

USDA NRCS NATIONAL
FERAL SWINE
DAMAGE ASSESSMENT
PRELIMINARY FINDINGS



Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE





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Acknowledgments

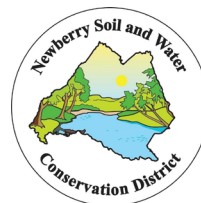
As with any endeavor of this nature, we greatly appreciate the efforts of all who contributed to this report. First and foremost, this report was made possible by a grant from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Feral Swine Eradication and Control Pilot Program. Lacey Williamson and Thad Heater with NRCS provided invaluable guidance throughout all phases of this project. Likewise, Janean Romines with the USDA Animal and Plant Health Inspection Service (APHIS) National Feral Swine Damage Management Program was instrumental in bringing together the key players to make this project possible. Behind the scenes, Samantha Leivers at Texas A&M University kept the survey data collection running smoothly, while Matt McDonough at Auburn University provided invaluable assistance in compiling this report and Glenn Swanson at Colorado State University developed the summary statistics from the national survey data. We thank the Feral Swine Eradication and Control Pilot Program (FSCP) partners, Ashley Henderson, Alabama; J. P. Fairhead, Arkansas; Kim Sash, Florida; Perri Cooper, Georgia; Jason Misaki, Hawaii; Theron Phillips, Louisiana; Jody Acosta, Mississippi; Jason Jensen, Missouri; Aaron Loucks, North Carolina; Lisa Knauf, Oklahoma; Jim Beasley, South Carolina; and T. J. Helton, Texas, for their efforts in collecting survey data and timeliness in providing content and reviewing their respective sections of this report. USDA APHIS Wildlife Services staff conducted most of the feral swine removal operations, which ultimately resulted in the successes observed by these FSCP projects. Thanks to the staff of Alabama Cooperative Extension System Communications, Strategic Marketing, and Client Relations for their assistance in producing this report: Glenda Freeman and Deborah Dupree, editors, and Kelly Knowles and Bruce Dupree, designers.

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NATURAL RESOURCES DIVISION



Alabama Cooperative Extension System and Texas A&M AgriLife Extension Service



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Introduction

Non-native invasive feral swine are one of the most significant natural resource management challenges facing producers, landowners, and state and federal agencies tasked with protecting agriculture and the environment. With agriculture-related damage often numbering in the tens of millions per year for states with current populations of feral swine, coupled with the difficulty of adequately controlling these animals because of their high adaptability and reproductive potential, feral swine have become a national issue over the past 20 to 30 years. In addition to the damage to agricultural crops and significant risks to food safety, feral swine also negatively affect water quality, compete with native wildlife species, and serve as disease vectors affecting livestock and human health. More and more landowners, state and federal agencies, and nongovernmental organizations have begun to aggressively pursue steps to substantially reduce or, in some cases, eradicate feral swine populations.

The Feral Swine Eradication and Control Pilot Program (FSCP) was implemented jointly by the USDA Natural Resources Conservation Service (NRCS) and the USDA's Animal and Plant Health and Inspection Service (APHIS). Total funding for the program was \$75 million over the life of the 2018 Farm Bill. In the first round of funding, NRCS obligated more than \$16.7 million to fund twenty projects in select portions of ten states, including Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Oklahoma, North Carolina, South Carolina, and Texas. A follow-up round of funding included projects in Hawaii and Missouri with further expansion of projects in Alabama, Mississippi, North Carolina, Oklahoma, South Carolina, and Texas. Each pilot project consisted broadly of three coordinated components: feral swine removal by APHIS, restoration efforts supported by NRCS, and assistance to producers for feral swine control provided through grants with nonfederal partners. The projects could last 1





to 3 years. NRCS provided up to 75 percent of the total project costs, with the remaining 25 percent coming from matching funds committed by partners.

Under a grant from the NRCS, a team of researchers and Extension specialists from the Alabama Cooperative Extension System at Auburn University, Texas AgriLife Extension at Texas A&M University, and Colorado State University were tasked with assisting NRCS in measuring and documenting the success of the pilot projects and the program. To accomplish this, researchers developed a standardized in-person survey administered by project partners to landowners within their projects to obtain a comprehensive understanding of the extent and nature of damages related to feral swine. These Extension specialists worked with each project partner to communicate successes, noteworthy observations, and lessons learned up to this point in the program. Therefore, it is important to note that this report captures only preliminary findings and acknowledges that additional project results will be forthcoming as projects are still active and ongoing.

About the FSCP Projects

Project partners were given the freedom to tailor their FSCP projects based on several factors: available resources, priority areas, landowner interest, feral swine distribution, and the resource to be protected. However, there was one common theme among all FSCP projects—partnerships. In addition to the fourteen partners leading FSCP projects in their respective states, an additional 59 agencies were directly involved in carrying out the FSCP projects with 68 more agencies providing in-kind support. As such, FSCP projects varied considerably from one another. For example, the Georgia FSCP focused on a collection of eight to ten adjoining landowners to form a core area from which removal began and subsequently grew outward to include additional producers, whereas the Alabama project focused on


feral swine removal from watersheds. Several other FSCP projects targeted their efforts in multicounty areas. While reducing crop damage was the objective for all projects, the Hawaii FSCP also focused on increasing water quality by reducing or eliminating feral swine from forests on upper elevations. Likewise, Alabama implemented a financial cost-share program, while other states offered trap loan programs. In Missouri where feral swine removal was already underway in an organized and systematic manner, FSCP funding played only a supporting role.

State projects were structured differently regarding how they interfaced with USDA APHIS Wildlife Services, delivered assistance to producers, and chose the resources they wanted to protect. Some state project partners faced substantially different challenges in working through the COVID-19 pandemic at the beginning of the FSCP. Because all states and agencies reacted differently to COVID-19 concerns, the ability and timing of partners to implement their projects varied greatly. As such, the initiation of some FSCP projects was delayed. Nonetheless, project partners forged ahead the best they could and, despite the early COVID-19 challenges, were successful in accomplishing their goals. Therefore, outcomes and relative success comparisons among FSCP projects should not be made.

Working with USDA APHIS Wildlife Services

USDA APHIS Wildlife Services was an integral partner with all FSCP projects and, in most cases, conducted all feral swine removal operations. The effort and logistical complexity of feral swine removals were immense and should not be understated. Communication and coordination among project partners and Wildlife Services staff were instrumental in the success of all these FSCP projects. In most cases, FSCP partner efforts centered around assisting Wildlife Services staff in identifying and securing access to local producers for feral swine removal, coordinating field support and outreach programming, and sometimes





providing direct field and equipment support for feral swine removal operations. Because of the magnitude and inherent complexities of the USDA APHIS Wildlife Services contributions to the success of these FSCP projects, the scope of this report focuses mainly on the USDA Natural Resources Conservation Service side of the FSCP.

National Damage Assessment Survey

Each project partner conducted a standardized in-person survey to collect data to determine the collective economic impacts of feral swine removal across all FSCP projects. Although all states participated in data collection for the National Damage Assessment, the significant differences in how projects were carried out combined with state-specific challenges of COVID, prevented the collection of sufficient data to conduct a comprehensive economic analysis across all FSCP projects. However, this data set still provided invaluable insight into the nature and extent of feral swine damage experienced by landowners and producers participating in each FSCP. It is important to note that damage estimates reported herein may not reflect feral swine damage elsewhere because FSCP projects, in most cases, targeted areas within the respective states experiencing significant feral swine damage.

Of those producers reporting damages from the 2020 and 2021 growing seasons, commercial agriculture crops were the most frequently cited resources being protected, followed by pasture and rangeland, property, natural resources, and timber. Although damaged crops varied among FSCP projects, corn, soybeans, and peanuts, followed by wheat, various hay crops, and cotton were among the most common crops producers reported being damaged by feral swine. Damage percentages, computed as the number of crop acres reported damaged divided by the total number of crop acres planted and averaged across all respondents, varied greatly within and among FSCP projects and, in some cases, were quite extreme. For example, producers from nine FSCP projects

planted an average of 312 acres of corn, with close to 25 percent of those acres being damaged by feral swine during some point in the growing cycle. In some cases, smaller fields (less than 20 acres) were frequently reported to be lost entirely due to feral swine.

Similar responses were observed for other crops. Peanuts were a common crop being damaged by feral swine in Alabama, Florida, Georgia, and South Carolina, with producers in these states planting on average 314 acres of peanuts each year. Of those producers reporting damage, approximately 12 percent of planted acres were reported damaged by feral swine; however, damage to peanuts was variable, with reported losses as high as 62.5 percent. Reported damage loss was generally less for soybeans, averaging about 5.2 percent across all survey respondents from Alabama, Arkansas, Louisiana, Missouri, Mississippi, and Oklahoma, with damage loss correlating to farm size and landscape context. Larger Mississippi Delta farming operations (e.g., 1,400 to 6,000 acres planted) experienced lesser amounts of damage (1.7 percent) on average compared to smaller farms in other states (8.2 percent damage loss). Additionally, recreational food plots used for hunting were also frequently damaged by feral swine in eight FSCP projects. Although still in the early stages of FSCP implementation, survey participants in the Hawaii FSCP reported that coffee, cacao, taro, sugarcane, ginger, sweet potato, and coconut crops were among those most frequently damaged by feral swine.

Property damage was universal among all FSCP projects. Survey respondents from all FSCP projects frequently indicated damage to roads and farming equipment due to rooting by feral swine and damage to livestock fences. Producers were also asked about their efforts to reduce feral swine damage before participating in the program. When conducting control efforts on their own (before participation in the FSCP), producers' most frequently used control technique was shooting. Producers reported spending about 95 days engaged in



this control technique on average, with many producers indicating its use throughout the year. Additional management included using corral or box traps (followed by euthanasia of captured animals) and hunting with dogs.

Collectively, landowners participating in the survey across all FSCP projects reported a positive trend toward fewer feral swine over the past 3 years within their counties. Some key observations from state-specific data likewise appear to indicate a substantial positive impact of feral swine removal. For example, survey respondents from the Georgia FSCP reported a substantial decline in yield loss in corn from 65 percent to 14 percent in 2019 and 2021. Likewise, those corn growers among the Florida FSCP respondents who received feral swine removal support from USDA APHIS Wildlife Services reported a 38 percent reduction in crop acres lost due to feral swine. Mississippi respondents saw an average reduction of 85 hours per month in their time dealing with feral swine removal, saving them an average of \$2,000. Further exploratory analyses will be conducted from this data set to develop a better picture of the FSCP project impacts.

Authors

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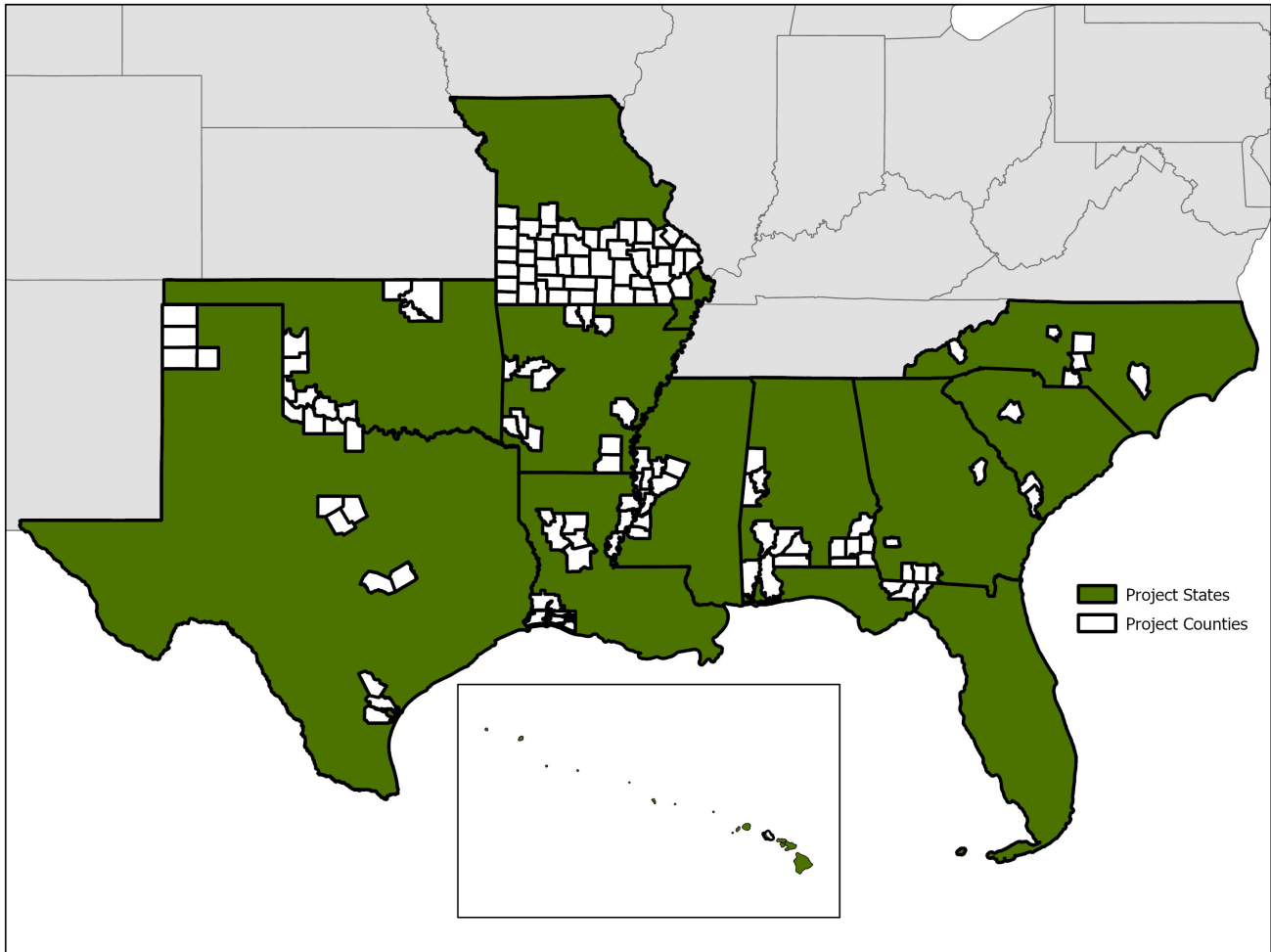
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Counties with Feral Swine Eradication and Control Pilot Program Projects





