Wildlife Services

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National Wildlife Research Center

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Surveillance Strategies/ Management Tools to Control Pseudorabies and Other Wildlife Diseases that Affect Humans and Livestock

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Major Cooperators

- Caesar Kleberg Wildlife Research Institute
- Genesis Laboratories, Inc.
- King Ranch, Inc.
- Texas A&M University-Kingsville
- Texas Animal Health Commission
- Texas Parks and Wildlife Department
- USDA/Agricultural Research Service
- USDA/APHIS/Veterinary Services
- USDA/APHIS/Wildlife Services
- Welder Wildlife Foundation

Groups Affected By These Problems

- Wildlife and natural resource managers
- U.S. citizens and landowners
- Livestock producers and farmers
- Sporting organizations
- Consumers
- Meat processors

NWRC Scientists Provide Basic Ecological Information to Develop Management Tools to Control Pseudorabies in Feral Swine, and Management of Other Wildlife Diseases that Affect Livestock and Humans

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 acceptable methods, tools, and techniques.

As increased urbanization leads to a loss of traditional wildlife habitat, the potential for conflicts between people and wildlife increases. Such conflicts can take many forms, but recently the potential for the transmission of diseases among wildlife, livestock, and humans has received greater attention.

The high reproductive rate and adaptability of the feral swine has resulted in populations that have dramatically increased in size and distribution. This invasive animal now occurs across the United States, where it causes a range of agricultural and environmental damage through depredation, rooting, and wallowing activities. Furthermore, feral swine compete with native wildlife and livestock for habitats, are carriers of exotic and endemic diseases, and transmit parasites to livestock and humans.

One disease of particular concern to the commercial swine industry is the pseudorabies virus, an infectious, often acute, herpesviral disease that infects the nervous system of livestock and wildlife. The disease poses a potential hazard to humans and a major hazard to the swine industry. Adult swine that recover from pseudorabies can develop latent infections and shed the virus indefinitely. Complicating eradication efforts, feral swine have been found seropositive for pseudorabies in 11 states where they are believed to be a free-ranging reservoir for the disease.

Applying Science & Expertise to Wildlife Challenges

Feral Swine Exposure to Selected Pathogens in southern Texas—The pork industry spends millions of dollars each year to prevent and eradicate diseases from domestic swine. Many of these diseases are also present in feral swine populations. NWRC scientists conduct studies to determine the magnitude of disease prevalence in feral swine populations and ascertain whether feral swine pose a threat to domestic swine. Blood samples were obtained from 409 feral hswine in Texas to determine the prevalence of selected pathogens. Exposure rates were 35% for pseudorabies, 1% for brucellosis, and 1% for porcine reproductive and respiratory syndrome. Scientists believe simple modifications to enclosures may provide adequate biosecurity and prevent exposure of domestic swine in this region.

Distribution and Disease Prevalence of Feral Swine in Missouri—NWRC scientists determined the current distribution of feral swine in Missouri, as well as the prevalence and distribution of feral swine with antibodies against pseudorabies, swine brucellosis, tularemia, and classical swine fever. Feral swine sighting data from the public, Missouri Wildlife Services, and Missouri Department of Conservation wildlife biologists was collected and used to determine the distribution of feral swine in the state. From 2000–2005, a total of 115 swine sightings occurred statewide. Scientists also evaluated 321 feral swine blood samples for antibody presence from 1993–2005. Antibodies against pseudorabies and classical swine fever were not detected; however, one feral swine had antibodies against swine brucellosis (0.3% prevalence) and one feral swine had antibodies against tularemia (1.3% prevalence). Information from this and other disease surveillance is being used to help eliminate certain diseases before they become established in feral swine populations in Missouri.

Tetracycline as a Biological Marker for Feral Swine—Tetracycline hydrochloride (THC) is an ingestible antibiotic that produces a fluorescent mark on growing bone. NWRC scientists are investigating its usefulness as a biological marker for feral swine. Study results showed feral swine will consume THC when combined with palatable baits, more than 150 mg THC is necessary for adequate marking, and marks can be identified in teeth 7 days or less after ingestion. THC may be a useful tool for mark-recapture analysis, evaluation of large-scale feral swine movements, and determining the uptake of pharmaceuticals by feral swine.

Evaluation of Population Estimation Techniques—Population indices and density estimates are often used to measure the effectiveness of wildlife management actions. NWRC scientists evaluated the effectiveness of the following techniques for estimating the population and density of free-ranging feral swine populations: 1) a mark-recapture technique using THC; 2) traditional aerial surveys and spotlight surveys; and 3) motion sensitive cameras for passive (PTI) and active tracking indices (ATI). Two feral swine populations in Texas were estimated both prior to and immediately following lethal removal. In southern Texas, scientists estimated a reduction in feral swine populations of 44% for mark-recapture, 75% for spotlight surveys, 92% for the PTI, and 39% for ATI. In central Texas, scientists estimated a reduction of 35% for the mark-recapture. No feral swine were detected pre- or post-removal for the PTI; however, scientists did detect a 100% reduction in feral swine populations for the ATI. The THC was a suitable biomarker for mark-recapture analysis of feral swine. Traditional spotlight survey and aerial survey estimates appeared biased for feral swine populations. However, motion sensitive cameras showed promise in monitoring lethal control of feral swine.

Feral Swine Baits and Attractants—Few data exist regarding suitable feral swine attractants. To better understand feral swine and other mammalian species visitation and removal rates of fish- and vegetable-flavored baits, NWRC scientists conducted several field trials in Texas. Results showed cumulative bait removal rates after four nights ranged from 93–98%. Feral swine, raccoons, and collared peccaries showed similar removal rates. Coyotes removed more fish-flavored baits and white-tailed deer removed more vegetable-flavored baits than expected. Scientists conclude that feral swine are attracted to and readily consume baits; however, given the number of other species also attracted to the baits the development of a baiting system specific for feral swine will be more difficult.

