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Wild Pigs
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Wild Pig Management Case Study:



Ft. Benning Military Reservation

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Introduction

Site Description - This manuscript provides a description of the feral pig (*Sus scrofa*) population on the United States Army Infantry Training Center located at Ft. Benning, Georgia (Fig. 1). The Ft. Benning Army Infantry Training Center is a United States Department of Defense facility and is 73,655 ha in size: 93% (68,745 ha) of the contiguous facility is located in 2 counties in Georgia, with 7% (4,910 ha) located in 1 county in Alabama. The Alabama and Georgia sections of the facility are separated by the Chattahoochee River, which is approximately 100 m wide at this portion of its course.

Approximately 16% (11,734 ha) of the military base comprises unmanaged cantonment areas and range/military closures. The cantonment areas (5,260 ha) are developed lands with housing, administrative, storage, and other developments necessary for the operation of a military facility. The remaining unmanaged lands (6,474 ha) are natural/disturbed habitats heavily used for military training. Throughout most of this area, human activity is tightly restricted due to live-fire training and other dangerous or sensitive activities. The managed natural lands of the facility comprise 84% (61,921 ha) of the total land area. Mixed pine (21,069 ha), hardwood (21,000 ha), longleaf pine (*Pinus palustris*; 3,856 ha), and loblolly pine (*P. taeda*; 7,296 ha) are the major floral communities found on the base. Planted pine communities consist of loblolly pine (3,844 ha) and longleaf pine (4,856 ha).

The installation is located within the East Gulf Coastal Plain and is characterized by level ridges tops and gentle slopes. The climate is semi-tropical with an average annual rainfall of 124 cm (Dilustro et al. 2002). Pine forests dominate ridges and are separated by hardwood bottoms (Doresky et al. 2001). The dominant softwood species on the area are longleaf, loblolly, and slash pine (*P. elliotii*), and the dominant hardwood species found are post oak (*Quercus stellata*), lural oak (*Q. laurifolia*), turkey oak (*Q. laevis*), water oak (*Q. nigra*), southern red oak (*Q. falcate*), white oak (*Q. alba*), sweetgum (*Liquidambar styraciflua*), tulip poplar (*Liriodendron tulipifera*), and blackgum (*Nyssa sylvatica*). The northwestern portion of the military base is bordered by Columbus, GA, which is a metropolitan area with a human population of approximately 185,000. The remainder of the facility is surrounded by a mixture of agricultural and forest lands. The major agricultural crops of the area are cotton, peanuts, and soybeans. The forested lands are a mosaic of pine plantations, mixed pine-hardwood uplands, and hardwood bottomlands.

Site Management - Natural lands on Fort Benning are managed by civilian Department of Defense employees of the Environmental Division. Within the Environmental Division are the Conservation and Land Management Branches. The Conservation Branch is responsible for management decisions relating to wildlife, endangered species, etc. The Land Management Branch takes the lead on decisions relating to forests, and is responsible for implementing timber harvest prescriptions, prescribed burning, etc. Management decisions relating to feral swine fall under the jurisdiction of the Conservation Branch. Forests at Ft. Benning are managed primarily for the longleaf pine ecosystem as driven by conservation needs for the red-cockaded woodpecker. Approximately 2,250 ha of forests are harvested (thinned or clearcut) annually, with most of this harvest consisting of thinning. Additionally, approximately 500 ha of longleaf pine are planted each year: only longleaf is planted to meet objective of restoring the longleaf pine

ecosystem. Because of the importance of fire to longleaf pine habitats, 14,000 ha are treated with prescribed fire annually. Approximately 80 ha of wildlife plantings are maintained on the installation.

History of Pig Population

Introduction of the Population - The original source of feral pigs at Ft. Benning is unknown. It is believed that feral pigs became established on the facility through normal range expansion. The Chattahoochee River and several other large tributaries of the Chattahoochee flow across the base; because feral pigs tend to prefer riparian habitats, these tributaries could have served as travel corridors. Although official records of feral swine are not available prior to the 1970s, anecdotal records indicate that feral swine were present at Ft. Benning at least as early as the 1950s. The predominance of agriculture surrounding Ft. Benning at that time suggests it is possible that feral swine could have been introduced, although this is conjectural. Within an intensively agricultural landscape matrix, Fort Benning may have provided the only available forested habitats and local residents could have introduced pigs onto Ft. Benning to create a huntable population. Alternatively, free-ranging livestock have been a part of agricultural practices in the Southeast since European settlers arrived; pigs almost certainly escaped domestication on many occasions since then and may well have been present well before the 1950s.