USDA NRCS NATIONAL
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PRELIMINARY FINDINGS

STATE PROJECT
SUMMARIES



USDA NRCS Feral Swine Eradication and Control Pilot Program (FSCP)

Alabama Project Summary

Lead Agency: Alabama Soil and Water Conservation Committee



ALABAMA
SOIL & WATER
CONSERVATION
COMMITTEE



Partner agencies (formal contractual partners):

- Alabama Cooperative Extension System
- Auburn University
- University of West Alabama
- Alabama Association of Conservation Districts
- Alabama Media Group

Quick Facts

Lead agency: Alabama Soil and Water Conservation Committee

Location: Wiregrass (Barbour, Coffee, Dale, Geneva, Henry, and Houston Counties), Gulf Coast (Clarke, Conecuh, Baldwin, Escambia, Mobile, and Monroe Counties), and Blackbelt (Greene, Pickens, and Sumter Counties) regions

Congressional districts: 1, 2, 7

Total NRCS investment: \$5.7 million

Participating landowners: 227

Acres impacted: 173,661

Outreach programs conducted: 318

Estimated outreach program reach: 500+

Narrative

With populations reported in nearly all Alabama counties, feral swine cause significant damage to agricultural crops and natural resources throughout the state. For example, 35 percent of Alabama producers responding to a 2022 survey reported the presence of feral swine on their properties during the previous 3 years. Estimates of damage to agricultural crops were \$13 million/year for hay and cotton crops⁴; estimates of crop loss of corn, soybeans, and peanuts was \$21 million/year¹. Feral swine damage can be highly variable from farm to farm and among production fields within farms. Some peanut farmers in southeast Alabama, for example, reported losses of more than 50 percent of their crops soon after planting³. The impacts of feral swine on water quality also can be significant² and pose substantial health risks to humans and livestock.



This FSCP project aimed to significantly reduce or eradicate feral swine populations in targeted watersheds to improve agricultural production and the environment. Watersheds within three project areas (Wiregrass, Coastal Plain, and Blackbelt) were selected based on historically abundant feral swine populations coupled with relatively high percentages of the land based in agriculture production.

Within each project area, local soil and water conservation districts hired a feral swine coordinator to proactively solicit landowners' and producers' participation within designated watersheds where feral swine removal efforts would be concentrated initially. These feral swine coordinators then facilitated meetings between landowners and Animal and Plant Health Inspection Service (APHIS) Wildlife Services field staff to gain access to their properties to trap and eliminate feral swine. This FSCP also provided APHIS Wildlife Services with seventy wireless camera trap systems for

Testimonials

“ The Feral Swine Control Program has literally saved our farm. We began to see feral swine about 8 years ago. Almost overnight our crops, hay land, pastureland, and even our yard were invaded by these destructive animals. We are very grateful for the trapping services and especially the cost-share program that has allowed us to begin trapping the hogs ourselves. A great program. Thanks USDA.”

- Micky Smith,
Sumter County

“ Thanks so much for your help in the cost-share program as it pertained to wild hog control. Dr. Strong and I really appreciate you walking us through the details in partnership with the USDA and Coffee County Conservation District office to help control such a destructive animal. We are already having results!”

- John C. Sims,
Coffee County



Alabama Project Summary (continued)

removing feral swine. During the project, APHIS Wildlife Services provided twenty automated gates, camera systems, and six net traps for use.

To encourage landowners to engage in feral swine removal throughout each project area, a feral swine Conservation Incentive Program (CIP) was created whereby landowners within the project areas could receive a 70 percent rebate on the purchase of either a commercially produced or self-assembled feral swine trap that met stringent guidelines developed by the Alabama Soil and Water Conservation Committee (ALSWCC). The maximum financial assistance was \$12,000 for landowners with more than 1,000 acres and \$6,000 for landowners with less than or equal to 1,000 acres. To participate in the CIP, each landowner first had to complete an in-person or online technical training program on feral swine management developed by the Alabama Cooperative Extension System.

A social and digital media campaign focused first on the counties in the program and then statewide encouraged landowners to participate in the CIP. Statistics from the program showed that the topic of feral swine removal is of significant interest statewide.

ALSWCC provided subcontracts to Auburn University and the University of West Alabama to (1) monitor changes in water quality before and after feral swine removal, (2) assess crop damage using unmanned aerial systems (UAS), and (3) conduct surveys of FSCP participants to measure changes in feral swine damage over time. Results are not yet available, but it is anticipated that these studies will produce information that can be used to improve future feral swine removal efforts and programs.

Research and Project Results

1. As of January 2023, 227 Alabama producers participated in the Conservation Incentive Program and purchased feral swine traps that were used to remove feral swine on 173,661 acres.

2. Using swine molecular source tracking, significant reductions in water quality in streams with feral swine were observed. On average, *E. coli* levels were 17.77 percent greater in streams positively linked to feral swine fecal contamination.

Lessons Learned

1. Use county lines to delineate project area boundaries, not watershed ones, to reduce public confusion regarding project eligibility. Doing so also makes promoting and advertising programs easier when using county boundaries versus watershed boundaries.

2. Use language commonly recognized by the public, such as “rebates” in place of “Conservation Incentive Program” or “cost share.” Using terms that were more commonly known by the public made promoting the program easier.

3. Promote programs using geotargeted (county boundaries) social and digital media ads. Engage professionals when working outside the area of expertise of the project partners. Be willing to adapt and change the message as you learn more about what resonates with the public. Expand geographical areas to capture absentee landowners.

4. Expand the social and digital media campaign outside the targeted project areas to reach absentee landowners once the project area becomes saturated with ads. Interest in managing feral swine was high. During the first 2 months of a 4-month marketing campaign through Alabama’s largest online newspaper and other social media platforms, the click-through rates (percentage of those reached who clicked on the ad to seek additional information) were 0.23 percent (online newspaper) and 6.48 percent (social media). A CTR of 0.1 percent or greater is the industry standard for a successful digital campaign, and a CRT of 2 percent or greater is the industry standard for a successful social media campaign.

5. Communicate regularly and efficiently. Staying on top of communication will help prevent confusion, duplicating work, gaps in the program, etc.

6. Require producers that participate with APHIS Wildlife Services to purchase a trap to ensure continued removal of any feral swine that return to their properties after the initial removal operations are completed.

Other Contributing Agencies

USDA APHIS Wildlife Services
Alabama Wildlife Federation
Alabama Farmers Federation
Alabama Cattlemen’s Association

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⁴McKee, S., A. Anderson, K. Carlisle, and S. A. Shwiff. 2020. Economic estimates of invasive wild pig damage to crops in 12 US states. *Crop Protection* 132:1–12.



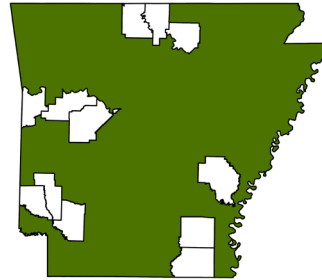
USDA NRCS Feral Swine Eradication and Control Pilot Program (FSCP)

Arkansas Project Summary



**NATURAL RESOURCES
DIVISION**

**Lead Agency:
Arkansas
Department of
Agriculture,
Natural Resources
Division**
(formerly Arkansas Natural
Resources Commission)



Partner agencies (formal contractual partners):

- USDA APHIS Wildlife Services
- University of Arkansas System Division of Agriculture Cooperative Extension Service
- Survey Research Center, University of Arkansas—Little Rock
- Arkansas Association of Conservation Districts

Quick Facts

Lead agency: Arkansas Department of Agriculture, Natural Resources Division
Location: West Arkansas River Valley (Logan, Sebastian, Yell Counties), North Central Ozarks (Baxter, Izard, Marion Counties), Southeast (Arkansas, Ashley, Drew Counties), and Southwest (Howard, Hempstead, Sevier Counties)
Congressional districts: 1, 3, 4
Total NRCS investment: \$3.9 million
Participating landowners: 230+
Acres impacted: 162,848
Outreach programs conducted: 32
Estimated outreach program reach: 3,000

Narrative

Although small feral swine populations have lived in Arkansas for generations, their population has increased dramatically in the past 30 years. Currently, feral swine are present in every county in Arkansas, with populations reported in all but Lonoke, Greene, and Clay Counties¹. Feral swine affect the state's economy and natural resources in ways that are difficult to measure economically and often underrepresent the actual cost of their damages to agriculture and the environment. One recent study found that feral swine cause an estimated \$20 million in damage to commodity crops in the state², but damage to other

properties, landscapes, and ecosystems often are challenging to measure and, therefore, unreported.

The Arkansas Department of Agriculture took the lead role in this FSCP project by facilitating and coordinating the hiring of conservation district field technicians to enhance further removal efforts supported by USDA APHIS Wildlife Services and other partners on the Arkansas Feral Hog Eradication Task Force. Specifically, the goal of this FSCP was to reduce or eradicate feral swine from each of the four pilot project areas, measure the success of these efforts, provide cost-share payments to landowners to incentivize survey responses, conduct outreach and education events within each project area, and evaluate the practical use of unmanned aircraft systems (UAS). To accomplish this goal, ten conservation district technicians were hired to work with USDA Wildlife Services staff to conduct feral swine removal operations. Hiring these technicians provided additional and necessary “boots on the ground” to control feral swine in four well-defined focus areas. These areas included the West Arkansas River Valley (Logan, Sebastian, Yell Counties), North Central Ozarks (Baxter, Izard, Marion Counties), Southeast (Arkansas, Ashley, Drew Counties), and Southwest (Howard, Hempstead, Sevier Counties) regions of Arkansas. Compared to a scattered approach for feral swine removals, focusing efforts in these areas allowed for leveraging resources among several agencies. Although USDA APHIS Wildlife Services was the

Testimonials

“The eradication program has helped my farm tremendously. I grow 20 acres of corn for feed, and this is the first year I've had no damage. Turkey and quail populations have increased as well. This is a very good program that needs to continue.”
- Owen, North Central Ozarks

“Keep up the program so we can keep the pigs out”
- Debbie, North Central Ozarks



Arkansas Project Summary (continued)

agency for feral swine removal, conservation district technicians learned that many landowners needed to be made aware of this agency. Most landowners were familiar with and trusted local agency representatives who live and work in their communities, such as the conservation district technicians, which opened doors to new unreached audiences. Once feral swine were successfully removed from one property, the owner often relayed to their neighbors the benefits of this service, which opened access to adjoining properties. The conservation district technician maintained relationships with landowners even after feral swine were trapped and responded quickly if feral swine reappeared.

