MISSOURI'S FERAL HOG TASK FORCE: ADDRESSING INCREASING FERAL SWINE POPULATIONS

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Abstract: Feral hog (*Sus scrofa*) populations are expanding in size and distribution in Missouri and other parts of the United States. Increases of this invasive species are a serious concern because of the damage they cause and diseases they carry. Affected stakeholders in Missouri formed a task force in 1998 with sixteen member agencies and organizations to develop a program for the control/eradication of feral hogs in the state. The task force identified three objectives with appropriate supporting strategies to help achieve the ultimate goal: protection of Missouri's public health, agricultural economy, and natural resources through eradication of feral swine in Missouri. The task force has been an essential vehicle in working toward these objectives during a time when member agencies and organizations are tight on funding. The collaboration has accomplished several tasks that could not have been implemented by any single participant. This paper presents the successes and shortcomings of Missouri's efforts and provides recommendations to other states that may implement feral hog control.

Key words: disease surveillance, education, feral hog distribution, feral hog eradication, feral hog legislation, feral swine, law enforcement, outreach program

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INTRODUCTION

Feral swine (*Sus scrofa*) populations are expanding in size and distribution in Missouri and other parts of the United States. Increases of this invasive species are a serious concern to agricultural producers, livestock health officials, human health professionals, wildlife agencies, private landowners, and conservation organizations. Feral hogs are well known for damaging the environment, destroying crops and pasture, competing with native wildlife, degrading aquatic systems, increasing soil erosion, and spreading diseases to people, livestock, pets and wildlife. Texas state with the largest feral hog population, reports the annual damage to agriculture at $51.8 million (Adams et al. 2005). The total damage caused by feral swine in the United States is estimated to be approximately $800 million annually (Pimentel et al. 2000). This estimate is approximate, and probably conservative, because environmental damage costs attributable to feral swine are not easily quantified nor are the costs of potential disease outbreaks.

Pimentel et al. (1999) thought that there were 4 million feral pigs in the United States, while Muller et al. (2002) estimated in 2000 that 3 million were present in Texas alone. Whereas some of these populations have been present for many years, others are recent establishments (Gibson et al. 1998). In 1988, twenty-three states reported having feral swine populations (SCWDS 1988, Mayer and Brisbin 1991). Invasive swine have continued to expand their range and were present in more than 30 states in 2002

(Bergman et al. 2002) and in 39 states in 2004 (SCWDS 2004). Since the 2004 update, feral swine have also been reported in Iowa (Bill Bunger, Iowa DNR, personal communication), Michigan (Timothy Wilson, APHIS, personal communication), Pennsylvania (Chris Croson, APHIS, personal communication), Maryland (Dan Emanueli, APHIS, personal communication) and New Jersey (Beth Jones, APHIS, personal communciation).

MISSOURI FERAL HOG TASK FORCE MISSION

The mission of the task force is to protect Missouri's public health, agricultural economy, and natural resources by eradicating feral hogs from Missouri. The task force does this by:

1. Implementing control measures to reduce/eradicate feral hog populations and utilizing strategies to minimize additional releases/escapes. The task force reviews population control techniques and recommends the most effective approaches to private landowners and agency personnel. The task force also tests trap designs and related baits and lures for effectiveness.
2. Documenting geographic locations of all sightings, kills and the damages they cause, and monitoring population trends at each location.
3. Obtaining blood samples from hunters and agency personnel for disease testing at the Missouri Department of Agriculture's Diagnostic laboratory in Jefferson City, Missouri.

HISTORY OF FERAL HOGS IN MISSOURI

During the settlement of Missouri, livestock were legally allowed to roam freely and it was the responsibility of landowners, not livestock owners, to fence their properties to exclude hogs and other livestock. State law was changed in 1873, to allow individual counties to decide who was responsible for fences to control livestock. St. Charles County was one of the first to require confinement of hogs, but did not do so until 1884. Other counties gradually followed suit and "free range" ended for the whole state in 1969 (T. Hutton, unpublished report).

Since 1969, there have been feral hogs in a few Missouri Counties, primarily south of Interstate 44. These populations have been sporadically augmented by intentional releases or accidental escapes in those, and other counties. Locations that have had hogs for the least ten years include Mark Twain National Forest (MTNF) in Barry and Stone counties in southwest Missouri and Howell county in south central Missouri.

In the early 1990s, the situation began to change as some people began breeding and promoting European wild boar (*Sus scrofa)* as a form of alternative agriculture and for hunting on controlled-shooting areas. Also in the early 1990s, domestic pork prices plummeted and some hogs were released by their owners to avoid losing money trying to raise them. Hunters also developed a keen interest in hunting hogs from trips to the southern United States where feral hogs are plentiful. Swine are illegally released swine to establish huntable populations closer to home (B. Kohne, MDC, personal communication). Hunters do take a large number of hogs, but generally stop short of eradication due to the difficulty of removing the last few specimens within each discreet subpopulation. Some hunters intentionally leave enough "seed stock" to insure future hunting opportunity.

