Wildlife Services

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National Wildlife Research Center

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Methods Development and Population Management of Vultures and Invasive Wildlife

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Groups Affected:

- Air travelers
- Airlines
- Airports
- Archaeological site managers
- Broadcast and communication tower owners and operators
- Business owners
- City managers
- Electric utility companies
- Endangered species conservationists and managers
- Health authorities
- Homeowners
- Military installations
- Natural resource managers
- Tourists
- Water managers (management districts)
- Wildlife managers

Major Cooperators:

- Biosecurity Queensland/Department of Primary Industries
- Florida Department of Environmental Protection (or state parks)
- Florida Fish and Wildlife Conservation Commission
- National Park Service
- University of California-Davis
- University of Colorado School of Public Health
- University of Florida
- University of Southern Queensland
- U.S. Air Force
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- U.S. Navy
- Wildlife Services Operations

National Wildlife Research Center Scientists Address Problems Associated with Invasive and Overabundant Wildlife 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 with NWRC's field station in Gainesville, Florida, conduct research to resolve problems caused by invasive species and overabundant native species. This 26-acre research facility includes large outdoor test pens and aviaries which allow research to be conducted under natural environmental conditions.

As land-use patterns change and people move into previously uninhabited areas, wildlife conflicts, inevitably, increase. Of growing concern are problems associated with some abundant native bird species, such as vultures, gulls and crows, which readily adapt to urban and suburban settings. Additionally, populations of invasive or non-native species, such as feral pigeons, monk parakeets, Burmese pythons, feral swine and Argentine tegu lizards, continue to grow with harmful impacts to native ecosystems and human health and safety.

Applying Science & Expertise to Wildlife Challenges

Feral Swine Impacts to Rangelands. — Grazing lands in central Florida are a mosaic of sown pastures, native grasslands, wetlands, and woodlands that offer a variety of important ecosystem services. Feral swine damage to these areas negatively impacts economic productivity and biodiversity. In a recent study, NWRC and University of Florida researchers looked at the specific impacts of feral swine damage in pastures and grasslands. They found that feral swine rooting in native grassland pastures reduced the number of plant species, while rooting in sown pastures increased the number of plant species. In both sown pastures and native grasslands, swine rooting altered plant communities and reduced agricultural productivity. Forage grasses were mainly associated with unrooted areas, whereas low-quality forage or nuisance species dominated rooted areas. The researchers estimated that more than 300,000 hectares (about 741,000 acres) of pasture and forage are lost to feral swine rooting in central Florida each year, amounting to a $2 million loss in cattle production. More stringent programs to manage feral swine populations could minimize the negative impact of their rooting on valuable grazing lands.

Protecting Endangered Sea Turtle Nests From Predation. — On Florida's Keewaydin Island, raccoon and feral swine predation poses major threats to sea turtle nests. Using 6 years of nesting data for endangered sea turtles, NWRC researchers partnered with WS Operations and the Conservancy of South Florida to study the impacts of feral swine and raccoon predation on nests. Researchers also examined the benefits of eradicating feral swine from the island and caging sea turtle nests to protect them from predation. Swine began preying on nests midway through the 2007 nesting season and destroyed all sea turtle nests on the island. The swine were later eradicated before the 2008 nesting season. Eradication costs totaled $14,020, while the value of the hatchlings lost to swine predation in 2007 was 27 times higher at $379,100. When studying the benefits of caging sea turtle nests, researchers found that from 2005 to 2010, raccoon predation rates for caged nests were significantly lower than for uncaged nests every year except 2009, when little raccoon predation occurred. For feral swine, caging did not prevent predation, but caged nests remained intact almost 12 days longer than uncaged nests. In short, eggs in caged nests have a greater chance of hatching before feral swine eat them. Researchers note the use of cages and other barriers as well as the removal of predators are effective strategies for protecting not only sea turtle eggs, but also other threatened and endangered plants and animals.

Evaluation of Invasive Reptile Management and Research. — Invasive or non-native reptiles and amphibians have been in Florida for over 135 years, and their populations have increased quickly in the last half century. Exotic snakes, lizards, frogs, turtles, and crocodilians are all breeding in Florida. NWRC researchers led a team of scientists and managers to identify the invasive reptile species with

the greatest ecological threats to Florida and find out the most useful ways to reduce their damage. They evaluated 37 invasive reptile species and scored them based on their impacts to endangered or threatened species, eradication potential, stage of invasion (localized versus widespread), and adaptability. Results showed seven species with the highest potential for negative impact: Argentine giant tegu lizard, Burmese python, Nile monitor lizard, North African python, spectacled caiman, black spiny-tailed iguana, and yellow anaconda. Next, the team looked at vulnerabilities in each species that might be exploited for control purposes and the overall potential for successful management. They recommended the Nile monitor, black spiny-tailed iguana, and Argentine giant tegu for further research on management methods. Developing new tools for these species, along with practical management programs, have the highest probability of success in some areas.

