Wild Pig Damage Abatement
Education and Applied Research Activities

Texas A&M AgriLife Research and Extension Center-Overton

June 2013

Fast Facts

- The first educational program conducted in Texas on wild pigs and abating their damage was on March 22, 1990 in Cayuga, Texas. A national symposium was also hosted by Extension in 1993 in Kerrville, Texas.

- Extension educational programming on wild pigs and abating their damage has returned $26.52 for every $1.00 invested based on a Texas Department of Agriculture – funded pilot program through the Texas A&M Research and Extension Center at Overton (2006-2012).

- Based on a survey characterizing wild pig removal in Texas, landowners removed an estimated 753,646 (29% of the estimated 2.6 million wild pigs in Texas) during CY2010. Trapping accounted for the most pigs removed (57%), while shooting (aerial, terrestrial and recreational hunting) accounted for 35%. The use of dogs (6%) and snares (2%) accounted for the remainder of pigs removed by Texas landowners.

- Extension educational efforts conducted from the Texas A&M AgriLife Research and Extension Center-Overton have included 2 international presentations, 12 national presentations and 13 state-wide presentations (2006-present).

- A wild pig radio telemetry study was conducted by Texas A&M AgriLife Research, Texas A&M AgriLife Extension and the Noble Foundation (OK) to collect information on wild pigs. Data analyses in this study have revealed that the home range of mature sows averages 1,071 acres.

- Extension contacts with the media regarding wild pigs and abatement of their damage have included 29 television interviews, 30 radio interviews, 80 newspaper interviews, 4 magazine articles authored, 21 magazine article interviews and 7 podcast/utube interviews (2006-present).

- A wild pig demonstration site has been established at the Texas A&M AgriLife Research and Extension Center-Overton and is open to the public for viewing best management practices for abating wild pig damage through their control.

Wild Pig Damage Abatement
Education and Applied Research Activities

Texas A&M AgriLife Research and Extension Center-Overton

Compiled by:

Billy Higginbotham
Regents Fellow, Professor and
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Texas A&M AgriLife Extension Service
Texas A&M AgriLife Research and Extension Center
Overton, TX

June 2013

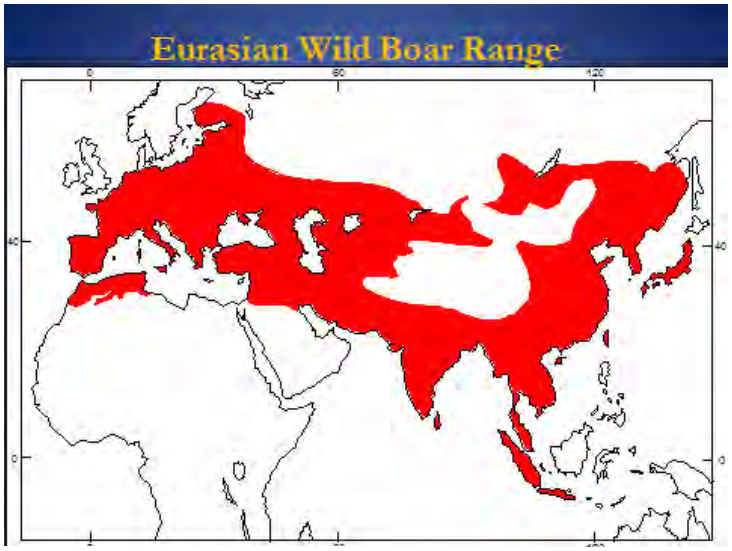
FOREWARD

The wild pig is an invasive exotic species introduced into what is now the United States at Tampa Bay, Florida in 1539. Three short years later, Hernando de Soto's exploration party entered what would become Texas with approximately 800 pigs in tow. These pigs, along with domesticated swine as new frontiers were settled, would provide some of the seed stock that would become feralized populations in subsequent centuries in Texas and across the southeastern United States.