MISSOURI FERAL HOG TASK FORCE ORGANIZATION

Feral hogs became an issue in Missouri in 1991 when a small population

was detected living in the Irish Wilderness of the Mark Twain National Forest in Oregon County. Hunters harvested a few of the hogs which were positive for pseudorabies. Consequently, the Missouri Department of Agriculture was forced to quarantine that portion of the MTNF. This quarantine cost the MTNF a substantial sum due to the difficulty of eradicating the diseased hog population. As a result, sixteen agencies and organizations interested in livestock health, agricultural productivity and natural resource conservation joined forces to form the Missouri Feral Hog Task Force (Table 1) when feral hog populations developed at other sites in Missouri in the late 1990s.

Table 1. Missouri Feral Hog Task Force Members

State Agencies	Missouri Department of Agriculture
	Missouri Department of Conservation (MDC)
	Missouri Department of Natural Resources
Federal Agencies	U.S. Department of Agriculture, APHIS, Wildlife Services
	U.S. Department of Agriculture, APHIS, Veterinary Services
	U.S. Department of Agriculture, Mark Twain National Forest
	U.S. Department of Interior, Ozark National Scenic Riverways
	U.S. Department of Defense, Ft. Leonard Wood Army Base
	U.S. Department of Defense, Corps of Engineers Wappapello Lake, Truman Lake, Stockton Lake, Clearwater Lake and Bull Shoals Lake (COE)
Private Organizations	Missouri Farm Bureau
	Missouri Conservation Federation
	Missouri Pork Producer's Association
	Missouri Cattlemen's Association
	MFA, Inc.
	Missouri Consulting Forester's Association
Colleges	University of Missouri-Columbia School of Natural Resources

MAJOR ACCOMPLISHMENTS OF MISSOURI'S FERAL HOG TASK FORCE

Update Missouri's Feral Hog Legislation

As in many states, Missouri's "stray livestock" statutes dated from the 1800s and were inadequate to address increasing feral hog populations in the 1990s. In general, the antiquated statutes assumed that livestock owners would be anxious to recover their animals because of their financial value. Consequently, landowners who found stray livestock on their property were required to confine the animals and provide adequate food and water while they attempted to find the livestock owners through law enforcement channels and printed newspaper notices. Since the feral hogs were technically strays, but strays that were damaging property and which no one would claim, they could not be immediately killed according to the 1800 laws.

One of the first efforts of the Task Force was to update those statutes and clarify the status of feral swine by defining a "feral hog", and allowing their timely elimination. The updated Missouri Revised Statutes, Chapter 270.400, defines feral hogs as ..."any swine not conspicuously identified by ear tags or other forms of identification that was born in the wild or lived outside of captivity for a sufficient length of time to be considered wild by nature by hiding from humans or being nocturnal shall be considered feral hogs...Any person may take or kill a feral hog on public land or private land with the

consent of the landowner; except that, during the firearms deer and turkey hunting season the regulation of the Missouri Wildlife Code shall apply."

Funding

The Task Force's activities have been sustained largely by in-kind contributions from task force member organizations. Those organizations recognize the high stakes involved in feral hog control and the necessity of addressing hog populations while they are relatively small and may be controlled. At the same time, task force members successfully petitioned Missouri's congressional delegation for a small federal appropriation that has proven essential in providing traps, bait and technical assistance to private landowners and agency personnel in the control effort. Both the U.S. Forest Service and Missouri Department of Conservation have also made small grants to APHIS-Wildlife Services for concentrated effort on and around wilderness and natural areas.

Public Education and Information

The Task Force recognized the importance of a sustained public education program to raise awareness and to enlist the public's help in reporting feral swine occurrences, eliminating them as quickly as possible and marshalling funds to help control them. This Outreach and Education effort continues and articles have appeared in the Missouri Conservationist, MDC's All Outdoors, Missouri Pork Producer's Magazine, Missouri Farm Bureau's Show Me, Missouri Cattleman, Missouri Conservation Federation's Missouri Wildlife, The Joplin Globe, and St. Louis Post Dispatch, The Kansas City Star, River Hills Traveler, Springfield News-Leader, West Plains Daily Quill, Kirksville Daily Express, Southeast Missourian, Banner Press, Puxico Press, Poplar Bluff Daily American Republican, Neosho Daily News, Chillicothe Constitution-Tribune, St. Joseph News-Press, Columbia Tribune, Nevada Daily Mail, Wayne County Journal Banner, and St. Joseph News-Press. Task Force members have been interviewed for MDC's radio show; by KUMZ, KWOC, KZIM, KJEM, KPWB, the Missouri Farm Net: and by TV station KFUS. (T. Hutton, APHIS, personal communication.).