Since the 1920s, introducing Eurasian wild boar as a game animal has become common throughout the Southeast. Intentional or unintentional introductions of wild boar have undoubtedly contributed to the feral pig population on Fort Benning. It is not clear to what extent current populations are descendents of escaped or released domestics or introduced Eurasian boars. Most likely, the type of wild pig that inhabits Ft. Benning is descended primarily from domestic stock. Coloration patterns (white spots, etc.) and morphology (curled tails, heavy hams) of many of the hogs on the base suggest considerable domestic influence. Most of the animals that are harvested by hunters annually, however, demonstrate a physical appearance (e.g., slim body line, heavy shoulders, and long snout) similar to the Eurasian wild boar. Although the presence of these body forms do not indicate that pure-strain Eurasian wild boar were ever introduced to Ft. Benning or surrounding lands, they do suggest either a hybridization between domestic breeds and wild boar, or reversion among the feral pigs to ancestral morphologies best adapted to surviving in the wild.

Expansion of the Population - Little data are available regarding expansion of the feral pig population following introduction/colonization. Ft. Benning personnel suggest that feral pigs have increased continually over the past several decades. Ft. Benning personnel further suggest that the frequency of sighting increased dramatically during the early 1990s, suggesting that the pig population was exploding. Originally, feral swine were found almost exclusively in lowland areas and riparian drainages. However, during the late 1990s, they had become much more prevalent in upland areas, suggesting that high population densities and competition for resources were forcing individuals to move into what are normally considered marginal habitats. Due to the difficulty in censusing wild animal populations, particularly feral swine which tend to aggregate in habitats with low visibility, no data are available regarding densities of feral pigs on Ft. Benning. However, data collected from hunter harvest surveys suggest that more feral pigs are harvested annually than white-tailed deer (*Odocoileus virginianus*).

Damage by Feral Pigs

Summary of Damage - Damage by feral pigs at Ft. Benning can be classified into 2 categories: disturbance of natural systems and disturbance of human activities and structures. Disturbance of natural systems at Ft. Benning is similar to what can be found in other locales where feral swine are present. Rooting or overturning of soil is probably the most widespread form of damage. As has been described previously (Singer et al. 1984, Dickson et al. 2001), feral swine, in their search for insects and edible roots and tubers, overturn soil extensively while foraging. At Ft. Benning, it is not uncommon to find areas of overturned, bare soil and exposed roots in excess of 1,000 m² in area. Rooting is most common in riparian habitats and wildlife plantings, but can be found almost anywhere. This form of disturbance is probably least common in upland areas predominated by dry soil types. As a result of their propensity to root and wallow in riparian areas, resulting stream sedimentation can be a major problem. Stream sedimentation

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due to hog activity is not uncommon (Singer et al. 1984) across their range, and while not yet studied on Ft. Benning, visual observations suggest that sedimentation is occurring.

Probably the greatest concern of resource managers at Ft. Benning is the impact that feral swine may have on species of concern. Of specific interest at Ft. Benning are the relict trillium (*Trillium reliquium*), gopher tortoise (*Gopherus polyphemus*), and red-cockaded woodpecker (*Picoides borealis*). Relict trillium is a federally-listed species, and currently there are 7 populations of relict Trillium on Ft. Benning. Rooting by feral pigs has historically caused damage to these populations indirectly through soil disturbance. Although there is little, if any, direct evidence of impacts of feral pigs on the Georgia state-listed gopher tortoise, there have been documented examples of pig predation on herpetofauna and their nests (Coblentz and Baber 1987, Taylor and Hellgren 1997), suggesting that feral pigs may adversely affect gopher tortoises as well. Additionally, feral pigs have the potential to indirectly influence the endangered red-cockaded woodpecker by inhibiting recruitment of longleaf pine seedlings. Lipscomb (1989) found that rooting by feral pigs could reduce density of regenerating longleaf pine seedlings by 98%. The well-developed tap roots of long-leaf pine seedlings are highly preferred forage when available (Hardtner 1935). While hog predation on longleaf pine would not have short-term effects on red-cockaded woodpeckers, the presence of feral pigs could reduce longleaf recruitment and ultimately availability of preferred longleaf habitat in the future.