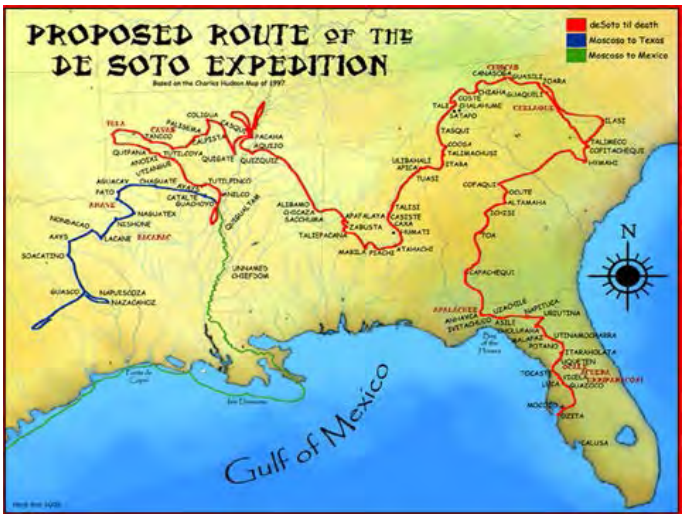
Wild pig damage became an issue in Texas beginning in the mid-1980's. Since then, Extension education and applied research geared toward abating damage by reducing wild pig populations have been an area of focus.

The contents of this report provide information on the scope of Extension education and applied research activities coordinated by faculty and staff headquartered at the Texas A&M AgriLife Research and Extension Center at Overton.

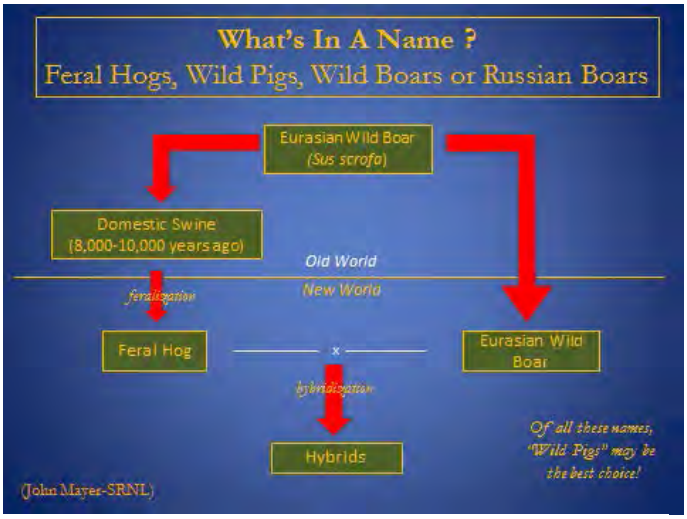
TABLE OF CONTENTS



Current range of the Eurasian wild boar.



Hernando de Soto's exploration route from Tampa Bay, Florida to Texas.



The name "wild pigs" is the best description for feral hogs, Eurasian wild boars and their "hybrids".

Wild pig estimated population size and distribution in 1990.

Wild pig estimated population size and distribution in 2012.

I. INTRODUCTION/BACKGROUND

TEXAS A&M AGRILIFE EXTENSION WILD PIG DAMAGE ABATEMENT
Texas A&M AgriLife Research and Extension Center-Overton
(March 2011-May 2012)

Billy Higginbotham
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Introduction

The Texas A&M AgriLife Extension Service provides quality, relevant, research-based educational information to the people of Texas. The Texas A&M AgriLife Extension Service is the only state agency uniquely positioned to address the educational aspects focusing on wild pigs and abating their damage to Texas agriculture.

Background

Hogs were first introduced to the New World in Florida in 1539 and subsequently into Texas by the mid-1500's. This source, along with free-ranging hog production practices and purposeful introductions of Eurasian wild boars have contributed to the present status of wild pigs in the state. Today, the wild pig is considered to be an invasive exotic species with a population estimate of 2.6 million head in Texas and > 5 million head nationwide. A 2011 study by A&M AgriLife Extension and the Institute of Renewable Natural Resources-TAMUS estimated that approximately 79% (134 million acres) of the Texas landscape represented suitable habitat for wild pigs. Pigs currently occupy approximately 90% to 95% of Texas counties, 47 other states and 4 Canadian provinces.

