SP-467
JANUARY 2012

TEXAS A&M UNIVERSITY

Feral Hogs Negatively Affect Native Plant Communities

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(Photo courtesy Dr. Jim Cathey, Texas AgriLife Extension Service)

Feral hogs (*Sus scrofa*) are non-native, highly adaptable, and cause significant ecological and economic damage in Texas.

Cover photo courtesy Dr. William Rogers

Figure 1. Feral hogs can cause significant ecological damage by their rooting habits that turn over the soil, damaging plant communities and possibly leading to greater erosion. (Photo courtesy Jared Timmons, Texas AgriLife Extension Service)

Feral Hogs Negatively Affect Native Plant Communities

Introduction

Landowners face many challenges as they manage their land for agricultural uses and wildlife habitat. Droughts, flooding, and invasive species are major hindrances that landowners must account for to maximize productivity on their property. One invasive species in particular, feral hogs (*Sus scrofa*), are a significant economic burden to landowners due to their destructive feeding and wallowing habits that cause damage to pastures and crops (Figure 1). Also, feral hogs compete with wildlife species for available resources which can take an economic toll on landowners who manage their land for wildlife.

Feral Hog History

Feral hogs are non-native to North America; they were transported to this continent from Europe and Asia. Beginning in the 1500s early explorers such as Hernando de Soto introduced swine as a food source to the North American mainland (Wood and Barrett, 1979). Many of these domestic swine were free-range livestock, which allowed some animals to escape and become feral (wild) populations. Eurasian wild boars were also introduced to the environment starting in the late 1890s for hunting purposes. All of the initial Eurasian wild boars were released on fenced properties, but later escaped confinement, resulting in more wild hogs in the environment (Mayer and Brisbin, 2008).

Feral Hog Biology

Feral hogs, domestic swine, and Eurasian wild boars belong to the same species and can all interbreed. Sows can produce litters one to two times a year, depending on availability of food resources, and have on average four to six piglets per litter, though more are possible. Few predators are capable of preying upon large, healthy adult feral hogs. Younger feral hogs can become prey to a number of animals such as coyotes, bobcats, foxes, and others. Feral hogs can weigh over 300 pounds, but more commonly weigh between 100 and 150 pounds (Stevens, 2010). Feral hogs rarely reach 400 pounds. Feral hogs are opportunistic omnivores, meaning they can eat both plant and animal matter and switch food sources with availability. Feral hogs also lack functional sweat glands and wallow in streams and other water sources to keep cool.

Figure 2. Oak and hickory trees are a major component of ecosystems in much of Texas and provide habitat for many wildlife species. (Photo courtesy Jared Timmons, Texas AgriLife Extension Service)

Feral Hog Damage

Feral hogs cause an average of $52 million of damage annually to the agricultural industry in Texas. This estimate does not account for growing feral hog damage in suburban areas. Examples of feral hog damage include but are not limited to: rooting pastures and rangeland, consumption of native vegetation, negative effects on water quality, and predation of wildlife.

Riparian Ecology

Oak (*Quercus sp.*) and hickory (*Carya sp.*) trees are among the most ecologically important tree species in Texas (Figure 2). These broad-leaved trees produce large seeds, such as acorns and nuts (mast) respectively, which are highly sought after by wildlife for food. Non-native feral hogs compete with native wildlife, such as deer, squirrels, and birds to consume this mast and may have a disproportionate effect on seed abundance and future tree recruitment. Oaks and hickories provide screening, loafing, and escape cover for many wildlife species, and some animals rely on them for nesting, roosting, and foraging. Additionally, timber from these trees is economically valuable and can be used for construction materials and fuel for burning.