The Task Force tries to have at least one major article published annually. Most recently, Missouri Farmers Association Today's Farmer published an article titled "Hogs Gone Wild" to alert the public, and especially rural residents, to the problems associated with feral hogs. A popular article, "Do Pigs Have Wings?", also appeared in the November 2004 issue of the Missouri Conservationist. This article has been reprinted as a stand-alone handout and is available for distribution by task force members.

Information on feral hogs is available on the Missouri Department of Conservation, Mark Twain National Forest, Fort Leonard Wood and COE-Wappapello websites and in the Summary of Missouri Hunting and Trapping Regulations. Feral hogs have been featured at booths at the Missouri State and Ozark Empire Fairs, at Missouri Cattlemen's, Missouri Farm Bureau, State FFA, and Soil and Water Conservation District conventions, the Governor's Conference on Agriculture and at APHIS, Wildlife Services booth at the Missouri Natural Resource Conference. In addition, presentations have been given to the United Bowhunters and Conservation Federation's annual meetings, National Wild Turkey Federation Board of Directors, Farm Bureau's Conservation Agriculture Conference, St. Joseph Audubon Chapter, Columbia Area Archery Club, Missouri's Agricultural Leadership of Tomorrow workshop and MDC Wildlife Division's

Training Conference. A special "Feral Hog Workshop" was also held at the 2005 Missouri Natural Resources Conference and a presentation on the Task Force was given at the 2006 Southeast Association of Fish and Wildlife Agencies Conference. The Task Force has also developed a "feral hog board" for display in the Missouri Conservation Department's "Operation Game Thief" trailer that tours county fairs and other public events. Feral hog control workshops have also been held for private landowners and for the COE staff at Truman Reservoir.

Hog information magnets have been distributed to individuals and agencies throughout the state to help gather sighting information. The magnets provide phone numbers of the major agencies within the Task Force. Informational posters have been posted throughout the state at public access areas requesting information on feral hog sightings.

Resolutions in Support of Feral Swine Control

Both Missouri Farm Bureau and the Missouri Conservation Federation passed resolutions calling for the control/eradication of feral hogs from Missouri. In subsequent action, both the Midwest and National Associations of Fish and Wildlife Agencies adopted resolutions urging Congress and the President to place higher priority on, and provide adequate funding for, feral hog control in the United States.

Law Enforcement Subcommittee

Some people who are releasing swine may be unaware of their negative characteristics and will discontinue releases upon learning of the feral hog statutes and associated penalties. Other people are making releases knowing the consequences full-well and disregarding the interests of agriculture, forestry, native wildlife, and their fellow citizens. Obviously, continuing releases make efforts to eradicate hogs more difficult. Capture and prosecution of persons involved in these activities should have a high priority as a deterrent. The passage of "Feral Hog Statutes" in 2002 provided an important tool to address the problem.

The chairman of the Missouri Feral Hog Task Force subsequently created a law enforcement subcommittee to determine ways to prosecute people involved in illegal hog releases. The subcommittee included law enforcement personnel from the Missouri Department of Conservation, Mark Twain National Forest, U.S. Army Corps of Engineers, APHIS, Veterinary Services and Missouri Department of Agriculture. The subcommittee's task was to determine the best approach to enforce state and federal laws on public and private lands. A special "sting" operation was conducted in early 2005 and several people were prosecuted for illegally releasing hogs. Most releases took place on Federal and state lands in hopes of establishing huntable populations. Illegal hog hunting guides on the Mark Twain National Forest were also prosecuted.

Missouri Feral Swine Database

USDA, Wildlife Services personnel developed the Feral Swine Database Submittal Sheets to gather uniform information from agency personnel and the public on each reported hog sighting/removal. The Task Force developed a map via GIS in 2005 to show the locations of all hog sightings for a five year period in relation to land ownership. Most hogs occurred on, or in close proximity to, federal or state managed lands in Missouri.

Regional Working Groups

In areas with sizeable, long-term populations, formation of regional working

groups has facilitated feral hog control at the local level. Two such groups have been organized to date in southeast and southwest Missouri respectively and have cooperated in control efforts on public and private land. Both groups were very active in 2005 and 2006 in removing feral swine in their areas and collecting useable blood samples for disease testing. Two hundred twenty and 306 feral swine that we know of were killed in 2005 and 2006 respectively. Undoubtedly that is just a fraction of the total removed by hunters and private landowners during the same period. Timely, sustained efforts appear to have successfully eliminated feral hog populations at some locations.