A subaward to the University of Arkansas was issued to measure the success of the pilot project. This included conducting telephone interviews with landowners before and after receiving feral swine removal services from conservation district staff and sending mail surveys to landowners adjacent to those receiving trapping services and mail surveys to a sample of landowners in the pilot project areas. Landowners who received conservation district services and agreed to participate in a telephone interview were offered a \$150 cost-share payment. A portion of this grant was also used to evaluate the use of UAVs in estimating feral swine damages in agricultural crops and pasturelands, locating feral swine in real time to facilitate their removal, and assessing populations before and after removal efforts.

Research and Project Results

1. Of those participating in follow-up phone interviews, nearly all landowners (206 of 207) who received feral swine removal services indicated that they were very satisfied with removal efforts and want this pilot project to continue to keep feral swine and their damages low to nonexistent on their land and neighboring properties.
2. Before feral swine removal operations began, participating landowners (n=207) estimated approximately 12,873 feral swine on their properties. This number declined to about 2,500 in a follow-up mail survey a year later.
3. Landowners receiving trapping services by July 2022 (n=166) reported \$877,098 in total damages before feral swine trapping occurred, including losses in commercial crops, livestock, timber, food plots, improved pastures, roads, old fields, stream banks, property, and stored commodities. In a mail survey, a sample of landowners in the broader pilot project areas (n=218) reported \$199,976 in total damages to pastures, commercial crops, timber, wetlands, and recreation/hunting lease lands.
4. Landowners receiving trapping services tended to have more significant feral swine damages to commercial crops, timber, recreational lands, and pasture/hayfields than other landowners within the project areas indicating that conservation district technicians successfully targeted those in need of feral swine removals.

5. When asked how much money would have been lost if feral swine were not removed from their properties, landowners (n=207) who received feral swine removal as part of this project reported approximately \$886,145 in loss avoidance, or approximately \$4,281 per respondent. This figure does not include the surrounding landowners where the same feral swine also cause damage.

Lessons Learned

1. Conservation district technicians effectively gained the local trust and bridged access to private lands for feral swine removals. Landowners were more likely to provide access to someone known in the community. In many instances, conservation district technicians introduced willing landowners to USDA APHIS Wildlife Services who were previously unaware of the service they provide.
2. Coordinating efforts between USDA APHIS Wildlife Services and conservation district technicians worked well for the most part when both agreed to the premise of service to the landowner rather than agency competition. Developing a common metric—such as reducing feral swine damages and landowner satisfaction, combined with the number of feral swine removed, with both agencies receiving credit—would encourage greater cooperation.
3. Implementing a \$150 cost-share to incentivize survey respondents required a number of transactions, which called into question whether the additional workload was worthwhile. A possible recommendation is dropping the cost-share benefit given that the removal service is currently free. Conservation district technicians indicated that free service was more important to landowner participation than the cost-share payment.
4. Conservation district technicians relied on the availability of USDA APHIS Wildlife Services technicians, wildlife officers, landowners, or others in the community to dispatch feral swine, which hampered the efficiency of feral swine removals. It is recommended that alternatives be investigated to improve efficiencies so that conservation district technicians are allowed to dispatch feral swine.
5. Unmanned aircraft systems (UAS), or drones, facilitated trapping strategies in areas where feral swine can be detected quickly, such as large open cornfields. Feral swine were detected best after leaf drop, and colder temperatures provided greater thermal contrast. Drones were useful for assessing agriculture damages, but the ability to detect damages can vary from field to field and may require different lenses for detection.

Arkansas Project Summary (continued)

Other Contributing Agencies

USDA APHIS Wildlife Services
Arkansas Game and Fish Commission
Arkansas Farm Bureau
The Nature Conservancy (Arkansas)
Central Arkansas Resource Conservation and
Development Council
Arkansas Natural Heritage Commission

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USDA NRCS Feral Swine Eradication and Control Pilot Program (FSCPP)

Florida-Georgia Project Summary

Lead Agency: Tall Timbers



Partner agencies (formal contractual partners):

- University of Georgia, Tifton Veterinary Diagnostic and Investigational Laboratory
- University of Georgia, Warnell School of Forestry and Natural Resources

Quick Facts

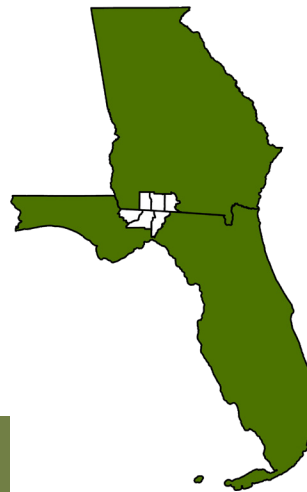
Lead agency: Tall Timbers
Location: Red Hills region
Florida: Jefferson, Leon, Gadsden Counties
Georgia: Brooks, Thomas, Grady Counties
Congressional districts: Florida: 2, 5; Georgia: 2, 8
Total NRCS investment: \$1.8 million
Participating landowners: 87
Acres impacted: 220,000
Outreach programs conducted: 6
Estimated outreach program reach: 200

Narrative

The Red Hills region of northern Florida and southwestern Georgia is situated between the Ochlockonee and Aucilla Rivers. The Aucilla River is designated as a “Florida Outstanding Water” for its intact habitats, rich biodiversity, and relatively clean water.

The Aucilla and Ochlockonee Rivers provide clean, fresh water to the Gulf of Mexico, supporting a large seafood and recreational industry. This region also supports a diversity of land use that includes agriculture, forestry, and large recreational quail-hunting properties.

The Red Hills landscape has been frequently treated with prescribed fire without interruption, harboring tremendous natural resources. Among more than 100 threatened and endangered species present are the last landscape-scale populations of northern bobwhite quail and one of the largest populations of gopher tortoises on private lands.¹ The region also has numerous intact



ephemeral wetlands that support high amphibian diversity. All resources are tied directly to the health of the ground cover vegetation in upland and lowland habitats.

The Red Hills region supports more than 2,200 jobs on private properties. Tall Timbers has a long history of working with land managers and property owners in the region through their advisory work and conservation easement program.

Tall Timbers holds conservation easements on over 137,000 acres in the Red Hills region, which is nearly half of the properties. Other protected lands include a Georgia Department of Natural Resources (GADNR) wildlife management area, conservation easements held by other organizations, and conservation lands along the Aucilla River held by the Suwannee Water Management District.

Within the Red Hills region, feral swine have increased over the last 30 years and are now found throughout the region, causing significant damage to bottomlands, watersheds, ephemeral ponds, upland native ground

Testimonials

“ I really like working with my assigned trapper and talking to someone that is well versed in hog control. The trapping program has been very successful, and I would like to see it continue because we’ll likely never eradicate the hogs.”

- Warren Bicknell,
Thomas County,
Georgia

“ I had \$180,000 in damage/year prior to the trappers. They removed over 350 hogs, and I’ve had no damage since they started trapping.”

- Travis Sherman,
Leon County, Florida



Florida-Georgia Project Summary (continued)

cover, and agricultural crops. Damage by feral swine has been significant in bottomland forests, forested drains, and along major lakes, such as Lakes Iamonia and Miccosukee.

Some large properties along the Ochlocknee River have extensive feral swine damage to crops and drainage systems to the point where almost no drain has an intact ground cover. During rain events, this ground disturbance impacts water quality, especially turbidity and nutrient loads in tributaries to the rivers. In addition to damaging fragile ecosystems, feral swine have disrupted wildlife, such as wild turkey and white-tailed deer, resulting in range-wide declines of both species.

The overarching goal of the Florida-Georgia FSCP pilot project was to establish a feral swine removal program on a landscape scale (hundreds of thousands of acres) to substantially reduce or eradicate local feral swine populations and to train landowners on how to be self-sufficient in maintaining low feral swine densities to ensure long-term sustainability of removal efforts.

Tall Timbers established a trusted working relationship within this community, which was critical for implementing a project of this magnitude. Leveraging their landowner relationships, Tall Timbers staff continually solicited, secured access to, and coordinated landowner participation in feral swine removal operations conducted by USDA Wildlife Services. They also collected damage data from participating landowners for the National Damage Assessment Program. To facilitate the long-term sustainability of removal operations, Tall Timbers developed several workshops to train landowners in best management practices (BMP) for feral swine removal as well as a mobile phone application (Hog Havoc) for reporting feral swine and damage.

To monitor and evaluate the outcomes of feral swine removal efforts, Tall Timbers conducted several research studies. Changes in the abundance of native wildlife were monitored using systematic camera surveys on many of the project sites. Water quality was evaluated using feral swine-specific environmental DNA (eDNA) within the context of removal operations by USDA Wildlife Services. These studies also included monitoring feral swine numbers and changes in physical land damage caused by feral swine.

Many of these studies were still in progress at the time of this report. The reported results are preliminary unless otherwise noted.

Research and Project Results

1. More than 87 percent of landowners in the 400,000-acre Red Hills region participated in the project, providing trappers access to approximately 71 different properties. This level of landowner participation indicates the unity and support among landowners for feral swine removal.
2. One hundred fifty-one game cameras were installed across nine properties within the Red Hills region. Preliminary results from the 638,058 images indicate

a noticeable reduction in the amount of feral swine damage on these properties. Additional data analyses of these images are being conducted to examine the impacts of feral swine on native wildlife and habitats.

3. Fourteen feral swine within the project areas were fitted with GPS collars. Data showed that home ranges varied between 1,000 and 3,000 acres, and multiple sounders used the same resting sites, which were typically areas where fire had been suppressed, resulting in dense overhead cover.

Lessons Learned

1. In some cases, we observed a decline in *E. coli* levels in water bodies sampled on some properties, but this decline may or may not have been a direct result of feral swine removal. The difficulty in observing a cause-and-effect relationship was likely due to our detection ability using swine eDNA and varying water levels resulting from rainfall or drought. Future monitoring efforts should consider the likelihood of current swine eDNA markers to detect actual feral swine presence in an area.

2. Permanent funding for this project will be imperative to its success. Due to the relatively short-term nature of this pilot project, turnover among cooperator staff (e.g., USDA Wildlife Services operations staff) was high, resulting in significant challenges in developing and maintaining working relationships with landowners.

Other Contributing Agency

USDA APHIS Wildlife Services

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USDA NRCS Feral Swine Eradication and Control Pilot Program (FSCP)

Georgia Project Summary



FLINT RIVER
SOIL AND WATER
CONSERVATION DISTRICT

**Lead agency:
Flint River Soil
and Water
Conservation
District**

*Partner agencies (formal
contractual partners):*

- USDA APHIS Wildlife Services
- University of Georgia, Warnell School of Forestry and Natural Resources
- The Jones Center at Ichauway
- University of Georgia, Tifton Veterinary Diagnostic & Investigational Laboratory

Quick Facts

Lead agency: Flint River Soil and Water Conservation District

Location: Calhoun County

Congressional district: GA-002

Total NRCS investment: \$2.0 million

Participating landowners: 12

Acres impacted: 63,000

Outreach programs conducted: 3

Estimated outreach program reach: 63

Narrative

Southwest Georgia is the epicenter of Georgia's top industry—agriculture. Most of the state's crops that designate Georgia as a top producer in the country are grown in this region. These include cotton, corn, peanuts, and pecans. The annual farm gate value of the region is approximately \$2 billion per year, with a larger economic impact of approximately \$16 billion per year². Unfortunately, farmers have become increasingly concerned by the growing prevalence and damage caused by feral swine. According to a 2014 University of Georgia study, feral swine caused an estimated statewide loss of \$98 million per year in crops with an additional \$51.7 million per year in noncrop property damage¹. Row crops and vegetables are not the only economic sectors affected. Forestry, another industry in which Georgia leads the nation in production, is also negatively affected by the presence of feral swine. The majority of Georgia's pecan production acreage is located in the project area of southwest Georgia.