Role of Genetic Diversity on Monk Parakeets' Successful Invasion. — Invasive species cause millions of dollars in damages every year. Identifying characteristics that make a species a successful invader may help to prevent its spread. Several studies have investigated the impact of genetic diversity on species' abilities to establish themselves in new environments. It is thought that a more genetically diverse founder population is more likely to include individuals with traits that are better suited to the new environment, making it more successful. To examine this concept, NWRC and university scientists, as well as experts from Australia, Canada, and Spain, compared genetic data collected from native monk parakeet populations in South America with data from invasive populations in the United States, Europe, and Africa. Results showed that genetic diversity varied among the invasive populations and was overall lower than in the native populations. The low genetic diversity observed in invader populations does not support the hypothesis that high genetic variation inherently favors biological invasion or that invasion is favored by the combining or mixing of genetic variation from multiple source populations. In the case of invasive monk parakeets, other traits like their ability to build their own nests instead of relying on cavities for breeding, their tolerance of human disturbances, and their flexible and diverse diets may be responsible for their success.

Indexing Abundance of Voles in Artichoke Fields. — NWRC researchers compared two types of materials—nontoxic, grain-based wax bait blocks and artichoke bracts (modified fleshy leaves)—to see their effectiveness as chewing mediums to record vole presence and index their populations. Researchers also compared presence-absence observations of chewing on bait blocks to the total percent chewed, as well as three sizes of observation grids (4x4, 5x5, or 6x6 meters), to see which recording methods best tracked population abundance. After intense trapping, they determined the actual number of voles in the area to better assess the different methods. Results showed that bait blocks were better than artichoke bracts and continuous measuring was better than presence-absence observations for accurately determining vole abundance. All three grid sizes worked well to track the number of known voles; however, researchers caution that the largest grid size may be best if vole abundance is unknown or low.

Documenting Feral Swine Impacts to Archeological Resources. — Feral swine damage native plants and animals, agriculture, infrastructure, and spread diseases. Another important, but lesser known impact, is their disturbance to archaeological sites. Of the 293 archaeological sites in Florida inspected by NWRC researchers and collaborators over a six year period, 42 percent had experienced swine disturbance. The areas of disturbance mapped within three historic homestead sites showed 5 to 26 percent of the total site surface area had been rooted. Artifacts were located at depths of less than 10 cm and less than 20 cm at 85 percent and 90 percent of the sites, respectively. Feral swine rooting commonly exceeds 20 cm in depth, making the great majority of the sites vulnerable to artifact damage or displacement.

Selected Publications:

Bankovich, B., E. Boughton, R.Boughton, M.L. Avery, and S.M. Wisely. 2016. Plant community shifts caused by feral swine rooting devalue Florida rangeland. Agriculture, Ecosystems and Environment 220:45-54. doi: 10.1016/jagee.2015.12.027.

Edelaar, P., S. Roques, E.A. Hobson, A. Goncalves da Silva, M.L. Avery, M.A. Russello, J.C. Senar, T.F. Wright, M. Carrete, and J.L. Tella. 2015. Shared genetic diversity across the global invasive range of the monk parakeet suggests a common restricted geographic origin and the possibility of convergent selection. Molecular Ecology 24:2164-2176. doi: 10.1111/mec.13157.

Engeman, R.M. and M.L. Avery. 2016. Prioritizing management and research actions against invasive reptiles in Florida: A collaboration by an expert panel. Herp Alliance and USDA/WS/National Wildlife Research Center, Fort Collins, CO.

Engeman, R.M., R.A. Baldwin, and D.I. Stetson. 2016. Guiding the management of an agricultural pest: Indexing abundance of California meadow voles in artichoke fields. Crop Protection 88: 53-57. doi: 10.1016/j.cropro.2016.05.013.

Engeman, R.M., D. Addison, and J.C. Griffin. 2016. Defending against disparate marine turtle nest predators: nesting success benefits from eradicating invasive feral swine and caging nests from raccoons. Oryx 50(2):289-295. doi: 10.1017/S0030605324000805.

Engeman, R. M., J. S. Meyer, and J. B. Allen. 2017. Prevalence of feral swine disturbance at important archaeological sites over a large landscape in Florida. Scientific Reports 7, 40287. DOI: 10.1038/srep40287

Major Research Accomplishments:

- WS research estimated that more than 300,000 hectares (about 741,000 acres) of pasture and forage are lost to feral swine rooting in central Florida each year, amounting to a $2 million loss in cattle production.

- WS research found the use of cages and barriers, as well as the removal of feral swine and raccoons, are effective strategies for protecting endangered sea turtle eggs.

- WS evaluated 37 invasive reptile species in Florida and identified seven species with the highest potential for negative impact: Argentine giant tegu lizard, Burmese python, Nile monitor lizard, North African python, spectacled caiman, black spiny-tailed iguana, and yellow anaconda.

- WS analysis of invasive monk parakeet genetics showed that invasive populations had lower genetic diversity than native populations.

- WS experts determined bait blocks were better than artichoke bracts, and continuous measuring was better than presence-absence observations, for determining vole abundance.

- WS research documented extensie impactst to archaeological resources from feral swine rooting.