Feral pig disturbance of human activities and structures at Ft. Benning is widespread, but the magnitude of the disturbance and damage is unknown because much of the damage may be indirect and no means of reporting pig damage is common to all military units using the base. Feral pig rooting can result in extensive damage to equipment and motorized vehicles. Several live-fire ranges are spread across the installation, and often include underground wiring that is a part of executing and monitoring training exercises. When feral swine root in these areas, it is common for underground electrical wires to be damaged. In rare circumstances, equipment can become stuck or be overturned and damaged where pigs have rooted extensively. The effects that feral swine can have on motorized vehicles have been documented, but the impact that feral pigs have on motorized vehicles at Ft. Benning is unknown. Considering that military training exercises often rely upon heavy use of motorized vehicles in uneven terrain, damage caused to vehicles by hog rooting likely is considered to be the result of normal wear-and-tear of uneven terrain. Feral swine are also indirectly responsible for injuries to humans at Ft. Benning. On several occasions, paratrooper training exercises have resulted in injuries due to landing on uneven ground caused by hog rooting. Additionally, it is likely that soldiers on foot have sustained injuries from stepping on uneven ground caused by hog rooting.

History of Damage - The extent of damage caused by feral pigs has been positively associated with increases in pig density. As pig density increased during the 1990s, damages increased as well. Although a thorough review of hog damage has yet to be conducted at Ft. Benning, natural resource management personnel at the facility believe that if the feral pig population continues to increase, it is likely that it could become a significant threat to the ecological integrity of the Ft. Benning landscape. Additionally, it is likely that a concurrent increase in damage and disturbance to human activities and structures would increase as well.

Management of the Feral Pig Population

Management Strategy - Currently, the main management objectives of Ft. Benning regarding feral pigs are to monitor and to control the population. The pigs are valued by hunters as a big game species, and considerable numbers of feral pigs are harvested annually. However, the propensity of pigs to disturb natural resources and human activities, and undermine ecosystem integrity has caused considerable concern among natural resource managers on base. The challenge for managers is thus a difficult one, where they must balance reduction of damage by pigs to a critically important ecosystem against providing their hunting constituency with satisfactory opportunities to harvest pigs. Whereas eradication may be the optimal solution for preserving ecosystem functions, eradication is probably impossible at Ft. Benning because of the extensive acreage of the installation, the large acreage that is not readily accessible, and the potential source pool of feral pigs outside the installation. Further, because feral pigs are highly valued by many hunters at Ft. Benning, serious attempts at eradication would be politically disastrous. At best,

management efforts can hope to keep the pig population at a size providing a satisfactory annual harvest while minimizing negative effects on the ecosystem and military training.

Management Activities - Ft. Benning currently employs 3 control techniques for feral pigs. The primary form of control is through hunting. Although the Ft. Benning installation is not open to the general public for hunting, active military, retired military, active reservists, and federal employees stationed on Ft. Benning are permitted to hunt. In 2003, Ft. Benning natural resource personnel began trapping feral pigs in localized areas where damage was extensive and hunting pressure was ineffective at controlling damage. Large, live traps are baited with whole corn, and any pigs that are trapped are euthanized. Personnel at Ft. Benning remove approximately 25 wild pigs annually, but these removal efforts are normally confined to areas of high human activity where hunting is not permitted. The final technique that is employed to control impacts of feral pigs is exclusionary fencing. Three of the 7 relict trillium populations that had been damaged by pig activity were surrounded by 1 m exclusionary fencing secured with t-posts in 1997. The areas that have been fenced range in size from 0.3 to 2.5 ha. Within the fenced areas, the trillium populations are now prospering due to the low level of disturbance. On rare occasions, pigs have gained entry into these areas, but their impacts have been negligible.