The Flint River Soil and Water Conservation District (FRSWCD) is a state agency based in southwest Georgia and comprised of nine counties where district supervisors and staff have a strong reputation and trust among farmers and landowners. Actively engaging landowners and farmers was a critical component of project success. Because of this established trust, the FRSWCD and its partners could coordinate and communicate effectively with local participants to ensure successful project implementation. The overarching goal of this FSCP pilot project was to effectively reduce feral swine populations through a collaborative and replicable pilot project. This included reducing crop depredation and costs to agricultural producers, enhancing water quality, improving soil health, increasing native wildlife populations, and restoring aquatic and terrestrial habitats through a landscape-scale approach rather than a patchwork of control efforts across the watershed. Unlike other project designs, the FRSWCD focused its efforts on a select group of twelve adjoining landowners/farmers totaling approximately 63,000 acres. These acres are within a watershed where feral swine were removed by USDA Wildlife Services staff through aerial control or a combination of aerial and ground trapping control. Within the 63,000 acres, a core of 26,000 acres was focused on for research efforts monitoring and evaluating impacts of feral swine removal. As the lead agency for this pilot project, the FRSWCD coordinated all partner efforts and project implementation and took the lead in introducing and facilitating access to farmer properties for USDA

Testimonial

“ Truly effective control is a full-time job; time and resources required make this prohibitive for us. We have seen a direct benefit to our operation through this collaborative approach in our area working with our neighbors, the Flint River SWCD, and USDA-APHIS to implement truly effective control efforts across a large area.”
- Adam McLendon,
Calhoun County



Georgia Project Summary (continued)

APHIS Wildlife Services to conduct removal operations. The FRSWCD has also facilitated coordination and collaboration between all partnering agencies. To ensure the long-term sustainability of efforts, the FRSWCD conducted comprehensive outreach, including in-person workshops, participant meetings, and an array of digital outreach materials hosted on georgiaferalswine.com.

Monitoring and evaluating the impacts of feral swine removal was accomplished through subawards with the University of Georgia Warnell School of Forestry and Natural Resources, Tifton Veterinary Diagnostics and Investigational Laboratory, and The Jones Center at Ichauway. These investigations included monitoring feral swine before, during, and after removal operations by USDA Wildlife Services, conducting water quality analyses, tracing *E. coli* water sample sources, evaluating the efficacies of feral swine removal techniques, quantifying crop damage using unmanned aerial systems (UAS), measuring the impacts of feral swine on native wildlife populations within the project area, assessing efficacy of Judas pig monitoring through GPS data, and collecting damage data from participating landowners for the National Damage Assessment Program. Many of these studies were still in progress at the time of this report; the following results are preliminary unless otherwise noted.

Research and Project Results

1. Project participants reported an average 77.5 percent decrease in feral swine damage from 2020 to 2021. Additional 2022 crop year data analyses will be conducted to examine this likely continued trend.
2. A core area of the project was gridded with 147 camera traps recording half a million images over 2 years to examine interactions between feral swine and native wildlife. This data will be used to estimate feral swine populations and the resulting impacts of feral swine removal on native wildlife species.
3. Referred to as the Judas technique, feral swine are captured, released with a GPS collar, and monitored to know when they locate other feral swine for subsequent removal. Of thirteen feral swine released with GPS collars thus far, it took approximately 34 days before they were observed with another group of feral swine.
4. The yearly average percentage of water samples containing *E. coli* traced to feral swine varied throughout the project period ranging from 18 percent in 2020 to 14.8 percent in 2021 and 21.2 percent in 2002. However, it is important to note that these preliminary results have not considered factors such as precipitation and weather, the timing of samples, feral swine population estimates, or removal efforts.
5. Continuous water-quality sensors that collect temperature, conductivity, and turbidity measurements in 15-minute intervals were installed in January 2022 in three locations with varying feral swine removal efforts. Spikes in turbidity were observed during periods of stable flow, and rapid changes in conductivity at some

spikes appeared useful in separating flow-induced changes in turbidity from those of presumed feral swine activity. Through high- and low-flow conditions, the site with the least removal effort had the greatest average and most variable turbidity.

Lessons Learned

1. Due to the diverse array of partners involved in this project, monthly check-in calls were immensely valuable in providing an opportunity for alignment across all facets of the project and creating an opportunity for collaboration among various aspects of project research. Likewise, annual meetings with participating landowners facilitated greater stakeholder engagement and the ability to maintain buy-in and awareness of project activities.
2. Mini conferences of pilot projects may be a good idea for more in-depth facilitated meetings to understand where there may be overlap or opportunities for collaboration. Periodic meetings with the nearby Florida FSPC project provided opportunities to share ideas and collaboration.
3. There are several local efforts around feral swine control in our region. Ensuring that local technical service providers have clear information and aligned language on effective feral swine control is critical. A more concerted and expanded effort is needed across our region, including working with other organizations and technical services providers, such as local NRCS field offices, to ensure consistent and shared messaging to local landowners.
4. This project targeted control efforts in a contiguous land base beginning with a core area and moving outward to enroll additional acreage and properties into the project. Rather than opening landowner sign-up across a watershed, which results in a patchwork of small, spatially inconsistent control areas, the targeted approach for selecting an area on which to focus removal operations allowed for intensive control in one large contiguous area.

Other Contributing Agencies

McLendon Acres, Inc.
University of Georgia Cooperative Extension
Georgia Department of Natural Resources
Georgia Department of Agriculture

Contact for More Information

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¹Mengak, M. T. 2015. Georgia wild pig survey final report. Warnell School of Forestry and Natural Resources Outreach Publication 16–23, Athens, Georgia, USA.

²University of Georgia Center for Agribusiness and Economic Development. 2018. Georgia farm gate value report 2017. University of Georgia Center for Agribusiness and Economic Development, Athens, Georgia, USA.



USDA NRCS Feral Swine Eradication and Control Pilot Program (FSCP)

Hawaii Project Summary



Lead Agency:
**State of Hawaii/
Department of
Land and Natural
Resources/Division of
Forestry and Wildlife**

Partner agencies (formal contractual partners):

- Ko'olau Mountains Watershed Partnership
- Oahu Resource Conservation and Development Council
- Windward Oahu Soil and Water Conservation District
- University of Hawaii Department of Natural Resources and Environmental Management



In addition to reducing damage to agricultural producers, the Hawaii FSCP addressed feral swine impacts within the higher-elevation forests of the Ko'olau Mountains, which supply groundwater for approximately 90 percent of the population on the island of Oahu¹. As the island's main source of fresh water, groundwater recharge is the most valuable product produced by the Ko'olau forests, providing approximately 364 million gallons of water per day with a net present value of at least \$1.42 to \$2.63 billion¹. Unfortunately, groundwater levels in aquifers such as the Pearl Harbor aquifer have declined by half since 1910. This is the most important aquifer in Hawaii for municipal use. Protecting it and others from further decline is an utmost priority for Hawaii's sustainability.

Testimonials

“ There was an overall reduction in crop damage and evident decrease in pig presence. There is no irrigation or crop damage in any fields currently.”
- Mahiku Farms,
Honolulu County

“ Not a significant decrease in presence and damage; however, less plants have had their irrigation tubes pulled out, which is usually caused by pigs, and therefore the damage and presence has decreased slightly.”
- Contemporary Landscaping,
Honolulu County

Quick Facts

Lead agency: Hawaii Division of Forestry and Wildlife
Location: Winward, Oahu
Congressional district: 2
Total NRCS investment: \$870,000
Participating landowners: 9
Acres impacted: 395.7
Outreach programs conducted: 1
Estimated outreach program reach: n/a

Narrative

Feral swine are identified as a major nuisance in Hawaii across all landscapes. They directly reduce the quantity and quality of native forests, negatively impact water quality, and damage agricultural crops.

The FSCP project was developed to reduce the impacts of feral swine on agricultural producers within the lower elevation areas of the Windward Oahu Soil and Water Conservation District (SWCD), a region dominated by small, diverse farming operations. Most of the agricultural production in this area consists of nurseries, kalo, papaya, ulu, cacao, and a diverse array of row crop vegetables, including greens, corn, and tomatoes. There is also a scattering of livestock production, mainly cattle and horses. Most of the farms in this area are small, roughly 5 to 10 acres in size, with approximately 75 percent leased from one of the multiple large landowners in the area.

Although feral swine are a significant nuisance in Hawaii, they are classified as a big game animal and have a long-established cultural and recreational value to many Hawaiians^{2,3}. The Hawaii Department of Land and Natural Resources Division of Forestry and Wildlife (DOFAW) is therefore tasked with reducing feral swine populations to reduce damage and managing feral swine in specified areas for recreational and cultural use.



Hawaii Project Summary (continued)

Unlike other FSCPs, meat salvage and food security are often an issue when DOFAW interacts with the public. As such, a major component of the Hawaii FSCP project was to engage local hunters and trappers in the removal of feral swine as a means to ensure proper meat salvage and alleviate concerns from this stakeholder group regarding FSCP goals and activities. The Hawaii FSCP was organized and implemented into two distinct phases. Phase one focused on feral swine removal from agricultural lands. Phase two targeted feral swine removal from higher-elevation mountain forest areas.

Most phase one participants were identified by the Oahu Soil and Water Conservation District staff. Once removal operations by the Animal and Plant Health Inspection Service (APHIS) Wildlife Services were successful, traps and maintenance activities were transitioned to local community/landowner groups to ensure that trapping and meat salvage was maintained. Phase two began at this point.

As FSCP project leader, DOFAW staff took the lead role in overall project coordination and conducted producer assessments. The DOFAW, the Oahu Resource Conservation and Development Council, Pono Pacific, and the SWCD engaged local hunter groups to facilitate meat salvage during phase one operations. The University of Hawaii College of Tropical Agriculture and Human Resources was contracted to provide technical consultation on monitoring protocols and data analyses.

Research and Project Results

1. Some properties were easier to determine the amount of total damage to crops. Mahiku farms reported the greatest amount in crop recovery and improvement and overall revenue return. Before removal operations, overall damage by feral swine was estimated at \$30,000. Trapping has reduced damage by an estimated 90 to 100 percent on the farm. No fields or irrigation are currently being affected, and all fields are currently viable and in use.

2. According to all landowners involved in this project, the overall presence of feral swine has decreased in the year since removal operations began. Whereas some landowners noticed more of a decrease than others, they all stated that there had been a noticeable decrease in both presence and crop damage.

3. Trapping on farms was challenging due to available agricultural food sources that attracted feral swine to numerous sites throughout the properties. Farmers cooperated in allowing the use of damaged or discarded crops that feral swine were accustomed to eating to be used as baits; this enhanced trapping success.

4. There were many similarities in behavior among feral swine captured on all properties. Although many feral swine reacted negatively to trapping, several outliers seemed to be tamed and acquainted with human presence. This behavior was likely due to farmers or neighbors feeding feral swine, allowing them to become accustomed to humans.

5. Each area on each farm should be evaluated to determine which trap type (box or corral) will have the greatest impact and benefit to the farmer. (For example, the average cost of a box trap was \$275 whereas a corral trap was \$450.) Although there is a higher initial cost and more labor involved in building and installing a corral trap, the number of feral swine caught over an equal amount of time is greater than that of a box trap; however, box traps are easier to transport, take up less area, and have a lower initial cost to build.

Lessons Learned

1. Clear communication, coordination, and cooperation among all the agencies, landowners, and hunters involved in this FSCP was critical. We learned how to better manage personnel time by effectively rotating trapping technicians along with the timing and duration of trapping efforts among several properties throughout the island. These actions increased our collective effectiveness in removal operations. Coordination of shared responsibilities among agencies allowed us to overcome many of the logistical challenges of servicing several properties in a timely manner.

2. Several difficulties were encountered when attempting to coordinate the salvage of meat from feral swine during removal operations. For example, it was difficult to find hunters who were available in the middle of the day to come and take feral swine that were removed by agency personnel. Moreover, some people did not have a place to butcher the animals they received and to properly dispose of carcasses; this subsequently discouraged their participation. A solution to this problem may be to offer facilities for hunters or the public to butcher and discard animal waste.

3. Throughout the process of learning to construct both box and corral traps, several aspects of trap building were learned to improve the overall efficiency and effectiveness of each trap type. For example, an entire piece of feral swine panel should be used to construct a single box trap, thereby preventing weak points in the trap. Reusing panels on corral traps allows for greater flexibility in moving corral traps from one trapping site to the next.

4. We learned the benefits and disadvantages of hinge or pin triggers and how to manipulate the sensitivity of these trigger mechanisms. We found that using static braided fishing line to set the trigger system was the most effective method as it can be set to the right amount of sensitivity. On farms with a large presence of



Hawaii Project Summary (continued)

nontarget animals, such as chickens and peacocks, we learned that a trigger set too lightly may result in traps being inadvertently closed by these animals.