Disease Surveillance

Feral swine can carry 30 important viral and bacterial diseases (Davidson and Nettles 1997, Samuel et al. 2001, Williams and Barker 2001) in addition to 37 parasites that affect people, pets, livestock or wildlife (Forrester 1991). *Brucella suis* and the pseudorabies virus are infectious pathogens of immediate economic importance to domestic swine producers and are the focus of national eradication campaigns (Gresham et al. 2002). Missouri's classification as "disease free" could be jeopardized if wild hogs carry either swine brucellosis or pseudorabies and infect commercial and/or transitional herds.

Diseases can be controlled within wild hog populations through constant monitoring and localized eradication when the disease is found. USDA, WS is assisting the state of Missouri in disease testing by providing blood sampling kits for the detection of these diseases to Conservation Agents and hunters throughout the state. These kits include instructions and all necessary equipment to collect the blood samples for submission to the Missouri Department of Agriculture's Diagnostic Lab at no cost to the person submitting it.

Since the pseudorabies-infected feral swine from the Irish Wilderness were eliminated in the early 1990s, feral hog blood samples from Missouri have been relatively disease-free. Four hundred eighty-five feral hog blood samples were submitted from March 1995, through December 2006 for pseudorabies and swine brucellosis testing. Only one hog taken in Cole County during 1999 tested positive for swine brucellosis. This animal was one of a group estimated to total 5 to 6 animals that were eliminated by a combination of public hunting and dedicated shooting within six months of their release. Three feral swine from Benton, Taney and Barry counties have tested positive for tularemia in statewide testing of 147 feral pigs since March 2005.

Missouri has successfully eliminated the infected populations in the Irish Wilderness and Cole County incidents mentioned above. The Task Force also intercepted an illegal hog hunting operation in Dade County before it began operation. In the process, investigators discovered that 12 of the animals were wild-caught swine illegally imported from Florida. Disease testing established that 6 of the 12 Florida pigs were positive for pseudorabies. While all infected swine are believed to have been eliminated in this case, any feral swine that appear in this vicinity will have high priority for elimination and disease testing

MAJOR SHORTCOMING/NEEDS

Most of the recent expansion of Missouri's feral swine population has come from illegal releases by individuals to create sizeable populations for hunting and from accidental escapes from hunting preserves in various parts of the state. To further combat illegal releases and accidental escapes, it is essential to: 1. seek additional statutes/regulations that reduce illegal releases and the likelihood of accidental

escapes; 2. continue efforts to apprehend individuals involved in illegal releases and enforce confinement standards to reduce escapes; and 3. educate county prosecutors and judges to the risks associated with feral swine and seek aggressive prosecution of persons making illegally releases.

While many task force organizations have made major contributions to the control effort and federal appropriations have been essential to the progress to date, Missouri's feral hog populations are increasing in size and distribution and more resources must be devoted to the effort to have a reasonable chance for success. At low population levels, the cost per animal will be high, but eradication costs will pale in comparison to total damage costs from crop destruction and/or major disease outbreaks if these populations are not eliminated. Feral hog populations must be treated as would any serious disease that these animals can carry. Although the newly established populations may be disease-free at first, they will become infected when they come in contact with infected feral swine populations. Witmer et al. (2003) summarized surveillance studies of feral swine populations in the United States and reported infection rates of 0-46 and 0-53% for pseudorabies and swine brucellosis, respectively.

Trapping and shooting were the only methods actually implemented by the agencies involved in Missouri's feral hog reduction activities. Additional research needs to be conducted on these and alternative control methods. Research may develop other methods in the future at which time costs can be calculated to determine the relative efficiency of various methods. For now, new baits/attractants are badly needed to attract hogs effectively without feeding/attracting other wildlife such as deer, turkeys, squirrels, and raccoons.

CONCLUSION

The effort to eradicate feral hogs from Missouri will be long and difficult. They are difficult to find at low population levels, become nocturnal and/or move with heavy hunting pressure, survive well because they are omnivorous, and have a prodigious reproductive capacity. Control efforts must focus on 1. discouraging further releases of feral swine through education, regulation, enforcement, and prosecution; 2. early detection of their presence; and 3. the elimination of herds where they currently exist. Hunting by the general public is not likely to eradicate hogs as they become more nocturnal and harder to find as numbers dwindle. Hog eradication is not likely in the state unless substantially more funding is allocated to the effort to mount more aggressive control efforts. The combined resources of federal and state agencies, commodity groups, wildlife associations, and other stakeholders will be required to address this issue successfully.

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