Figure 3. Healthy riparian areas consist of native grasses, forbs, shrubs, and trees that reduce floodwater velocities, thereby inhibiting excess erosion and allowing greater infiltration. (Photo courtesy Blake Alldredge, Texas AgriLife Extension Service)

Oaks and hickories are major components of riparian areas along streams and rivers in many parts of Texas. Riparian areas (Figure 3) are transitional margins between uplands and stream habitats, where

Figure 4. Fenced exclosures were used in this study to evaluate the effects that feral hogs have on this ecosystem. (Photo courtesy Dr. William Rogers)

vegetation is strongly influenced by the presence of water, and is significantly different from upland communities (Wagner, 2003). Feral hogs are known to use riparian areas as travel corridors and the linkage to water and diverse, lush plant life may concentrate feral hog activity in these ecologically important locations. Healthy riparian areas provide many ecosystem services that benefit humans. Examples of these services are:

- Flood water retention as trees and other plants reduce water velocities, increasing groundwater recharge and sediment deposition;
- Improved water quality as sediments and nutrients are filtered by plants and soil;
- Plant roots that protect banks from excess erosion, allowing the channel to maintain its shape;
- Fish and wildlife habitat;
- Timber production;
- Greater recreational opportunities for hunting, fishing, and ecotourism;

Many riparian areas in Texas have undergone reduction in size and/or changes in vegetative species as agriculture, urbanization, deforestation, man-made reservoirs, and invasive species alter these ecosystems. For most trees, as the size of the seed increases, the number of seeds a tree can produce decreases. Since oaks and hickories produce large seeds, they are limited in their seed number production, making them vulnerable to high seed consumption by feral hogs (Sweitzer and Van Vuren, 2002). This high consumption rate may affect forest structure by greatly reducing the chances for large-seeded trees to germinate. Consequently, feral hogs may reduce the ecosystem services in many environments, such as riparian areas, as their actions degrade plant communities. The impacts of feral hogs on crops, livestock, and wildlife have been observed by many, but investigations involving native plant communities are limited and mainly based on observations.

Study

Researchers from Rice University and Texas A&M University conducted a study in the Big Thicket National Preserve, in southeastern Texas, to determine the impact of feral hogs on riparian ecosystems (Siemann et al. 2009). In January 2001, 16 plots (32 feet x 32 feet) were constructed on a 656-yard transect line near Little Pine Island Bayou in Hardin County, Texas. Eight of the plots were fenced using woven wire fencing with strands of barbed wire at the bottom, middle and top of the woven wire (Figure 4). Eight of the plots were not fenced. From these plots, ground cover was determined by counting the number and species of woody plants between 20 and 55 inches tall. In addition, five 10 inch deep by 3/4 inch wide soil cores were taken from each plot and analyzed for percent Carbon and Nitrogen in 2004.

These researchers expected that feral hogs would:

1. Decrease the abundance of large seeded tree species (such as oaks and hickories) by eating their seeds;
2. Increase the abundance of less desirable small-seeded tree species, like Chinese tallow (*Triadica sebifera*) by creating favorable soil conditions and reducing competition from large-seeded species;
3. Increase sapling mortality;
4. Break up and incorporate litter into the soil and lower the Carbon to Nitrogen ratios in the soil.

Figure 5. In unfenced plots, there was significantly more bare ground and Chinese tallow was two times more abundant than in fenced plots. (Photo courtesy Dr. William Rogers)

Results of the Study

In this study, negative effects that feral hogs had on native plant species (oaks and hickories in particular) and the soil chemistry were clearly demonstrated (Table 1). Excluding feral hogs from areas in this east Texas forest using fenced exclosures increased the diversity and survival rate of native tree species. In fact, the large seeded species saplings, such as oaks and hickories, were more than twice as abundant within the fenced plots as in the unfenced plots. This strongly suggests that feral hogs consumed large amounts of mast in forests such as the Big Thicket, which can lead to a change in the plant community overtime as these trees that produce large seeds become less numerous.

Excluding feral hogs increased the growth rate of saplings (juvenile trees not large enough to be considered mature) in this forest. The increased growth rate of saplings was expected, as fencing provided protection from herbivory and reduced the stressful effects of soil disturbance. High plant diversity is important in forests, as in every ecosystem, to increase overall productivity, to promote resistance to natural disasters and diseases, and to support numerous wildlife species. In the unfenced plots, diversity was lower due to invasion by Chinese tallow, which was more than twice as abundant as in fenced plots (Figure 5). Chinese tallow is a non-native invasive tree that grows aggressively in full sunlight

Table 1. Results from Siemann et al. (2009) study conducted in the Big Thicket National Preserve. Comparison between fenced and unfenced plots shows the response of habitat characteristics to feral hog behavior.