A conservative estimate of wild pig damage to Texas agriculture alone is $52 million annually, with additional annual expenditures of $7 million for repairing damage and/or controlling pigs. These economic impacts do not include damages occurring to urban/suburban landscapes, ecological/environmental concerns and personal property/injuries due to disease transmission and/or vehicle-pig collisions. Nationwide, all forms of damage are estimated to exceed 1 to 1 ½ billion dollars annually.

Extension education directed at landowners focuses on the adoption of best management practices in order to abate wild pig damage. To accomplish this goal, Texas A&M AgriLife Extension utilized one-on-on contacts, group educational meetings, method and result demonstrations, mass media and websites in order to disseminate research-based information to landowners in particular with a secondary audience of the general public.

II. CHARACTERISTICS AND ECONOMICS OF DAMAGE

Economic Impacts of Wild Pigs

Billy Higginbotham
Professor and Extension Wildlife and
Fisheries Specialist

The economic impacts of free-ranging pigs felt in the 21st century are nothing new—damage in the form of agronomic crop depredation date back to the time of the colonists in the 1600's (Conover 2007). Current damage attributed to wild pigs includes agronomic crops, pasturelands, commercial forestlands, livestock predation/disease transmission (e.g., pseudorabies) , environmental damage to native plant and wildlife species (including threatened and endangered species), wetlands and water quality in surface waterways, greenspaces (e.g., parks, athletic fields suburban/urban landscapes) and threats to human health including disease transmission (e.g., swine brucellosis, E. coli) ,wild pig/vehicle collisions resulting in property damage, human injury and death.

Pimentel et al. (2005) estimated that wild pigs cause $800 million in damage to agriculture and the environment annually in the United States. In a 2003 Texas survey, Adams et al. (2005) noted that landowners averaged $7,515 in agricultural damage, with an additional $2,631 spent on damage repair and wild pig control since wild pigs first appeared on their properties.

Given such sobering statistics, can wild pig abatement efforts make a difference? Indeed, a Texas study of 48 cooperators owning 223,000 acres of land in three distinct ecosystems documented pre-control agriculture damage totaling $2,228,076 directly attributable to wild pigs. Following two years of control efforts conducted by Wildlife Services, damage decreased by 66% to $747,585 (Higginbotham et al. 2008). However, landowners themselves are the first line of defense for abating wild pig damage, but must adopt efficient research-based control methods to be successful (Rollins et al. 2007). Outreach education information delivered to Texas landowners participating in Extension outreach programs and field days conducted from 2006-2009 valued wild pig control information received at $5.1 million dollars based on their estimates of future damage (Higginbotham 2010).

Whenever economic impacts relative to wild pigs are mentioned, the connotation is usually one describing negative consequences. Nevertheless, is it possible to literally make a silk purse from a sow's ear? The answer is yes, there is a silver lining, albeit a thin one, to the dark cloud of ever expanding wild pig populations.

The first of these silver linings include lease income generated by hunters interested in recreation hunting of wild pigs. Rollins et al. (1993) reported recreational hog hunts averaged $169 (range $25-$1,000) per hunt. A recent Internet search for hog hunts revealed that wild pig hunts are being marketed by several methods: 1) hunt length (e.g., $100 to $200 per day exclusive of

"trophy" fees), 2) package hunts (e.g., $\leq$ $725 inclusive of lodging, guides and meals) and 3) by the pig (e.g., sows-$150, boars $300). Many ranches cater exclusively to hog hunters year round, while others offer hog hunts at times of the year when native game species (e.g., white-tailed deer, turkey, quail, dove, waterfowl) hunting seasons are closed.