Other Contributing Agencies

USDA APHIS Wildlife Services
Oahu Resource Conservation and Development Council
Turtle Bay Resort/Kuilima Farm
Kamehameha Schools, Punalu'u
First Presbyterian Church of Hawaii (FPC), Ko'olau
Kāko'o 'Ōiwi
Ohulehule Forest Conservancy Lands
Honolulu Board of Water Supply Lands
Kualoa Ranch Lands
Waiahole Forest Reserve
Kawainui Marsh State Wildlife Sanctuary
Kaluanui Natural Area Reserve
Waiamalo Forest Reserve

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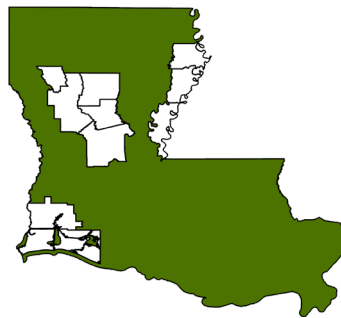


USDA NRCS Feral Swine Eradication and Control Pilot Program (FSCP)

Louisiana Project Summary



Lead Agency:
Louisiana
Department
of Agriculture
and Forestry,
Office of Soil
and Water
Conservation



Partner agencies (formal contractual partners):

- Red River Soil and Water Conservation District
- Natchitoches Soil and Water Conservation District
- Dugdemona Soil and Water Conservation District
- Grant Soil and Water Conservation District
- Rapides Soil and Water Conservation District
- Tensas-Concordia Soil and Water Conservation District
- Madison Soil and Water Conservation District
- Gulf Coast Soil and Water Conservation District
- Louisiana State University AgCenter

Quick Facts

Lead agency: Louisiana Department of Agriculture and Forestry

Location: Red River, Natchitoches, Winn, Grant, and Rapides Parishes (priority 1); Madison, Tensas, and Concordia Parishes (priority 2); Cameron and Calcasieu Parishes (priority 3)

Congressional districts: 3, 4, 5

Total NRCS investment: \$3.4 million

Participating landowners: 454

Acres impacted: 150,000

Outreach programs conducted: 8

Estimated outreach program reach: n/a

Narrative

At an estimated population of 700,000 to 900,000 and increasing, feral swine are present in all 64 Louisiana parishes, causing significant damage to agriculture. A 2022 Louisiana State University Ag Center report estimated direct damage to agriculture by feral swine at \$91.1 million in 2020². Damage to rice alone was approximately \$13 million.

Feral swine also pose a significant risk to Louisiana's vast network of waterways, bayous, wetlands, and riparian areas. The destructive feeding behavior of feral swine rooting in moist soil in search of roots, tubers, and invertebrates destroys native plant communities, damages soil quality, and causes erosion. They also may induce the spread of invasive plant species by creating disturbed areas that favor establishment of highly competitive invasive species over native species. In these areas, feral swine often cause increased bacterial contamination in the form of *E. coli* and other pathogens.

Testing of feral swine by APHIS Wildlife Services, the US Geological Survey Wetland and Aquatic Research Center, and the Louisiana Department of Wildlife and Fisheries (LDWF) indicated increased incidences of pseudorabies, vesicular stomatitis, leptospirosis, and swine brucellosis¹. LDWF surveillance testing of more than 1,000 feral swine statewide revealed that 5 percent were serologically positive to swine brucellosis. Moreover, the survey showed that during

Testimonials

“ When trapping on my property began in 2021, I had already lost approximately 40 acres of planted corn to feral hogs. Throughout the remainder of 2021, almost 100 hogs were trapped and removed. With continued trapping, there was no known damage on my property by the end of planting this year (2022). ”

- Karlton Methvin,
Natchitoches Parish

“ After hearing about the feral hog trapping efforts from the Madison Soil and Water Conservation District, I reached out to Justin and let him know I needed any help they could provide. Within the 2 years of trapping, they have trapped over 400 hogs, and my deer population is finally on the rise. ”

- Jim Brown,
Madison Parish



Louisiana Project Summary (continued)

the 2019–2020 hunting season, more than 200,000 feral swine were harvested strictly by hunters. This did not include feral swine removed by agencies, professional trappers, or farmers.

The Louisiana Department of Agriculture and Forestry's Office of Soil and Water Conservation and its districts and the USDA Natural Resources Conservation Service (NRCS) have a working partnership of 70-plus years. Their common purpose is to encourage, plan, and deliver technical and financial assistance to private landowners, government agencies, and others for natural resource conservation.

Working with NRCS, the Louisiana FSCP identified and began the pilot project in three priority areas, respectively: (1) Red River, Natchitoches, Winn, Grant, and Rapides Parishes; (2) Madison, Tensas, and Concordia Parishes; and (3) Cameron and Calcasieu Parishes. Feral swine reduction and eradication activities on these private and public lands were synchronized for maximum effectiveness.

The overarching goal of this FSCP was to reduce or eliminate feral swine damage using the existing conservation partnership's network, stakeholder engagement, and delivery and reporting system to reduce damage to agriculture and native ecosystems while protecting human and animal health.

Local SWCD staff within each priority area were tasked with the following actions: conduct pre-activity and damage assessment surveys on private lands; develop area-wide protocols for prioritizing/delivering technical assistance; coordinate enrollments and activities for pre-baiting/trapping; assist in coordinating APHIS Wildlife Services operations with landowners; collect damage data from participating landowners for the National Damage Assessment Program; conduct post-activity stakeholder surveys; and conduct follow-up natural resource damage assessments.

Research and Project Results

1. With the cooperation and financial assistance of LDAF, the Louisiana State University AgCenter designed and mailed out a custom survey to 6,000 agriculture producers throughout Louisiana. The survey collected information about feral swine damage through the 2020 calendar year. More than 1,200 surveys were returned; of these, over 950 respondents stated they owned or managed agricultural land totaling 659,887 acres, of which approximately 50 percent was cropland.

2. Of the 950 respondents, 70 percent stated that feral swine interfered in some way with their farming operations in the past year; this included over 60 percent with crop damage and almost 80 percent with negative impacts to their local wildlife habitats.

3. Statewide, an estimated loss of \$66.2 million in agricultural land and \$24.9 million in nonproduction land was attributed to feral swine in 2020. Production loss estimates for 2020 included over \$14 million in sugar cane, over \$13 million in rice, and over

\$9.3 million each for soybeans, corn, and hay. Nonproduction damage costs included more than \$5 million to replant and restore pastures, more than \$4 million to repair drains/levees, and more than \$2 million to redisk.

4. Respondents' preferred methods of feral swine removal were hunting/shooting (33 percent) and trapping (31.6 percent).

Lessons Learned

1. Environmental conditions, such as soil type, vegetation, and microclimate, had to be considered when placing traps as did the type of trap to use to maximize the likelihood of capturing feral swine. For trappers working during hotter summer months, placing traps near a water source and/or a hardwood bottomland area was the key to capturing feral swine.

2. Continuous-catch feral swine traps using netting material (as opposed to metal panels) proved to be both cost and labor efficient for trappers, especially in areas with dry ground.

3. Avoidance of nontarget animals (e.g., black bears) presented significant challenges when attempting to capture feral swine in areas where both species were present. In some cases, feral swine removal was not possible.

4. Care should be used when selecting trap locations so that curious passersby not part of the removal operation do not interfere with the trapping process. Using appropriate visual screening (e.g., sufficient distance from the road to allow natural vegetation to screen the trap from view) was critical.

Other Contributing Agencies

USDA APHIS Wildlife Services
USDA Forest Service
U.S. Geological Survey
USDI Fish and Wildlife Service
Louisiana Department of Wildlife and Fisheries
Louisiana Office of State Parks
National Wild Turkey Federation
Ducks Unlimited
Louisiana Landowners Association

Contact for More Information

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²Salassi, M., M. Carter, and G. Gentry. 2022. Economic impact of feral swine damage to agricultural lands in Louisiana. Louisiana State University, Louisiana State University AgCenter, Baton Rouge, Louisiana, USA.

USDA NRCS Feral Swine Eradication and Control Pilot Program (FSCP)

Mississippi Project Summary

Lead Agency: Delta Wildlife



Partner agencies (formal contractual partners):

- Mississippi Soil and Water Conservation Commission
- Mississippi Department of Agriculture and Commerce
- Mississippi State University

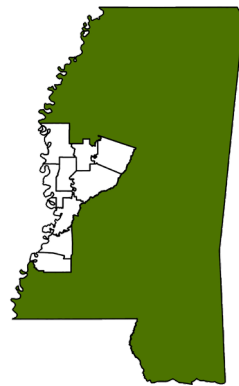
Quick Facts

Lead agency: Delta Wildlife
Location: Claiborne, Holmes, Humphreys, Issaquena, Jefferson, Sharkey, Washington, Warren, and Yazoo Counties
Congressional district: 2
Total NRCS investment: \$3.0 million
Participating landowners: 127
Acres impacted: 237,911
Outreach programs conducted: 10
Estimated outreach program reach: 150

Narrative

The nine-county area of this FSCP project in the Mississippi Delta is one of Mississippi's most productive row crop agricultural areas. However, this area also holds some of the highest feral swine populations in the state. Feral swine cause tremendous amounts of damage by consuming and trampling crops and rooting and wallowing in crop fields. Rooting and wallowing cause crop loss and create holes and ruts that can damage farm equipment, endanger equipment operators, compact soils, and cause soil erosion³. The crop loss due to feral swine in Mississippi exceeds \$20 million annually and is largely comprised of damage to corn, soybeans, cotton, and rice^{1,2}.

The purpose of the Mississippi Delta FSCP was to reduce feral swine populations and the economic damage they cause to agriculture, forestlands, wetlands, wildlife, private property, and other



associated infrastructure in the project area. As the lead organization of this FSCP, Delta Wildlife coordinated a multipartner approach to reduce feral swine damage. The effort included direct technical assistance and feral swine removal support to landowners, farm operators, and farm managers; support to existing feral swine management activities by Animal and Plant Health Inspection Service (APHIS) Wildlife Services; implementation of an outreach program to educate producers on feral swine removal techniques; and establishment of a long-term trap loan program to sustain feral swine trapping efforts after the formal project ends.

Landowners in the project area who had feral swine damage were identified through local soil and water conservation district offices. A Mississippi Association of Conservation Districts project coordinator then interviewed these landowners to document damages and assign priority for management activities. Delta Wildlife staff worked directly with farm operators and

Testimonials

“ Thanks to the feral hog program with Delta Wildlife, our farm, recreational properties, and the South Delta are better places to live and work. [Delta Wildlife] are instrumental in helping us control feral pigs throughout the year, especially in our busiest times—planting and harvesting.”
- Jeffrey Mitchell, Sharkey and Issaquena Counties

“ We have seen a tremendous difference in our property since Delta Wildlife began trapping pigs for us. After removing well over 100 pigs, rooting in our food plots has been minimal, we have better-quality deer hunting, and we have had the best turkey hatch in several years.”
- Bill Link, Yazoo County



Mississippi Project Summary (continued)

managers to implement removal activities. Damage caused by feral swine was documented prior to and for 1 year after trapping operations to estimate the economic return on damage reduction; data was analyzed by researchers at Mississippi State University.

This FSCP project directly supported existing APHIS Wildlife Services feral swine management activities in the project area. APHIS Wildlife Services already had agreements with several landowners in the project area to conduct aerial gunning, night shooting, and trapping with existing resources not part of this FSCP project. However, the number of APHIS Wildlife Services staff in the project area was insufficient to actively trap all the areas where trapping was needed. Therefore, Delta Wildlife field staff assisted APHIS Wildlife Services with trapping efforts as needed within the project area and as assigned by the APHIS Wildlife Services Mississippi feral swine program coordinator.

The education of landowners regarding feral swine management and proper trapping techniques was equally as important as removing feral swine and reducing economic damage. Under the leadership of the Mississippi Department of Agriculture and Commerce (MDAC), educational materials used in outreach programs were produced by Mississippi State University and the Mississippi Department of Wildlife, Fisheries, and Parks. Furthermore, MDAC hosted several in-person feral swine management and trapping seminars while Delta Wildlife field staff provided additional one-on-one field training with landowners to facilitate continued feral swine removal by landowners after the FSCP project ends.

Research and Project Results

1. As of January 2023, 128 landowners enrolled 170,312 acres in the original four-county project area, and an additional 69,322 acres have been enrolled in the five-county expansion project area at the time of this report.
2. Mississippi State University researchers are examining landscape features of the Mississippi Delta that may serve as predictors of areas where high levels of feral swine activity are likely to occur. Results from this study will be useful in guiding future removal activities.
3. Detailed field-level data regarding trapping input costs are being recorded to develop an accurate assessment of actual removal, ultimately benefiting landowners interested in trapping feral swine.
4. The trap loan program will begin in the last quarter of the FSCP project's final year. Landowners will be able to access traps through Delta Wildlife or their local soil and water conservation districts.