Habitat Characteristics	Fenced Plot	Unfenced Plot
Large-seeded species abundance	2X greater than unfenced plots	—
Chinese tallow abundance	—	2X greater than fenced plots
Plant species diversity	—	Decreased
Sapling growth rate	Increased	—
Soil nitrogen levels	—	Increased
Bare ground	—	Increased
Forb cover	Increased	—
Graminoid cover (grass and grass-like)	—	Increased
Litter	Increased	—

Figure 6A. Chinese tallow (*Triadica sebifera*) leaves. (Photo courtesy Jared Timmons, Texas AgriLife Extension Service)

Figure 6B. Chinese tallow leaf. (Photo courtesy Dr. Jeremy Stovall, Stephen F. Austin State University)

Figure 7. Chinese tallow has rapidly taken over this canopy opening in this forest, thereby excluding all other species. (Photo courtesy Blake Alldredge, Texas AgriLife Extension Service)

or shade (Rogers and Siemann, 2002), has very high drought and flooding tolerances (Butterfield et al. 2004), responds positively to increases of nitrogen (Siemann and Rogers, 2007), and is highly tolerant to herbivory damage (Zou et al. 2008; Figure 6A, 6B). Feral hog rooting in the leaf litter and upper soil layers increases nitrogen levels in the soil by accelerating litter breakdown and may negatively impact soil organisms that inhibit the growth of Chinese tallow (sensu Nijjer et al. 2007). Chinese tallow has already altered many ecosystems in the southeastern U.S. by outcompeting native plants. In some areas like the Gulf Coastal Plains of Texas, Chinese tallow dominates the plant community, which is detrimental to many wildlife species, including grassland birds and waterfowl (Figure 7).

Figure 8. In fenced plots, there was significantly higher forb and woody cover and litter compared to unfenced plots. (Photo courtesy Dr. William Rogers)

Fenced plots had higher forb cover, woody cover, and litter compared to the unfenced plots which had higher graminoid (grass and grass-like plants) cover and bare ground (Figure 8). Results in unfenced plots were expected due to the rooting behavior of feral hogs that significantly disturbs the soil. On average, 22% of the ground area in the unfenced plots was disturbed every year during this study (Figure 9). Unfenced plots also had higher nitrogen levels in the soil, due to the turning over of the soil by feral hogs that incorporated the litter layer into the soil more rapidly. In addition, defecation and urination by feral hogs in the unfenced plots likely contributed to the elevated levels of nitrogen in the soil.

Figure 9. In unfenced plots, there was significantly more bare ground and graminoid cover than in fenced plots. (Photo courtesy Dr. William Rogers)

Feral Hog Effects in Other Ecosystems

This study evaluated the effects of feral hogs on riparian forests. However, due to their high adaptability and a wide ranging diet of plant and animal material, feral hogs have the potential to affect many other types of ecosystems as well. Upland forests (Campbell and Long, 2009), native grasslands (Cushman et al. 2004), streams (Kaller and Kelso, 2006), and wetlands (Chavarria et al. 2007) are among the various ecosystem types that are negatively impacted by non-native feral hogs (Figure 10). Feral hogs affect these ecosystems in the following ways:

- Reduce the number of large-seeded tree species by consuming large amounts of mast in upland forests (Campbell and Long, 2009);
- Loss of vegetative ground cover and litter layer that invertebrates and small vertebrates depend on for cover, and that provides critical microclimatic conditions necessary for seedling establishment and growth in forests (Chavarria et al. 2007);
- Disturbance of soil by rooting can lead to conditions that are favorable for exotic plants to invade in many ecosystems (Kotanen, 1995);
- Altered invertebrate and microbe communities that serve as the foundation for the food chain in stream systems (Kaller and Kelso, 2006);
- Contribute fecal coliforms, such as *E. coli* (Jay et al. 2007), to streams which may significantly harm aquatic life (Kaller et al. 2007).