In Texas, another source of landowner-generated income is derived from selling live-trapped pigs to processing facilities and hunting preserves. A 2008-09 survey of Texas landowners impacted by wild pigs indicated that only 13% were actually selling live-trapped pigs, however, those that did sell pigs averaged $4,466 income per year (Higginbotham 2010). Various buying stations scattered across Texas pay landowners for live pigs on a per pound basis, with the largest pigs bringing the highest price per pound (e.g., $0.30/ pound, Phillip Swallows pers. comm.). From 2004-2009, a total of 460,911 wild pigs were processed at locations requiring a federal permit in Texas (Rene Caldwell, USDA pers. comm.). At a conservative value of just $30 per pig, landowners gained income of almost $14 million during this six year reporting period alone. This income serves to at least partially offset the negative damage caused by wild pigs and helps to pay for on-going control efforts.

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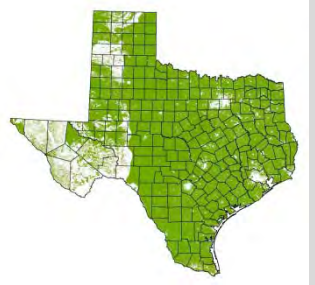
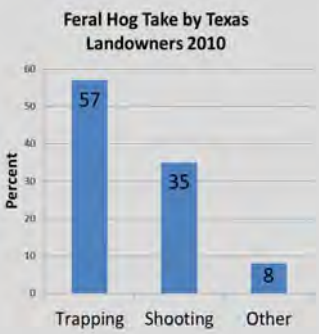
III. TEXAS A&M AGRILIFE RESPONSE TO WILD PIG DAMAGE

Texas A&M AgriLife Extension Service
Wildlife & Fisheries Sciences Unit
Responses to the Feral Hog Problem



Potential Feral Hog Habitat



The Feral Hog Problem

Approximately 2.6 million feral hogs occupy 79% of Texas' landscape. Feral hogs are an invasive, exotic species that cause approximately $52 million in damages to Texas agriculture producers annually. This estimate does not include damage to habitat used by native wildlife or suburban areas. Feral hog damage can be significantly reduced through effective education and outreach to private landowners. This document is a snapshot of the Wildlife & Fisheries Extension Unit's feral hog education and outreach efforts.

Wildlife and Fisheries Extension Response to Feral Hog Problem

- **Feral Hog Community of Practice (CoP)**
  - Startup funded by eXtension.org, awarded $60,000 (January 2011 – May 2012)
  - The Feral Hog CoP will concentrate on the control, adaptive management, biology, economics, disease risks, and the human interface of feral hogs across the United States
  - 15 Leaders and 50 members representing 23 states, several state and federal agencies, numerous academic institutions and NGOs
  - 103 FAQs and 54 articles published
  - Feral Hog Facebook Facebook (1,146 Likes)
  - Ask The Expert, 4 National Webinars
  - Launched – May 2012
- **Plum Creek Watershed Feral Hog Project (Travis, Hays & Caldwell counties)**
  - Funded by TSSWCB through an EPA 319 grant, awarded $207,609 (2009 –8/31/2012)
  - 65 site visits
  - 30+ presentations in the tri-county area and 3,792 participants
  - 376 feral hogs reported removed via online reporting tool
  - Radio and newspaper interviews
- **Feral Hog Abatement Project (2006-2012)**
  - Mass Media Contacts: 172
  - Educational Programs: 138 for 19,924 clientele (88% increased knowledge)
  - Economic Value of Information Received by Program Participants: $8,849,741
  - Benefit to Cost Ratio of Extension Educational Efforts: 26.52 to 1.00 or $26.52 return for each $1.00 invested in educational programming alone
- Feral Hog Related Publications, Videos & Websites
  - 26 publications in print with 7 translated into Spanish.
  - 1,200+ downloads from Texas AgriLife Extension Bookstore
  - 14,000+ online views
  - 12 YouTube videos with 74,000+ views
  - Several webinars
  - Coping With Feral Hogs: 50,000+ unique visitors, 108,000+ pages accessed
  - Wild Wonderings Blog: 30,000+ unique visitors, 49,000+ pages accessed
  - Widespread social media presence
- **Feral Hog Take Study**
  - 700 landowners were surveyed statewide and asked to characterize their feral hog control efforts for 2010. There were 36,664 feral hogs removed from 1.8 million acres. Trapping was responsible for 57% of the hogs removed, shooting and hunting 35%.
  - Study data were used to estimate an annual hog harvest of 754,000.