Lessons Learned

1. Clear and detailed standard operating procedures (SOP) and guidelines for all trappers working on the project were instrumental in consistently achieving positive results in a multicounty area. The development of SOPs allowed new hires to assimilate into the operation and significantly reduced training time.
2. Streamlined record keeping of trap inputs and efforts by field technicians/trappers was difficult in the beginning due to the volume of trapping operation data being collected. To remedy this, an app was created for the technicians to use in the field to collect trapping and effort data for future analysis.
3. Building trust with landowners was important, especially in new areas. Literature detailing the trapping process, friendly and knowledgeable technicians, good communication, and professionalism garnered strong working relationships with landowners. Seasonal access can be problematic without a trusting relationship with property owners, as they do not want the trapping process to impose on recreational activities.
4. Strong partnerships were key to the success of this FSCP project. It was important to clearly identify roles and responsibilities for all components of the project, have a timeline for implementation, and have contingencies in place for dealing with obstacles along the way.

Other Contributing Agencies

USDA APHIS Wildlife Services
Mississippi Department of Wildlife Fisheries and Parks
Mississippi Association of Conservation District

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USDA NRCS Feral Swine Eradication and Control Pilot Program (FSCCP)

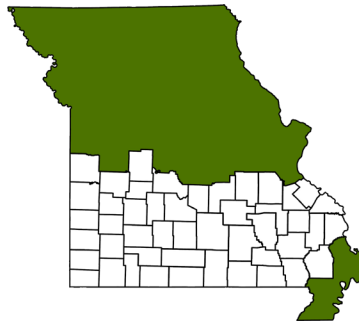
Missouri Project Summary



Lead Agency: Missouri Department of Conservation

Partner agencies (formal contractual partners):

- USDA Animal and Plant Health Inspection Service (APHIS) Wildlife Services
- University of Missouri Extension
- Soil and Water Conservation Districts
- Natural Resources Conservation Service (NRCS)



Since its inception, MFHEP has been extremely effective at reducing feral swine damage and distribution within the state. A recent study found that MFHEP prevented an estimated \$24.9 million in agricultural production damage from 2016 to 2019. MFHEP also has been effective in developing and adopting policies to curtail feral swine recreational hunting, which was one of the primary causes of feral swine spread throughout Missouri.

In 2016, the Missouri Department of Conservation and the Army Corps of Engineers closed lands under their respective jurisdictions to feral swine hunting to reduce hunter incentives to move and release feral swine on these lands. Similarly, the U.S. Forest Service closed the Mark Twain National Forest to feral swine hunting in late 2019. In 2020, the National Park Service followed suit, closing the Ozark National Scenic Riverways to feral swine hunting. In May 2021, the Missouri legislature passed HB 369, which made it illegal to transport, release, or possess feral swine; the bill included more substantial penalties, further discouraging feral swine movement.

Testimonials

“As of now, we haven't had any hogs for 6 months. Trappers have killed approximately 50 hogs on our place in 3 or 4 years. Trappers did a good job.”
- N., Madison County

“We are making progress so far this year. We have seen less signs of hog damage than ever. Keep the FHEP well funded and the pressure on, or we could lose 10 years of hard work in 1 year.”
- D., Reynolds County

“Appreciate all that MDC and the Feds are doing. Keep it up.”
- L., Bollinger County

Quick Facts

Lead agency: Missouri Department of Conservation

Location: Southern third of Missouri

Congressional districts: 4, 7, 8

Total NRCS investment: \$3.4 million

Participating landowners: 1,627

Acres impacted: 4,667,358

Outreach programs conducted: 65

Estimated outreach program reach: 608

Narrative

In 2016, feral swine were estimated to occur in 459 watersheds across southern Missouri, encompassing 11.2 million acres, with producers incurring production losses of approximately \$486,000/year¹. In response to this growing spread of feral swine, the Missouri Feral Hog Elimination Partnership (MFHEP) was established to eradicate systematically this growing threat to agriculture and natural resources.

MFHEP is a partnership among fifteen state and federal agencies and agriculture and conservation NGOs to eliminate feral swine from public and private lands throughout Missouri. MFHEP is unique compared to other states in that partnering agencies adopted an incident command system (ICS) approach to facilitate increased effectiveness and efficiency and ensure accountability.



Missouri Project Summary (continued)

Although MFHEP experienced many early successes, feral swine populations were still present in approximately 190 watersheds encompassing approximately 4.5 million acres in the state. As such, FSCP funding provided much-needed support at a critical time in MFHEP's strategic approach toward eradicating feral swine in the state.

FSCP funding was allocated to three projects to strategically and systematically eliminate feral swine populations. FSCP funding aided in the following ways: (1) replacing equipment and supplies used by MFHEP staff to eliminate feral swine; (2) purchasing loaner equipment for landowners in the pilot project area to repair lands damaged by feral swine; and (3) conducting landowner engagement and technical training programs to empower landowners to eliminate feral swine beyond the duration of the pilot project. FSCP funding was used to assist trappers needing UTVs, trailers, etc. The funds also were used by county Soil and Water Conservation Districts (SWCD) to purchase no-till drills, offset discs, harrow carts, cultipackers, and a soil pulverizer, which they loaned to landowners to fix damage caused by feral swine.

Four specialists from the University of Missouri Extension System received funding to provide educational support throughout twenty-seven southern and southeastern Missouri counties. The outreach educators were tremendously beneficial in establishing relationships at county levels with groups such as farm bureaus, cattlemen's associations, SWCDs, county commissions, and many others. The educators built relationships with landowners in areas where feral swine are endemic. They established landowner co-ops and assisted in signing up additional landowners for participation. In Carter County alone, the educator signed up participants equating to an additional 30,000 acres of private land, which has made our aerial operations much more efficient.

Research and Project Results

1. Since 2016 there has been a 60 percent reduction in watershed occupancy of feral swine throughout their range in Missouri. Feral swine have been completely eliminated from one of six elimination areas (the western portion of the Lakes Region FSCP project areas). This area encompasses 1.4 million acres in portions of eleven counties in southwest Missouri. Moreover, the total number of feral swine removed by MFHEP staff has declined sharply since 2020, likely indicative of reduced populations within the project areas.

2. Developing "field maps" data collection and management system increased the efficiency, coordination, and data integrity among partnership trappers from different agencies. Law enforcement officers could also access the data to aid in patrol and enforcement efforts.

3. Partnering with the USDA APHIS National Wildlife Research Center, MFHEP used genetic-based research to identify fifteen distinct feral swine populations in Missouri resulting from inter- and intrastate movement.

4. Use of unmanned aircraft systems (UAS) greatly improved the efficiency and effectiveness of aerial removal operations, particularly in removing the last remaining feral swine in one of the project watersheds.

5. Social network analysis of MFHEP provided a quantitative assessment of participants involved in feral swine management in Missouri. The study revealed that individuals from federal and state governments (the largest number of participants), voluntary sector entities, and universities were all involved in the network.

Lessons Learned

1. Development of the incident command structure (ICS) substantially improved efficiency, effectiveness, and accountability. The structure brought all partners and players together to work toward a common goal while eliminating duplication of effort.

2. Orders to close feral swine hunting on all public lands were critical to success. Hunting closures were essential to curtailing the culture of recreational hunting of feral swine.

3. Passage of HB 369 was critical to curtailing the spread of feral swine. The law redefined feral swine and made it illegal to transport, release, or possess them. It also imposed more substantial penalties for violations.

4. A dedicated helicopter for conducting removal operations during the winter and additional UAS support proved critical in effectively targeting feral swine at low densities.

5. Funding of four University of Missouri Extension specialists was a key to facilitating the continued success of feral swine eradication. The educators reestablished relationships with members of SWCDs, county commissions, county farm bureaus, and cattlemen's association chapters and engaged landowners that were not previously a part of MFHEP eradication efforts.

6. Development and refinement of systematic baiting protocols were critical to operational success. Systematic baiting helped to detect feral swine in areas with lower population densities.

Missouri Project Summary (continued)

Other Contributing Agencies

USDA APHIS Veterinary Services
USDA Forest Service, Mark Twain National Forest
U.S. Department of Interior Fish and Wildlife Service
Mingo National Wildlife Refuge
Missouri DNR State Parks
Missouri Department of Agriculture
Missouri Department of Health and Senior Services
U.S. Dept of Defense Army Corps of Engineers (Little Rock, St. Louis, and Kansas City districts)
U.S. Department of Interior National Park Service,
Ozark National Scenic Riverways
U.S. Army, Fort Leonard Wood
Missouri Farm Bureau
L-A-D Foundation, Pioneer Forest
Quail and Upland Habitat Federation
Conservation Federation of Missouri

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USDA NRCS Feral Swine Eradication and Control Pilot Program (FSCP)

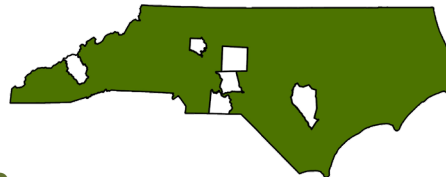
North Carolina Project Summary



Lead Agency:
North Carolina Department of Agriculture

Partner agencies (formal contractual partners):

- USDA Animal and Plant Health Inspection Service (APHIS) Wildlife Services



Testimonial

“ This only works if there is a directed and sustained effort.”

-Anslo Fowler, Davie County

The domestic pig industry brings in \$7.1 billion annually to the state and represents 44,000 jobs. Building the state capacity to reduce the impact of diseases important to the domestic pig industry had not been effectively mapped out until this pilot program was initiated.

Quick Facts

Lead agency: North Carolina Department of Agriculture

Location: Sampson, Davie, Haywood, Montgomery, Randolph, and Anson Counties

Congressional district: 2

Total NRCS investment: \$1.8 million

Participating landowners: 3,420

Acres impacted: 259,068

Outreach programs conducted: 372

Estimated outreach program reach: 106,752

The goal of this project was to provide training to crop, livestock, and poultry producers to substantially reduce or eliminate damage caused by feral swine within select high-priority work zones. Disease sampling was also conducted on feral swine removed during this study to better understand the role of feral swine in maintenance and transmission of diseases of concern to livestock producers in this portion of the state.

The North Carolina Department of Agriculture (NCD) took the lead role in implementing the FSCP. Significant help was provided by partner agencies that included the North Carolina Department of Public Health, North Carolina State University Extension, North Carolina Wildlife Resources Commission, APHIS Wildlife Services, and APHIS Veterinary Services.

Narrative

In the last three decades, an increase in feral swine presence has been documented in North Carolina. With this, concerns about crop damage and transmission of diseases from feral swine to livestock have subsequently increased.

In a recent regional study, more than 30 percent of producers surveyed in North Carolina reported the presence of feral swine in the counties where they farmed; just over 10 percent of these farmers reported that feral swine impacted their farming operations³. Feral swine are reported to cause \$5,939,000 annually in damage to crops in North Carolina alone, with the largest losses occurring in the production of sweet potatoes³. Additionally, feral swine are known to carry over thirty-four diseases that may pose significant risks to livestock and humans^{2,4}. These diseases can cause losses to producers by either costly veterinary bills or loss of livestock¹.

During the first year of our FSCP, habitat models were used to identify several high-priority work zones where removal activities would be focused. These zones included four watersheds spanning a six-county area (Sampson, Davie, Haywood, Montgomery, Randolph, and Anson). Once identified, outreach programs were conducted to inform and engage crop, livestock, and poultry producers within the work zone about the FSCP and to solicit their involvement. During this period, equipment purchases were made to conduct feral swine removal operations during the second and third years of the FSCP.

Once participating producers were identified, NDAC staff conducted site visits with producers to determine the extent and nature of feral swine damage and to coordinate subsequent removal operations. Removal operations were then conducted by staff of NCD (in five of six counties) and APHIS Wildlife Services (one county) on properties of producers participating in the



North Carolina Project Summary (continued)

FSCP. It is important to note that partner agencies were instrumental in assisting NCDA and Wildlife Services in developing contacts with local producers and accessing their properties to conduct removal operations.

Trapped feral swine were tested to determine what, if any, transmissible diseases were present. After trapping, work zones were reassessed for the reporting of feral swine damage. Estimates of damage reduction were calculated using in-field assessments to quantify damage and the current value of crops.

Research and Project Results

1. Damage reduction was estimated at approximately \$1.8 million in 2022 on NCDA removal sites, with an additional \$1.6 million on sites serviced by APHIS Wildlife Services. These figures were determined based on reduced acreage damage to areas where feral swine removal was conducted (approximately 90 to 95 percent population reduction) and the current value of those crops.