As feral hog populations increase, impacts on the different ecosystems occupied by these animals will also increase, particularly in environmentally sensitive areas. As water quality concerns escalate, it is important to recognize how a non-native species like feral hogs degrade plant communities and water sources.

Figure 10. Native grasses, such as Little Bluestem (*Schizachyrium scoparium*), are important as they provide cover for bird species, such as quail, and allow water to infiltrate. (Photo courtesy Jared Timmons, Texas AgriLife Extension Service)

Figure 11. Corral traps are very effective at trapping high numbers of feral hogs at one time. (Photo courtesy of Blake Alldredge, Texas AgriLife Extension Service)

Soil Chemistry and Water Quality

The increase in soil nitrogen can lead to more run-off of nutrients in streams and rivers. High levels of nitrogen can cause eutrophication, which is a nutrient enrichment of streams. Eutrophication can result in increased amounts of algae, which deplete dissolved oxygen in the water (Baird, 1990). Reduction in dissolved oxygen can result in fish kills and offensive odors in waterways.

Management Implications

Feral hogs cause many problems to riparian ecosystems and their impact should be reduced. It is important to be proactive in efforts to control feral hogs by using several techniques in concert with one another. One of the most effective is trapping and removing feral hogs with the aid of a corral trap (Figure 11). A corral trap can catch an entire sounder, or group, of feral hogs in one effort. Snaring, hunting with dogs, or aerial gunning may also be necessary to reduce population numbers.

If feral hogs continue to persist despite removal efforts, another option is to fence environmentally sensitive areas. These areas can include locations where older trees have fallen, leaving an open area where sunlight can stimulate regeneration. Fencing around these areas allows the soil to remain undisturbed by feral hogs and new saplings to grow and mature.

Fencing for an environmentally sensitive area should consist of woven wire or utility panels with 4-inch squares at least 28 inches in height to exclude feral hogs. The fencing should be fastened to T-posts using bailing wire, making sure to reinforce areas of fence overlap. The fence should be staked tightly against the ground to prevent uprooting and access to protected areas. When constructing the fence, several living old growth trees should be included inside the fenced area to produce seed for future tree production. Often it is not economically or physically feasible to fence an entire property to restrict feral hogs from riparian areas. Fences in riparian areas are often washed away with seasonal flooding. Direct control methods to reduce population densities of feral hogs are preferred in these areas to reduce the negative effects they have on plant and water resources.

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Feral hogs captured in a corral trap (Photo courtesy Dr. Jim Cathey, Texas AgriLife Extension Service)

See other feral hog resources at http://agrilife bookstore.org.

- L-5523 Recognizing Feral Hog Sign
- L-5524 Corral Traps for Capturing Feral Hogs
- L-5525 Box Traps for Capturing Feral Hogs
- L-5526 Placing and Baiting Feral Hog Traps
- L-5527 Door Modifications for Feral Hog Traps
- L-5528 Snaring Feral Hog
- L-5529 Making a Feral Hog Snare
- SP-419 Feral Hogs Impact Ground-nesting Birds
- SP-420 Feral Hog Laws and Regulations
- SP-421 Feral Hogs and Disease Concerns
- SP-422 Feral Hogs and Water Quality in Plum Creek
- SP-423 Feral Hog Transportation Regulations
- L-5533 Using Fences to Exclude Feral Hogs from Wildlife Feeding Stations

Acknowledgments and disclaimer

We would like to recognize the efforts of all those involved in the design and implementation of this study, including Dr. Evan Siemann, Juli Carrillo, Christopher Gabler, and Roy Zipp. We would also like to thank Dr. Jack Mayer, Savannah River National Laboratory, and Dr. Tyler Campbell, USDA APHIS, for their insightful review of this publication.

This publication was developed as part of the Plum Creek Watershed Feral Hog Project, with funding support from the U.S. Environmental Protection Agency through a Clean Water Act §319(h) Nonpoint Source grant administered by the Texas State Soil and Water Conservation Board and from the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture (USDA), National Integrated Water Quality Program. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the USDA.