Extension Demonstrations and Translational Research

- **Impact of Northern Bobwhite Quail Nest Success**
  - Extension Wildlife Specialists conducted research in 1993 which determined feral hogs had an 11.4% negative impact on nest success.
  - Populations have increased significantly since that time, likely increasing the impact.

- **Techniques for Excluding Feral Hogs from Wildlife Feeding Stations**
  - Research conducted determined ideal heights of fence exclosures (28" & 34") for wildlife (i.e. deer) feeding stations in order to minimize feral hog utilization while allowing continual desirable wildlife use of some 300 million pounds of supplement fed annually.

- **Trap Designs for Increasing Catch Rates of Feral Hogs**
  - Research conducted produced six publications to provide the public with effective, proven methods of trapping and snaring feral hogs to maximize take. Additional research to maximize trapping efficiency is on-going.

Feral Hog Consuming Rio Grande Wild Turkey Nest

Wild Pig in Corral Trap

Pasture Damaged by Wild Pig Activity

Feral Hog Fixed with Tracking Collar

Feral Hog Project Future Needs

- **Feral Hog Community of Practice**
  - **Year 2 – *$200,000***
    - Building of comprehensive database including spatial distribution of feral hogs
    - Integration of feral hog awareness into local, state, and federal programs
    - Development of partnerships and magnify voice for feral hogs control and management
    - Content improvement and development
  - **Year 3 – *$100,000***
    - Input for comprehensive management strategy for feral hogs
    - Awareness and understanding of the role humans play in the invasion and control of feral hogs
    - National decrease in impacts of feral hogs
    - Capture of client needs and impacts to develop new programs and outreach
    - Evaluation of impacts of outreach materials through new tools and resources
- **Publications, Videos and Social Media**
  - **Fiscal Years 2013-2015 – *$250,000***
    - Extension Program Specialist, Extension Associate/Web-coordinator
    - Widespread social media presence
    - Development of new feral hog related products
    - Provide County Extension Agents with needed feral hog materials
- **Plum Creek Watershed Feral Hog Project**
  - **Fiscal Year 2013 – *$100,000***
    - Extension Assistant
    - Development of new education and outreach materials
    - Continued programming efforts
    - Increase use of online feral hog removal reporting tool
- **Wildlife and Fisheries Extension Education Response (annual)**
  - One fulltime faculty member to conduct education and on-going translational research directed at feral hog abatement--$110,000
  - operating budget to support expansion of education efforts and translational research--$50,000

TEXAS A&M AGRILIFE EXTENSION

Wild Pig Damage Abatement via Extension Education Programming

Billy Higginbotham
Professor and Extension Wildlife and Fisheries Specialist
East Region
Texas A&M AgriLife Extension Service

Introduction

The Texas A&M AgriLife Extension Service provides quality, relevant, research-based educational information to the people of Texas. These educational efforts (relative to wild pig damage abatement) were delivered to the public through county Extension agents via the subject-matter specialist(s) at the county, multi-county, regional and state levels. The Texas A&M AgriLife Extension Service is the only state agency uniquely positioned to address the educational aspects focusing on wild pigs and their damage to Texas agriculture.

Background

The estimated 2.6 million wild pigs in Texas are estimated to cause $52 million in agricultural damage with landowners spending an additional $7 million to control pigs and/or correct damage annually. In 2005, the Texas Department of Agriculture (TDA) issued a request for proposals for projects that could address wild pig damage abatement issues in Texas. A&M AgriLife Extension was successful in obtaining funds to conduct a pilot project that encompassed both education of and direct assistance/service to landowners negatively impacted by wild pigs. The two year pilot project was conducted in 2006-07. Additional project funding was obtained from TDA to continue agricultural damage abatement and Extension education for the public in 2008-09, 2010, 2011 and 2012-13.