2. Our team conducted a series of workshops and outreach programs to teach producers and landowners skills and provide information that can be used to minimize the impacts of feral swine on their farming operations.

3. This FSCP project served as the catalyst for developing a coordinated response program among several federal, state, and local agencies to prepare for potential transboundary animal disease incursions by feral swine.

4. We created a highly effective, landscape-wide, streamlined management plan to reduce the impact of feral swine in North Carolina.

Lessons Learned

1. Landowners who financially benefit from utilizing local feral swine hunters are less likely to use government agencies on the same properties.

2. By providing producers and landowners with the skills to properly and effectively remove feral swine, workshops and outreach programs taught by interagency teams can increase the number of feral swine populations removed from the landscape more efficiently than any single agency could do alone.

3. From a survey of 740 producers participating in the FSCP, producers had been actively trying to control local feral swine populations for an average of 8.4 years.

Other Contributing Agencies

USDA APHIS Veterinary Services
North Carolina Department of Public Health
North Carolina State University Extension
North Carolina Wildlife Resources Commission

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³McKee, S., A. Anderson, K. Carlisle, and S. A. Shwiff. 2020. Economic estimates of invasive wild pig damage to crops in 12 US states. *Crop protection* 132:1–12.

⁴Miller, R. S., S. J. Sweeney, C. Sloatmaker, D. A. Gear, P. A. DiSalvo, D. Kiser, and S. A. Shwiff. 2017. Cross-species transmission potential between wild pigs, livestock, poultry, wildlife, and humans: implications for disease risk management in North America. *Scientific Reports* 7:1–14.



USDA NRCS Feral Swine Eradication and Control Pilot Program (FSCP)

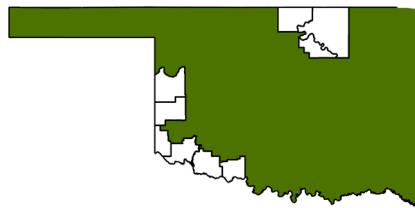
Oklahoma Project Summary



Lead Agency: Conservation Commission of Oklahoma

Partner agencies (formal contractual partners):

- Tillman Conservation District
 - Cotton Conservation District
 - Jackson Conservation District
 - Harmon Conservation District
 - North Fork of Red River Conservation District
- Kay Conservation District
 - Upper Washita Conservation District
 - Osage Conservation District
 - Pawnee Conservation District



with waterways in this region of the United States and contribute to reduced water quality².

The Oklahoma Conservation Commission (OCC) worked in partnership with six conservation districts in southwestern Oklahoma and three conservation districts in northern Oklahoma to reduce damage caused by feral swine in the respective project areas. One goal of this FSCP was to create feral swine-free zones along the Red River in southwestern Oklahoma and along the Kansas border. The other goal was to develop a self-sustaining feral swine control program administered by the cooperating conservation districts for continued removal operations once the FSCP project ends.

To accomplish these goals, the OCC hired a technician in each of the four project areas to serve as the local project coordinator (Kay County in north central, Red River County in southwest, Osage and Pawnee Counties in north central, and Upper Red River County in western parts of the state). These technicians played

Testimonials

“ I have had hog trapping efforts on my property for 2 years now because of hog damage on my pastureland, cultivated land, and noncultivated land. I can't begin to assign a value to the services provided to me, between the man hours and equipment needed, to get rid of hogs on my property; it is invaluable.”
- Jason Orgain, Roger Miller County

“ The feral swine control program (FSCP) has been a real plus for me. The FSCP employee and his APHIS partner have reduced the damage we have experienced as well as the associated time-consuming trapping/disposal burden on me. The program has been a huge help to us in managing our operation.”
- Dan Sebert, Pawnee County

Quick Facts

Lead agency: Conservation Commission of Oklahoma
Location: Tillman, Cotton, Jackson, Harmon, Kay, Beckham, Roger Mills, Osage, and Pawnee Counties (all first rounds)
Congressional districts: 3, 4
Total NRCS investment: \$2.1 million
Participating landowners: 279
Acres impacted: 1,359,332
Outreach programs conducted: 8 in-person and numerous online
Estimated outreach program reach: 1,200

Narrative

Feral swine have been an increasing nuisance throughout Oklahoma over the past several decades, with all 77 counties reporting established feral swine populations². The pervasiveness of these animals throughout the agricultural community is astounding. In a 2022 study, 85 percent of landowner respondents indicated that feral swine were present within the county in which they farmed, and 67 percent of producers reported feral swine presence on their properties within the previous 3 years. As such, crop losses to feral swine in Oklahoma are reported to be over \$18 million annually³, with additional non-crop damages through livestock predation, disease, veterinary services, and medical treatments at \$4 million/year¹. Feral swine also are strongly associated

Oklahoma Project Summary (continued)

a major role in contacting landowners to complete damage assessments, schedule access for Animal and Plant Health Inspection Service (APHIS) Wildlife Services removal operations, scout and pre-bait areas for trapping, and monitor trapping sites.

OCC technicians worked side by side with APHIS Wildlife Services personnel to deploy feral swine traps throughout the project areas where participating landowners granted access. These technicians also worked with local conservation districts within each project area to provide outreach program accessibility to all county residents needing feral swine control and to educate agricultural producers about programs available to assist with damage repair.

The OCC was keenly interested in monitoring the impact of feral swine control on water quality. Using historical and current water-quality data collected through the OCC Rotating Basin Monitoring Program, the agency established a water-quality baseline for small streams in the project areas to compare with post-implementation water-quality data. This information also was used to prioritize additional efforts needed in areas with the strongest overlap between feral swine-related water-quality problems and agricultural damage by feral swine. These areas were the focus of more intensive water-quality monitoring that involved more frequent turbidity and bacteria testing. Post-implementation data is currently being collected in 2023 for comparison to previous conditions to evaluate improvements in water quality resulting from feral swine control.

Research and Project Results

1. The Kay County project area is close to being declared a “feral swine-free zone” in areas where landowners have allowed access for removal operations. The project's goal had been to reduce damage by 80 percent in the project area.
2. Over the course of this FSCP project, an estimated \$22,636,059 in damage has been prevented across 1,359,332 acres.
3. In some portions of the project areas, complete eradication of feral swine was achieved across a contiguous landscape consisting of multiple adjacent farms.
4. Extreme drought over the past 8 months created significant challenges for collecting samples to determine improvements in water quality in response to feral swine removal.

Lessons Learned

1. Outreach was key to the success of our FSCP project. Gaining the participation of multiple adjacent landowners allowed for a greater chance of not only reducing but also eradicating local feral swine populations. Given the challenges experienced due to the pandemic, agencies should consider additional ways to reach and engage landowners.

2. Education of the broader public on the threats caused by feral swine was a key component to the program's success.

3. An integrated approach was paramount to the success of the program. Using every available tool in the toolbox will increase success rates for reducing feral swine populations.

4. Developing a sustainable program after the FSCP project ends will be challenging. Suitable funding to continue this work without USDA support will be difficult to acquire. The cost of traps, bait, operations staff, data management, and fuel will be difficult to sustain. Additionally, many landowners do not have the time or resources to control feral swine on their own.

5. When budgeting for initial grant proposals, do not underestimate the labor needs and other expenses to successfully implement a coordinated feral swine removal program across multiple project areas.

Other Contributing Agencies

USDA APHIS Wildlife Services
Noble Research Institute
Oklahoma Department of Wildlife Conservation
Oklahoma Association of Conservation Districts
Oklahoma Tribal Conservation Advisory Council
Oklahoma Farm Bureau
Oklahoma Farmers and Ranchers
Oklahoma Cattlemen's Association
Farm Credit of Western Oklahoma

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USDA NRCS Feral Swine Eradication and Control Pilot Program (FSCPP)

South Carolina Project Summary

Lead Agencies:

University of Georgia Savannah River Ecology Laboratory and Warnell School of Forestry and Natural Resources

South Carolina Department of Natural Resources

Newberry Soil and Water Conservation District



feral swine population poses a risk of disease transmission to these domestic animals^{2, 3}.⁴ Economically, feral swine trample and consume crops, root pasture and suburban lands, and damage infrastructures such as fences and roads, costing the state an estimated \$115 million in damages annually^{1, 5, 6}.

South Carolina has hundreds of thousands of acres of agricultural land susceptible to damage from feral swine. The problem is increasing as the feral swine population continues to grow. The state has seen an increase in hunter-harvested feral swine since 2004, with a 33 percent annual increase in 2017 alone³. Despite the expanding impacts and costs associated with the management of feral swine, the extent to which feral swine management reduces populations and diminishes environmental and agricultural damages is rarely quantified.

Testimonials

“ [Wild pigs] have become so much of a problem that we have to rethink what we’re planting, when we’re planting it, and what fields we choose to plant in. If it’s not your problem today, it will be your problem tomorrow. I appreciate what the researchers do, what the NRCS does, and what the USDA has done because I think it’s another step in the process to fix the problem; it’s a step in the right direction.”

-Austin Jackson,
Producer,
Aiken County

“ Feral swine are a threat to our economy, health, and ecosystem in Jasper County. The obstacles are endless on how to control these animals. We support the pilot program and will assist in any way possible to see this program succeed.”

-Thomas Stanley,
Farm Bureau,
Jasper County

Quick Facts

Lead agencies: University of Georgia Savannah River Ecology Laboratory and Warnell School of Forestry and Natural Resources
South Carolina Department of Natural Resources

Newberry Soil and Water Conservation District

Location: Newberry, Hampton, and Jasper Counties, South Carolina

Congressional districts: 5, 6

Total NRCS investment: \$1.4 million

Participating landowners: 93

Acres impacted: 129,799

Outreach programs conducted: 4

Estimated outreach program reach: 2,600

Narrative

Feral swine are found in all forty-six counties in South Carolina and cause significant damage to agricultural and environmental lands throughout the state. Environmentally, feral swine presence in South Carolina is associated with increased soil erosion, decreased water quality, destruction of native, rare, and endangered plant communities, and depredation of threatened species such as the loggerhead sea turtle⁵. Additionally, South Carolina is home to many cattle and domestic hog operations, with more than 330 in Hampton and Newberry Counties alone. The

South Carolina Project Summary (continued)

South Carolina's FSCP funding, through USDA Natural Resource Conservation Service, was allocated to the University of Georgia, the South Carolina Department of Natural Resources, and the Newberry Soil and Water Conservation District and used to support three distinct projects within the state. Across each of these three projects, the University of Georgia's Savannah River Ecology Laboratory and Warnell School of Forestry and Natural Resources was contracted to conduct research regarding changes in feral swine populations and damage as removal efforts were conducted.

The research objective was to quantify changes in feral swine population size and associated damages to agricultural and environmental resources in conjunction with feral swine removal efforts conducted under the FSCP. These efforts involved extensive removal of feral swine by the USDA Animal and Plant Health Inspection Service (APHIS). We predicted that professional control efforts would substantially decrease local feral swine populations, resulting in a corresponding decrease in both agricultural and environmental damage. In addition, the data gained would fill critical gaps in our knowledge of the efficacy of feral swine control programs. This information is needed to inform and adapt management plans to reduce the impacts and spread of this highly invasive species.

To accomplish this objective, the University of Georgia's Savannah River Ecology Laboratory and Warnell School of Forestry and Natural Resources, South Carolina Department of Natural Resources, and the Newberry Soil and Water Conservation District collaborated to lead monitoring efforts under the FSCP in South Carolina in cooperation with APHIS Wildlife Services, which led feral swine removal efforts. South Carolina DNR and Newberry Soil and Water led outreach efforts, while the University of Georgia led monitoring efforts to quantify the impacts of control efforts under the FSCP within South Carolina. Within this framework, these organizations worked with personnel of the Hampton and Jasper Soil and Water Conservation Districts to implement outreach and monitoring efforts within local communities throughout the counties selected for this pilot program.

Beginning in 2020, feral swine population, crop, and rooting surveys were initiated in conjunction with feral swine removal efforts conducted across a subset (n=19) of privately owned agricultural properties enrolled in the program throughout Newberry, Hampton, and Jasper Counties, South Carolina. Monitoring efforts were conducted through a combination of remote camera surveys, rooting damage field surveys, and landowner damage questionnaire surveys. All surveys were implemented immediately prior to initiation of control efforts and repeated every 6 months (camera surveys) or annually (crop and environmental damage surveys) from January 2020 through July 2022.