Prior to 2000, no data were collected regarding number of pigs that were harvested by hunters. Since then, harvest cards have been distributed to each hunter annually, and hunters were requested to report the number of pigs harvested. However, approximately 33% of the cards were not returned each year, and unlike deer, hunters were not required to report pig harvest. Table 1 provides data on the number of hunters returning harvest cards, as well the numbers of pigs and white-tailed deer that were reported. From 2000-2004, almost as many pigs (938.75 ± 321.08 [SD]) were reported harvested as white-tailed deer (1196.75 ± 107.36). Considering hunters are not required to report harvest of feral pigs, it is likely that actual harvest of feral pigs substantially exceeded that of deer. The data indicate that on average, hunters harvest a pig for every 78 ha. However, if we do not include unhuntable areas (e.g., cantonment and permanent closures) in the calculation, then hunters harvest a pig for every 65 ha, and normally at least part of this "huntable" landbase is closed on a daily basis due to military activities. Ft. Benning personnel suspect that the low numbers of feral pigs harvested during the 2001-2002 hunting season may have been due to the terrorist attacks of 11 September 2001. While the deer harvest did not diminish appreciably, there was a noticeable decrease in hunter effort during that year.

Currently, few data are available regarding costs of the feral pig control programs at Ft. Benning. The hunting program, like at most other locations, is a cost-effective tool for removing large numbers of feral pigs, although its effectiveness in controlling or reducing pig density is unknown. Expenses associated with constructing exclusionary fencing were not documented, but results suggest the enclosures have been very effective. However, economics dictate that in most cases only small areas can be protected with this technique. There are no data available to estimate the costs associated with trapping of feral pigs at Ft. Benning.

Future Management Needs

Planned Management Strategy - The planned management strategy for the feral pig population is to monitor and control the population. Although this strategy is somewhat general and vague, implementation of a more detailed strategy with precise management objectives is not currently possible. Ft. Benning personnel acknowledge that feral pigs pose a serious threat to the integrity of the natural ecosystem on the facility, and additionally cause large amounts of disturbance to human activity and structures. However, uncertainty about the efficacy of control techniques for feral swine do not allow for a more detailed strategy. Little is known about the pigs inhabiting Fort Benning, to include population size, demographic trends, movements, foraging behaviors, and food habits. Particularly in the absence of demographic information, the success of a lethal control program is hard to predict. Nothing is known about the level of mortality needed in a lethal control program needed to minimize or reverse population growth. Given the immense reproductive capacity of feral pigs, it is entirely possible that increasing mortality would result in a compensatory reproductive response from the population and control would thus be ineffective. Because of these and other questions, Ft. Benning is collaborating with researchers at Auburn University and the

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Alabama Cooperative Fish and Wildlife Research Unit to examine the ecology and management of feral pigs on the facility.

Current and Future Research - Currently, researchers at Auburn University and the Alabama Cooperative Fish and Wildlife Research Unit have begun a 5-year project to examine the ecology of feral hogs at Ft. Benning. The overall goal of the study is to generate data that will allow Ft. Benning personnel to develop a more detailed feral pig management strategy and allow more effective responses to problems associated with feral pigs. The specific objectives of the study are to:

1. Estimate the relevant demographic parameters and sensitivities of feral hog populations (annual survival, fertility, and population growth rates) necessary to examine the effects of management practices on the Fort Benning area.
2. Evaluate the distribution, movements, and habitat use of feral hogs and associated effects on gopher tortoises and sensitive habitats.
3. Evaluate effects of feral hogs on species of special concern through food habits analysis.
4. Evaluate effects of feral hogs on military training.
5. Determine the efficacy of population control measures in reducing the impact of feral hogs on the distribution and abundance of gopher tortoises, sensitive habitats, and military training.

Concurrent with this research, Ft. Benning is changing the way hunter harvest data are collected for feral pigs. More accurate harvest data, combined with detailed research, should provide a baseline from which a more effective management strategy can be implemented. Additionally, the detailed analysis of population demographics that will be generated from the research should enable development of more effective control techniques for feral pigs that can be tested with the Ft. Benning population.

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Table 1. Number of hunters^a, and feral pigs and white-tailed deer harvested during 2000-2004 at the U.S. Army Infantry Training Center in Ft. Benning, Georgia.