Impacts of Extension Educational Programming (2006-2012)

Year	Events	# of Participants	Knowledge Increase (%)	# Practices Adopted	Economic Impact	NPS (%)
2006	27	1,995	N/A	N/A	$919,471	50%
2007	40	3,202	68%	3.2	$2,059,350	51%
2008	8	760	98%	3.9	$723,165	56%
2009	11	990	89%	3.8	$683,530	74%
2010	16	1,561	98%	3.4	$1,676,281	67%
2011	26	2,551	98%	3.7	$2,104,919	67%
2012	12	990	99	3.9	$774,025	75%
Totals	140	20,049	--	--	$8,940,741	--
Benefit to Cost Ratio = $8,849,741 to $337,141 or $26.52 return for each $1.00 invested						

International, National and Statewide Presentations-Wild Pig Damage Abatement

(Billy Higginbotham)

(based on information generated from the Texas A&M AgriLife Research & Extension Center-Overton)

International

International Association of Fish and Wildlife Agencies-Omaha, NE
International Wild Pig Conference-York, U.K.

National

National Symposium on Feral Hogs- Kerrville, TX
Society of Range Management-Oklahoma City, OK
National Symposium on Wild Pigs-Mobile, AL
National Conference on Feral Hogs-St. Louis, MO
National Conference on Wild Pigs-Pensacola, FL
National Conference on Wild Pigs-San Antonio, TX
Southeast Deer Study Group-Oklahoma City, OK
ARKLAMISS Feral Hog Management Symposium-Ruston, LA
Quality Deer Management Association-Nashville, TN
National Vertebrate Pest Conference-Monterey, CA
The Wildlife Society-Waikaloa, HI
National Invasive Species Conference-Washington, D.C.

State

Texas State Soil and Water Conservation Districts Annual Meeting-San Antonio
Texas Banker's Association Agriculture and Rural Affairs Conference-Lubbock
Texas Plant Protect Conference-College Station
Texas Turfgrass Association Annual Conference-Galveston
Texas Trappers and Fur Hunters Association-Rusk
Texas Animal Control Association-Nacogdoches
Texas Chapter-Wildlife Society-Lubbock and San Antonio
Texas Surface Mine Reclamation Association-College Station
Landowner's Association of Texas-Houston
Texas Deer Study Group-Kingsville
Texas Pecan Grower's Association-Corpus Christi
Texas and Southwestern Cattle Raiser's Association-Ft. Worth
Texas Fruit Grower's Association-Eastland, TX

Texas A&M AgriLife Research and Extension Center-Overton

Wild Pig Control Demonstration Site

Located at the south entrance of the Texas A&M AgriLife Research and Extension Center at Overton, the wild pig control demonstration site is open to the public for self-guided tours.

Various corral trap designs and examples of several trap gates are included at the site. Also, an example of a wild pig snare is demonstrated for landowners interested in this control method.

An additional feature at the demonstration site is an excluder pen designed to prevent wild pigs from accessing deer supplement in feeders. This is an important best management practice for landowners to consider on properties where deer and wild pigs share the habitat.

2006-2010 Program Impacts

Damage Reported (% of respondents)

Pastures-75%
Fences, water troughs or other improvements-38%
Owner/employee time-40%
Commodity crops-29%
Loss of hunting lease value, wildlife food plots/feeders-23%
Wetlands-23%
Loss of land value-23%
Equipment/vehicles-21%
Specialty crops-16%
Livestock-11%
Stored commodities-5%
Personal injuries-3%

Landowner-Initiated Control Efforts (% of respondents)

Trapped and destroyed-54%
Owners/Employee hunting-51%
Use of catch dogs-19%
Trapped and sold-14%
Trapped and moved from premises-12%
Lease hunting-9%
Other (snares/aerial gunning)-7%

Practice Adoption (% of respondents)