The camera surveys generated an index of feral swine population size for each property at approximate 6-month intervals. Agricultural damage assessments were conducted for eighteen properties involved in

this study using in-person and telephone surveys. Landowners signed up through the removal program were contacted before control efforts to gather pre-control crop damage data and again roughly 1 and 2 years later to reassess crop damage after control efforts were implemented. Landowner responses from these surveys were used to estimate landowner-reported changes in crop damage caused by feral swine following the implementation of the program. Systematic rooting damage surveys were conducted annually on eighteen of the nineteen properties to quantify changes in environmental rooting damage attributed to feral swine.

Results thus far reveal that within 12 to 24 months of implementing trapping by APHIS Wildlife Services, control efforts successfully reduced the abundance of feral swine on private agricultural lands enrolled in the project. These population reductions were found to directly influence the extent of damage caused by feral swine, as environmental rooting damage decreased by 99 percent within 2 years of implementation of population control measures.

Collective results demonstrate that investment in feral swine management is worthwhile in many ways. Extensive trapping programs by trained professionals, such as through the FSCP, can remove large portions of feral swine populations from the landscape; reduce agricultural and environmental damage and economic impacts to private landowners; and be used along with monitoring programs to help landowners form adaptive approaches to maximize the efficacy of management investments.

Research and Project Results

1. Monitoring of feral swine abundance at regular intervals started before implementation of control by APHIS Wildlife Services. Results following implementation efforts demonstrated an approximate 70 percent reduction in feral swine population sizes on enrolled properties. This provided clear evidence of the efficacy of removal efforts and a critical baseline for estimating changes in crop and environmental damage moving forward.
2. Since the implementation of population control efforts by APHIS Wildlife Services, our project has demonstrated a substantial reduction in environmental damage from feral swine. Within 2 years of project initiation, rooting damage by feral swine has been reduced by 99 percent among enrolled properties.
3. Results following the implementation of population control efforts by APHIS Wild Services demonstrated an approximate 40 percent decrease in landowner estimates of agricultural damage. We anticipate these losses to be reduced even further through additional monitoring of crop damage on enrolled properties through the completion of the project.



South Carolina Project Summary (continued)

Lessons Learned

1. Monitoring efforts can be most effective when carried out before the initiation of removal operations. However, there was a mismatch in the timing of the arrival of funding for monitoring efforts and arrival of funding for removal operations, with funds for removal efforts arriving first. This made it challenging to conduct monitoring programs before trapping was initiated. However, we were able to find solutions to implement monitoring before trapping on numerous properties. If possible, funding for monitoring efforts should be provided before funding to initiate trapping to ensure high-quality baseline data can be collected.

2. With so many properties enrolled, coordinating survey efforts between project partners as well as between partners and individual property owners was challenging. Surveys needed to be optimized for individual properties based on the timing of crop planning, individual management goals, controlled burns, etc. We addressed this challenge to some extent by creating a single point of contact for landowners and then establishing regular communication between relevant project partners.

3. We experienced some challenges in accessing properties during white-tailed deer and wild turkey hunting seasons, as well as challenges with multiuse properties (e.g., farming vs. leased for hunting). These challenges included restricted access during all or a portion of hunting seasons or limited time allowed on properties to avoid morning and evening hunts. We were able to effectively work on all properties, but gaining access required a case-by-case approach.

4. Both APHIS and nonfederal partners were already conducting landowner surveys for their own respective needs at the onset of the project. This created confusion among some landowners; we, therefore, condensed these into a single survey and shared relevant information among partners to reduce the possibility of survey fatigue among participants.

Other Contributing Agencies

USDA APHIS Wildlife Services
Newberry County Tax Assessor's Office
Jasper County Tax Assessor's Office
Hampton County Tax Assessor's Office
USDA Farm Services Agency
USDA Forest Service
Jasper Soil and Water Conservation District
Hampton Soil and Water Conservation District

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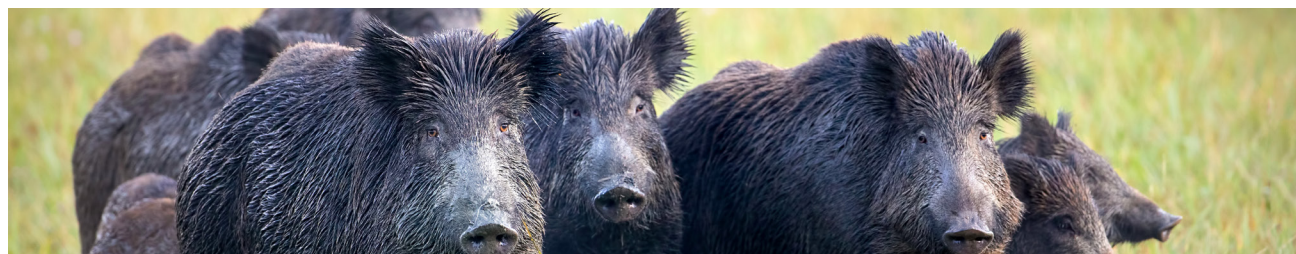
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³English, A., and N. Myers. 2019b. South Carolina feral swine pilot project: Hampton County (report). South Carolina Department of Natural Resources and United States Department of Agriculture Animal and Plant Health Inspection Service Wildlife Services, Columbia, South Carolina, USA.

⁴Keiter, D. A., and J. C. Beasley. 2017. Hog heaven? Challenges of managing introduced wild pigs in natural areas. *Natural Areas Journal* 37:6–16.

⁵South Carolina Department of Natural Resources (SCDNR). 2020. Wild Hog Information. www.dnr.sc.gov/wildlife/hog/index.html.

⁶South Carolina Farm Bureau. 2022. Wild Hogs: A Statewide Problem. www.scfb.org/articles/wild-hogs-statewide-problem.



USDA NRCS Feral Swine Eradication and Control Pilot Program (FSCP)

Texas Project Summary

Lead Agency: Texas State Soil and Water Conservation Board

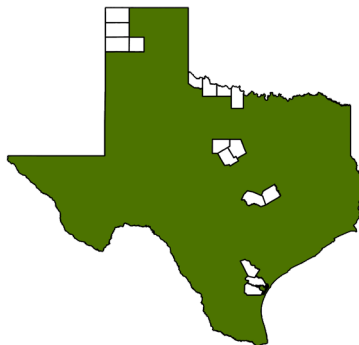
TEXAS STATE

Soil & Water

CONSERVATION BOARD

Partner agencies (formal contractual partners):

- Texas Wildlife Damage Management Association (TWDMA)
- Texas A&M Natural Resources Institute (NRI)
- Canadian River Soil and Water Conservation District (SWCD)
- Cross Timbers SWCD
- Hartley County SWCD
- Little Wichita River SWCD
- Lower Pease River SWCD
- Oldham County SWCD
- Upper Leon County SWCD
- Wichita County SWCD
- Wilbarger County SWCD
- Central Texas SWCD
- Little River-San Gabriel SWCD
- Taylor SWCD
- Bee County SWCD
- Nueces County SWCD
- San Patricio County SWCD



Testimonials

“ In my opinion [trap loan equipment] is the most effective trapping method I’ve seen. With the traps and the use of the helicopters, over time I think we could see hog numbers decrease drastically.”

- Nahum Patschke, Williamson County

“ This program is incredibly helpful and successful! My feral pig population has decreased tremendously.”

- Jim Smith, Milam County

Narrative

Feral swine remain one of the greatest damage management challenges to wildlife, agriculture, and watershed health in the United States. These animals have established themselves across Texas and pose a variety of challenges, including riparian and sedimentation damage, agricultural loss, predation, transmittal of disease and parasites, and environmental damage to both urban and rural environments. Recent studies estimate that the population of feral swine has increased in the United States from 2.4 million to 6.9 million, with 2.6 million feral swine in Texas alone¹. These numbers make feral swine one of the most abundant large-animal invasive species found in the nation.

New research suggests that the once accepted value of \$1.5 billion-plus of yearly crop damage and control costs across the United States may be much higher². In 2020, the Texas A&M Department of Agricultural Economics reported that the total agricultural damage in Texas exceeded \$100 million a year, with studies pointing as high as \$230 million. These costs do not take into consideration damage to natural resources.

As feral swine populations grow, so does the level of economic, biological, and natural resource damage. This non-native invasive species continues to be a threat to Texas waterways and ecosystems. Feral swine activities have a detrimental effect on watersheds and

Quick Facts

Lead agency: Texas State Soil and Water Conservation Board

Location: Upper Leon River (Eastland, Erath, and Comanche Counties), Canadian River project (Hartley, Oldham, and Potter Counties), and Red River (Hardeman, Wilbarger, Wichita, and Clay Counties). Additional priority counties: Milam, Williamson, Dallam, Bee, San Patricio, and Nueces.

Congressional districts: 11, 13, 15, 17, 25, 27, 31, 34

Total NRCS investment: \$4.4 million

Participating landowners: 154

Acres impacted: 1,359,332

Outreach programs conducted: 15

Estimated outreach program reach: 15,305



Texas Project Summary (continued)

water quality by causing increased sediment loads, algae blooms, oxygen depletion, bank erosion, and contamination by parasites and bacteria. Destruction of habitat for native wildlife and predation of wildlife is also a concern for the overall health of watersheds and the ecosystems within.

The Texas State Soil and Water Conservation Board (TSSWCB) is working in partnership with the Natural Resources Conservation Service (NRCS), United States Department of Agriculture Animal and Plant Health Inspection Service (USDA APHIS), Soil and Water Conservation Districts (SWCD), Texas A&M Natural Resources Institute (NRI), and the Texas Wildlife Damage Management Association (TWDMA) to administer the Feral Swine Control Pilot Program in the Canadian River watershed (Hartley, Oldham, and Potter Counties), Upper Leon River watershed (Eastland, Erath, and Comanche Counties), and the Upper Red River watershed (Hardeman, Wilbarger, Wichita, and Clay Counties). Additional priority counties include Milam, Williamson, Dallam, Bee, San Patricio, and Nueces.

TSSWCB partnered with fifteen local soil and water conservation districts to establish a smart trap loan program for farmers, ranchers, and landowners in these priority counties. The participating SWCDs purchased three to eight corral-style traps that include motion-detection cameras and remote activation. TSSWCB also partnered with TWDMA to support nine wildlife damage management specialists hired through Texas A&M AgriLife Extension Service Cooperative Wildlife Services Program. These technicians coordinated the SWCD trap loan program, which included receiving requests from landowners for trap loans, assisting landowners in trap placement and construction, monitoring traps used by the trap loan program, delivering and retrieving traps, providing cameras, and collecting data on trap uses in the program.

TSSWCB partnered with NRI for the education portion of this program. To date, NRI has conducted over a dozen feral swine outreach programs reaching over 300 landowners. They also have utilized social media, marketing, and online learning to boost the program's message to more than 15,000 people in target counties.

Research and Project Results

1. To date, seventy-five traps have been loaned to over 150 landowners, resulting in the removal of a substantial number of feral swine by landowners.
2. Social media marketing was a very cost-effective way to market upcoming educational programs about the pilot program. For example, for just over \$189 we targeted over 11,000 people in four counties.
3. Landowners participating in the trap loan program have contributed more than 12,500 hours to this effort.
4. Currently, there are ninety-three landowners, representing over 141,000 acres in the priority project areas, who are on the trap loan waiting list.

5. Feral hog damage can be controlled, given a landscape approach. To date, the collaborative approach has significantly reduced feral swine in the Canadian River pilot project area, reduced crop and pasture damage in the Upper Leon River and Red River pilot areas, and reduced crop damage in the Coastal Bend and Williamson/Milam County areas. The partnership is prepared to announce that feral hogs no longer inhabit Dallam County.

Lessons Learned

1. Effective marketing and outreach are crucial to the success of a new program. Social media marketing is a valuable tool to increase awareness to programs.
2. Building relationships with key partners early in the process helps with continuity and helps to ensure the success of programs like this one.
3. The COVID pandemic affected the early release of the program. TSSWCB and partners had to adapt messages and program delivery to minimize group settings. This included changes to outreach efforts, obtaining contracts, and ordering traps. In addition, one-on-one field education took the place of group demonstrations.
4. Landowners with extensive feral swine damage participated in both direct management and trap loan services. This required program administration to evaluate which services were best positioned to resolve the conflict and to coordinate between trap loan participants and direct management. Oversight of the trap loan program had to be conducted in close coordination with direct management.

Other Contributing Agencies

USDA APHIS Wildlife Services
Texas Farm Bureau
Texas Corn Producers

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Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE



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