Soil Water TSSWCB

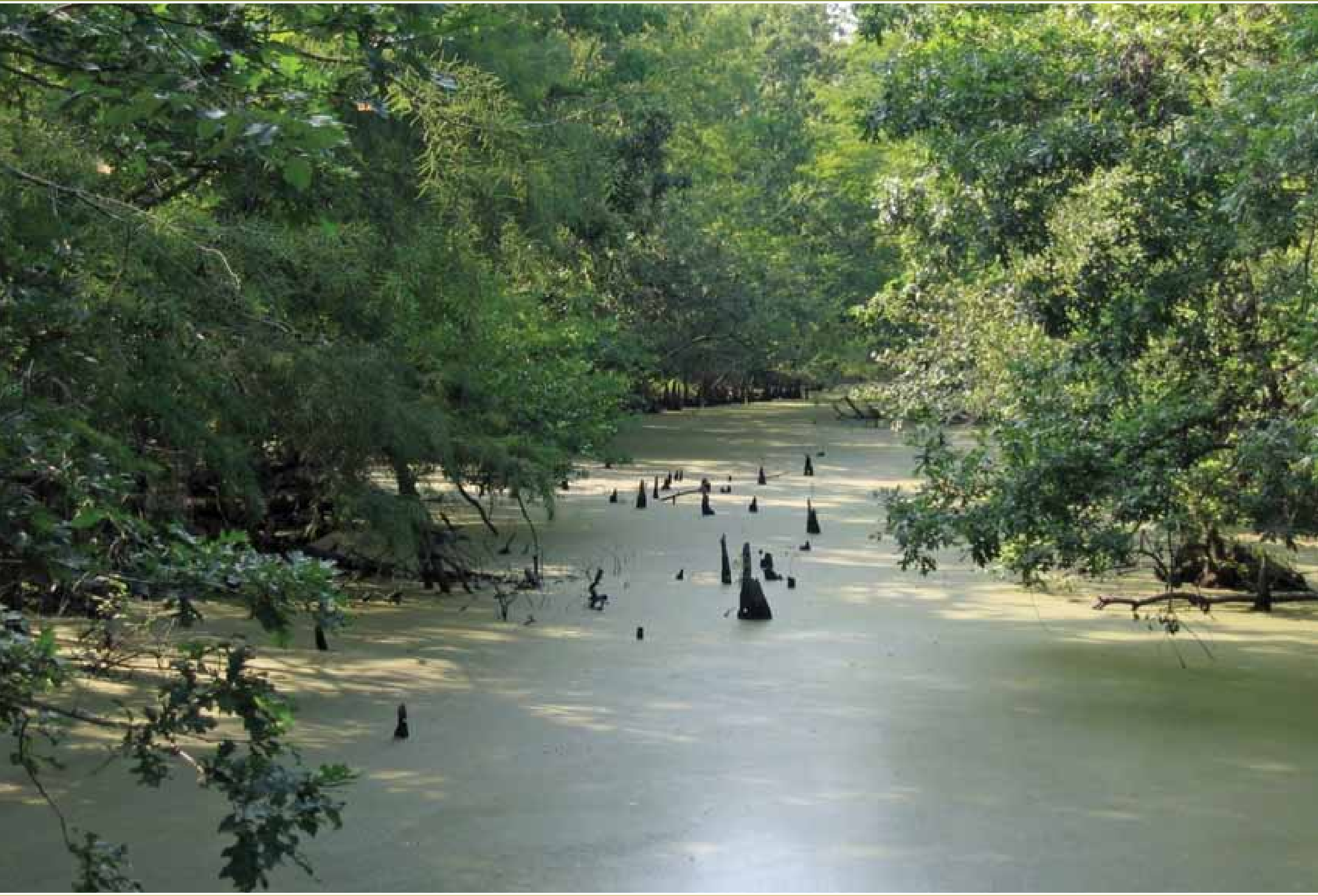

Photo courtesy Dr. William Rogers

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