reducing populations. Monk parakeets are an invasive species in Florida and several other States. They construct large stick nests in electric utility substations and power poles thereby causing power outages and increasing maintenance costs. In cooperation with Florida Power and Light Company, NWRC researchers developed an effective oral contraceptive called Diazacon for use with monk parakeets. Prior to submitting the necessary data to the U.S. Environmental Protection Agency (EPA) for registration of Diazacon, NWRC researchers analyzed the potential impacts of the contraceptive to non-target species, specifically bird-eating raptors that might feed on parakeets that had ingested Diazacon-treated bait. The analysis showed that a raptor would have to eat 50 monk parakeets daily (an impossible task) before it would be rendered temporarily infertile due to Diazacon residues in its prey. These findings enhance the likelihood of registration for Diazacon as an avian contraceptive.

Another invasive bird species of interest is the common mynah. Mynahs damage crops, create nuisance problems, and threaten native bird species in many countries. Mynahs were introduced in American Samoa in the 1980s. Since their introduction, they have become the most frequently observed avifauna in developed areas in the country. While the actual threat to ecological systems is currently unknown, the American Samoa Department of Marine and Wildlife Resources is concerned that expanding myna populations will exert competitive pressures on native species, such as the Samoan starling and white-collared kingfisher. Additionally, the mynahs are increasingly becoming social nuisances through nesting, foraging and vocalization behaviors. The government and general population of American Samoa would like to eradicate these birds before populations are too large to control. In collaboration with officials in American Samoa, NWRC scientists evaluated the toxicity of the registered pesticide DRC-1339 as a potential tool for mynah management. NWRC researchers determined the acute oral LD_{50} (the dose needed to kill 50 percent of a sample population) for common mynahs were 1.19 milligrams of DRC-1339 per kilogram of body weight. According to the EPA's classification, DRC-1339 would be classified as "very highly toxic" to common mynahs on an acute oral basis. In a second trial, NWRC scientists demonstrated the efficacy of lethal bait (cooked white rice treated with DRC-1339) to captive mynahs. Based on the findings from these trials, plans are underway to conduct a field efficacy study in support of registering DRC-1339 for use in America Samoa.

Development of Population Monitoring Methods—The ability to monitor wildlife populations helps managers to optimize and assess various management activities. The passive tracking index methodology is one monitoring technique developed by NWRC researchers that is being used to monitor feral swine populations in conjunction with control activities. A benefit of this methodology is its ability to simultaneously monitor co-occurring species, such as coyotes and deer. NWRC researchers are currently developing monitoring procedures for large invasive lizards in Florida to aid in the eradication and control of these species.

Selected Publications:

AVERY, M. L., J. D. EISEMANN, K. L. KEACHER, AND P. J. SAVARIE. 2011. Acetaminophen and zinc phosphide for lethal management of invasive lizards Ctenosaura similis. Current Zoology 57:625-629.

AVERY, M. L., J. S. HUMPHREY, T. S. DAUGHTERY, J. W. FISCHER, M. P. MILLESON, E. A. TILLMAN, W. E. BRUCE, AND W. D. WALTER. 2011. Vulture flight behavior and implications for aircraft safety. Journal of Wildlife Management 75:1581-1587.

AVERY, M. L., E. A. TILLMAN, K. L. KEACHER, J. E. ARNETT, AND K. J. LUNDY. 2012. Biology of invasive monk parakeets in south Florida. Wilson Journal of Ornithology 124:581-588.

ENGEMAN, R. M., C. BETSILL, AND T. RAY. 2011. Making contact: rooting out the potential for exposure of commercial production swine facilities to feral swine in North Carolina. EcoHealth 8:76-81.

ENGEMAN, R. M., K. J. COUTURIER, R. K. FELIX, JR., AND M. L. AVERY. 2012. Feral swine disturbance at important archaeological sites. Environmental Science and Pollution Research. On-line DOI 10.1007/s11356-012-1367-1.

ENGEMAN, R. M., E. JACOBSON, M. L. AVERY, AND W. E. MESHAKA JR. 2011. The aggressive invasion of exotic reptiles in Florida with a focus on prominent species: a review. Current Zoology 57:599-612.

JACOBSON, E. R., D. G. BARKER, T. M., MAULDIN, R. AVERY, M. L., ENGEMAN, R. AND S. SECOR. 2012. Environmental temperatures, physiology and behavior limit the range expansion of invasive Burmese pythons in southeastern USA. Integrative Zoology 7:271-285.

SAVARIE, P. J., R. M. ENGEMAN, R. E. MAULDIN, T. MATHIES, AND K. L. TOPE. 2011. Tools for managing invasions: acceptance of non-toxic baits by juvenile Nile monitor lizards and Burmese pythons under laboratory conditions. International Journal of Pest Management 57:309-314.

WALTER, W. D., J. W. FISCHER, J. S. HUMPHREY, T. S. DAUGHTERY, M. P. MILLESON, E. A. TILLMAN, AND M. L. AVERY. 2012. Using three-dimensional flight patterns at airfields to identify hotspots for avian-aircraft collisions. Applied Geography 35:53-59.

Major Research Accomplishments:

- WS collected and analyzed unique information on black and turkey vulture movements, flight altitudes, and activity patterns and developed models to assist Marine Corps Air Station-Beaufort, South Carolina, in reducing risks of bird-aircraft collisions.

- WS developed an innovative method for detecting environmental DNA of invasive Burmese pythons in water so that the presence of these secretive reptiles can be verified. This new technology will enable managers to rapidly survey large areas of habitat and assist in operational control programs to remove these invasive reptiles.

- WS collaborated on a review and analysis of physiological requirements and behavior of invasive Burmese pythons to assess the potential invasive range of the species. Results indicate there is minimal chance of Burmese pythons establishing viable populations beyond their current range in the subtropical environment of south Florida.

- WS documented impacts of feral swine rooting activity on important archaeological resources in south-central Florida. This represents the first published quantified description of such impacts by feral swine.