Use larger traps-56%
Pre-bait traps to encourage consistent feral swine visits-51%
Scout for feral swine-49%
Use baits with scent appeal-40%
Market trapped feral swine to offset economic impacts-39%
Set traps whenever fresh sign appears-37%
Vary/change baits used in traps at different locations-34%
Use protective eyewear/gloves during field dressing as a disease precaution-16%

Mean number of management practices to be adopted per respondent-3.2

Knowledge Gains

Increases in knowledge based on specific subjects (before vs. after a program):
Feral hog biology-75%

Legal control options-69%
Efficient trap/bait techniques-69%
Types/extent of hog damage-47%

Respondents increasing general knowledge of feral hogs and their control-98%

Economics

Value placed on outreach information provided at educational events -$7,533,404

Outreach Education Benefit/Cost Ratio: 22.63 : 1.00 or $22.63 return per $1.00 invested

Customer Satisfaction

Likelihood that program participants would recommend Texas AgriLife Extension Service to family, friends and colleagues as a source of information on feral hogs and their control: 9.0 on a 0 - 10 scale (0 = unlikely and 10 = likely)

Net Promoter Score-57 % (NPS scores >50% indicate high degree of customer satisfaction)

Website Statistics (http://feralhog.tamu.edu)

Unique visitors: 95,256
Pages Accessed: 226,274

Applied Research/Result Demonstration Projects

Use of Remote-Sensing Cameras to Improve Trapping Efficiency
Baiting/Scouting Protocol to Enhance Damage Abatement Efforts
Excluding Feral Swine from Native Wildlife Feeding Stations
Enhancing the IPM Approach Toward Feral Hogs through Efficient Trapping/Baiting
Plum Creek Watershed Partnership

AgriLife Extension Publications

Statewide Feral Hog Abatement Project, 2006-07. Final Report.
Statewide Feral Hog Abatement Project, Phase II-2008-09. Final Report.
Statewide Feral Hog Abatement Project, Phase III-2010. Final Report
Recognizing Feral Hog Sign
Corral Traps for Capturing Feral Hogs
Box Traps for Capturing Feral hogs
Building a Feral Hog Snare
Snaring Feral Hogs

Feral Hog Demonstration Site-Texas AgriLife Research and Extension Center at Overton

Demonstration site for the public featuring:

*Gate designs
*Tear-drop shaped trap
*Feral hog exclusion fencing around deer feeding stations

(Statistics compiled on behalf of the Extension Wildlife and Fisheries Project Group-Department of Wildlife and Fisheries Sciences-TAMU and Texas AgriLife Extension Service by Billy Higginbotham, Professor and Extension Wildlife and Fisheries Specialist- 4/20/11)

45033

TEXAS A&M AGRILIFE EXTENSION

MARKING INSTRUCTIONS
CORRECT: ● INCORRECT: ⊘ ⊘ ⊘ ⊘

FERAL HOG DAMAGE AND CONTROL SURVEY

You have recently participated in a program on feral hog life history, behavior and control information hosted by the Texas AgriLife Extension Service. Please complete the following on the economic impact of feral hogs and the value of information you received. Your survey will assist us in planning future programs.

1. Please mark all of the areas in which feral hogs had negative impacts on your property in the past year.
   - ○ Growing or planting commodity crop losses
   - ○ Growing or planting specialty crop losses
   - ○ Stored Commodities
   - ○ Pastures
   - ○ Wetlands
   - ○ Livestock (injury, deaths, diseases)
   - ○ Fences, water troughs, or other improvements
   - ○ Equipment or vehicles
   - ○ Personal injuries
   - ○ Loss of land value
   - ○ Loss of lease value, damage to food plots/feeders
   - ○ Owner or employee time

2. Please mark all of the control methods you use on your property(s).
   - ○ Trapped & destroyed
   - ○ Trapped & moved from premise
   - ○ Other (snares, aerial gunning)
   - ○ Trapped & Sold
   - ○ Owner/Employee hunting
   - ○ Lease hunting
   - ○ Use of dogs