In a follow-up study, scientists compared visitation and contact rates of mammals to 11 candidate feral swine attractants at scent stations using motion-sensing digital photography. Feral swine had greater visitation rates to apple and strawberry stations than to control stations. WS recommends managers consider using strawberry attractants for applications specific to feral swine. If, however, a less specific attractant is needed, then apple, berry, or caramel attractants may perform well.

Effectiveness of Localized Removal Events to Control Feral Swine Populations—Feral swine are one of the most aggressive and dangerous invasive species due to their impact to native plants and animals, damage to agriculture, and potential disease risks. Traditional control methods for feral swine include hunting, aerial shooting, poisoning, trapping, and fencing. To assess the effectiveness of localized removal events involving trapping and aerial shooting, NWRC scientists looked at the genetic makeup of feral swine populations before and after removal. Results showed that swine before and after removal events were genetically similar. This suggests that localized control methods have a minimal effect in controlling feral swine populations in southern Texas. The findings emphasize the need for more understanding of how landscape features facilitate feral swine movement and recolonization of available habitats.

Phylogeny of Feral Swine—Feral swine are widespread throughout the world as a result of human introductions. The large feral populations in the United States are thought to be a mixture of domestic swine, Eurasian wild boar, and the hybrids of these two forms. However, no detailed studies have evaluated the ancestry or relative contribution of domestic vs. "wild" swine to the current population of feral swine in the United States. NWRC scientists analyzed the phylogeny of feral swine in the continental United States, as well as Hawaii and Puerto Rico where feral swine have been isolated for several centuries and may represent the original founders from Spanish and other colonists. Muscle tissue was collected from 38 trapped or harvested swine and DNA analyzed. The DNA was compared with the sequences of domestic, feral, and wild swine archived at the National Center for Biotechnology Information (NCBI) database (http://www.ncbi.nlm. nih.gov/). The phylogenetic analysis revealed 4 major groups of swine. Southern Texas feral swine were most similar to domestic pigs and feral swine from Texas and elsewhere, with the exception of a wild boar from Spain. The results suggest that most South Texas feral swine probably descended from domestics that were released or escaped into the wild. The similarity to Spanish wild boar is intriguing and may suggest descendants of early releases.

Seasonal Home Ranges and Fidelity of Adult White-tailed Deer—Models predict that home range sizes of young (1 and 2 years old) and mature (5 and 6 years old) male white-tailed deer will be greater than middle-aged (3 and 4 years old) deer and that home range fidelity of young and mature deer will be less than middle-aged deer. NWRC scientists tested the predictions of these models by collecting home range sizes and fidelity of 96 radio-collared white-tailed adult male deer in southern Texas. Results showed annual home range sizes did not differ among age categories. Deer maintained smaller home ranges during spring than during other seasons, and old deer (≥7 years old) displayed smaller seasonal home ranges than young or mature deer. Deer exhibited greater home range fidelity during summer than during spring, prerut, and rut seasons. Researchers found limited evidence supporting the model predictions. The high annual home range fidelity observed suggests little shifting between years; however, annual home range sizes exceed the acreage of most private landholdings, which should be considered when formulating management and disease surveillance plans.

Survival and Movements of Translocated Deer— Managers commonly translocate white-tailed deer in south Texas, yet the effectiveness of this technique at enhancing deer populations is undocumented. NWRC researchers evaluated survival, movements, and body condition of 51 white-tailed deer from two translocations into a partially fenced property (2,000 ha) and an unfenced property (4,000 ha) in south Texas. Annual survival was lower in the partially fenced property (59%) compared to the unfenced property (74%), although more deer left the unfenced property (60%) than the partially fenced property (15%). Cumulatively, 39% of all deer survived and remained on the release area. Young (1.5-3.5 years old) translocated males had below average antler gain, body condition scores and rump fat measurements compared to native males. Results of this study help managers evaluate the effectiveness of translocations as a management tool.

Selected Publications:

Campbell, T.A., R.W. DeYoung, E.M. Wehland, L.I. Grassman, D.B. Long, and J. Delgado-Acevedo. 2008. Feral swine exposure to selected viral and bacterial pathogens in southern Texas. Journal of Swine Health and Production 16:312-315.

Campbell, T.A., and D.B. Long. 2008. Mammalian visitation to candidate feral swine attractants. Journal of Wildlife Management 72:305–309.

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

Hartin, R.E., M.R. Ryan, and T.A. Campbell. 2007. Distribution and disease prevalence of feral swine in Missouri. Human-Wildlife Conflicts 1:186–191.

Hellickson, M.W., T.A. Campbell, K.V. Miller, R.L. Marchinton, and C.A. DeYoung. 2008. Seasonal ranges and fidelity of adult male white-tailed deer in southern Texas. Southwestern Naturalist 53:1–8.

Reidy, M.M., T.A. Campbell, and D.G. Hewitt. 2008. Evaluation of electric fencing to inhibit feral swine movements. Journal of Wildlife Management 72:1012–1018.

Major Research Accomplishments:

- WS developed surveillance strategies that evaluated the potential or actual risk that pseudorabies and other diseases in feral swine pose to Texas livestock.
- WS developed baiting strategies for delivery of pharmaceuticals to control wildlife diseases, including pseudorabies.
- WS developed physical methods to minimize the transmission of pseudorabies and other diseases between livestock and wildlife.
- WS developed surveillance strategies to evaluate the risks of other wildlife diseases important to humans and livestock.
- WS tested model predictions of home range size and fidelity by white-tailed deer.
- WS studied the survival and movements of translocated white-tailed deer.