Hunting Season	Hunters	Feral Pigs Harvested	Deer Harvested
2000-2001	1,455	981	1,223
2001-2002	1,308	499	1,197
2002-2003	1,430	1,270	1,313
2003-2004	1,437	1,005	1,054

^a Number of hunters represents the number of harvest cards that were returned each year. Approximately 33% of the harvest cards were not returned annually.

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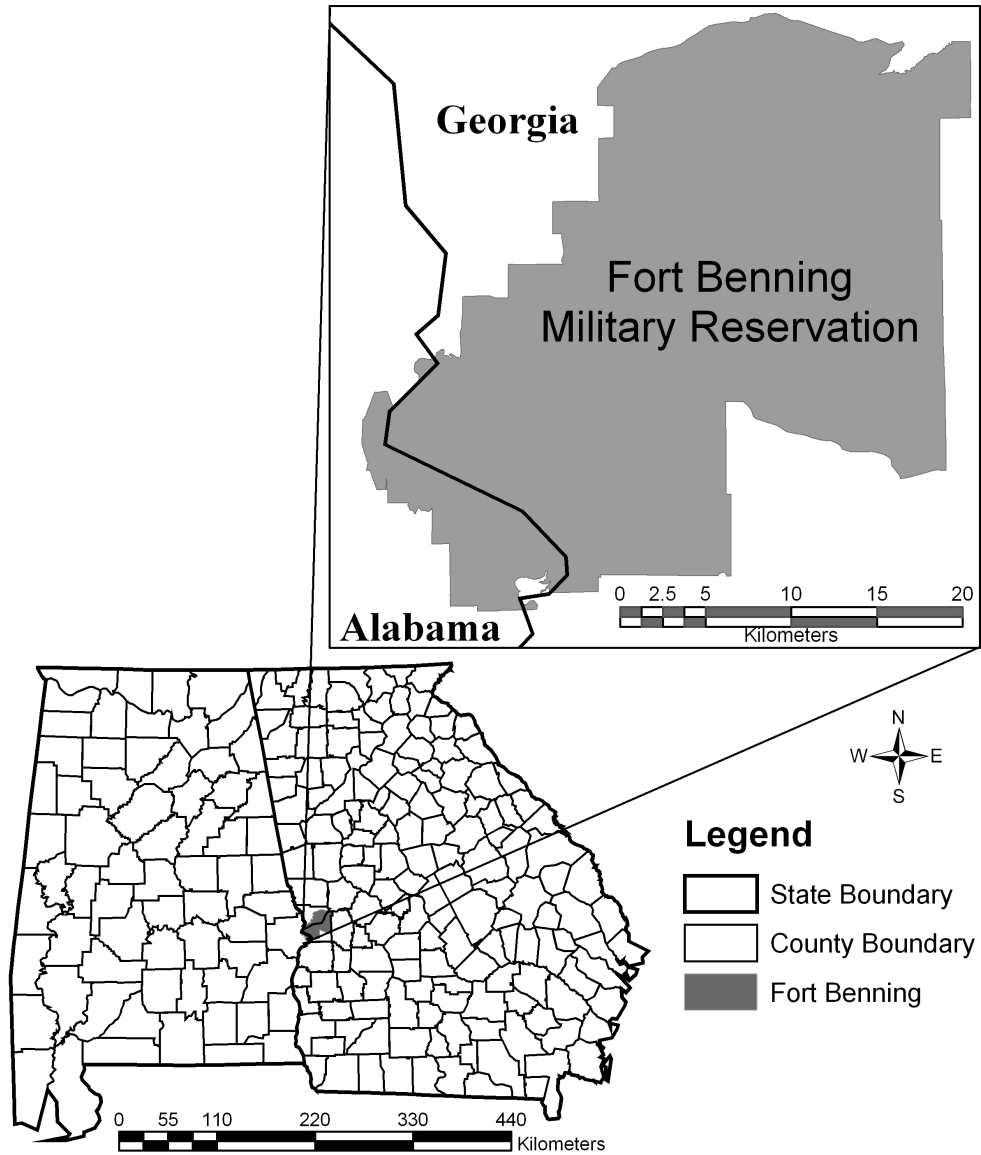


Figure 1. Map depicting the relative location and size of the United States Army Infantry Training Center in Georgia and Alabama, USA.

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