3. "Please estimate your total economic losses due to feral hogs during the **previous year** on all your property(s). This includes all items marked above in Question 1. $ [ ][ ][ ][ ][ ].00 (dollars only)

4. What do you expect your losses due to feral hogs to be during the **upcoming year** AFTER implementing what you learned at Texas AgriLife Extension Service workshop(s)? $ [ ][ ][ ][ ][ ].00 (dollars only)

5. How much income did you make by trapping and selling hogs and/or leasing hog hunting rights last year? $ [ ][ ][ ][ ][ ].00 (dollars only)

6. Did you increase your knowledge of feral hogs and their control by attending this program? ○ Yes ○ No

7. Rate your knowledge **before and after** the program on these subjects. Mark only one number for each answer choice with 1 = no little knowledge, 3 = some knowledge, 5 = high level of knowledge.

TOPICS	Before the Meeting	After the Meeting
a. Feral hog biology	○1 ○2 ○3 ○4 ○5	○1 ○2 ○3 ○4 ○5
b. Legal control options	○1 ○2 ○3 ○4 ○5	○1 ○2 ○3 ○4 ○5
c. Efficient trap/bait techniques	○1 ○2 ○3 ○4 ○5	○1 ○2 ○3 ○4 ○5
d. Types/extent of hog damage	○1 ○2 ○3 ○4 ○5	○1 ○2 ○3 ○4 ○5

8. Please mark all practices that you plan to adopt in order to better manage feral hogs on your property:
   - ○ Use larger traps
   - ○ Use baits with scent appeal
   - ○ Vary/change baits at different locations
   - ○ Set traps whenever fresh sign appears.
   - ○ Pre-bait traps to encourage consistent hog visits
   - ○ Scout for hog sign (tracks, wallows, rubs, hair)
   - ○ Wear eyewear and gloves during field dressing
   - ○ Market trapped hogs to processors to recoup losses

9. Based on the information provided at the program, what is the likelihood that you would recommend Texas AgriLife Extension Service (includes Wildlife Services) to your family and friends as a contact for information on feral hogs and their control? Mark one number below with 0 = not likely and 10 = likely.

○0 ○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 ○9 ○10

Not Likely **Likely**

Regional perspectives and opportunities for feral hog management in Texas

Clark E. Adams, Billy J. Higginbotham, Dale Rollins, Richard B. Taylor, Raymond Skiles, Mark Mapston, and Saidor Turman

Abstract In 2003 we conducted a study to determine the consequences of feral hog (*Sus scrofa*) invasions in several ecoregions of Texas. We examined the observations, experiences, and actions of landowners and managers concerning feral hogs on their property. We used purposive sampling of landowners and managers who fit 1 or more of 3 selection criteria. Landowners and managers were either sent a self-administered, mail-out questionnaire or given a copy of the questionnaire during pesticide applicator workshops. There were 775 survey participants. The effective response rate from those landowners and managers who received a mailed questionnaire was 62% (n=284). Nearly all (95%, n=491) of the pesticide applicator workshop participants turned in a completed questionnaire. Sampling error based on the farms (includes ranches) in Texas and in each region was ±3%, α=0.05. The majority (74%) of respondents were ranchers, and 18% were farmers. Most respondents felt that feral hogs came from the neighbor's property and were an agricultural pest. Rooting, wallowing, and crop damage were the major forms of damage caused by feral hogs. The average economic loss due to hog damage, over the lifetime ownership of the land by the respondent, was $7,515 (U.S). Hog control was an incidental process. The average cost for hog control over the lifetime ownership of the land by the respondent was $2,631 (U.S.). There was strong support for programs related to feral hog management and control, but only half of the survey participants responded to the question. The average quiz score of 11.5 indicated that respondents could correctly respond to <50% of the 26 questions. Region was found to have an effect ($P \leq 0.05$) on all questions tested except one. Management implications included the need for educational programs about feral hogs, how landowners can make better use of feral hogs on their property, ongoing education efforts about feral hogs, and the impact of this study on the public policy and decision-making process.

Key words feral hogs, landowner, survey, *Sus scrofa*, Texas

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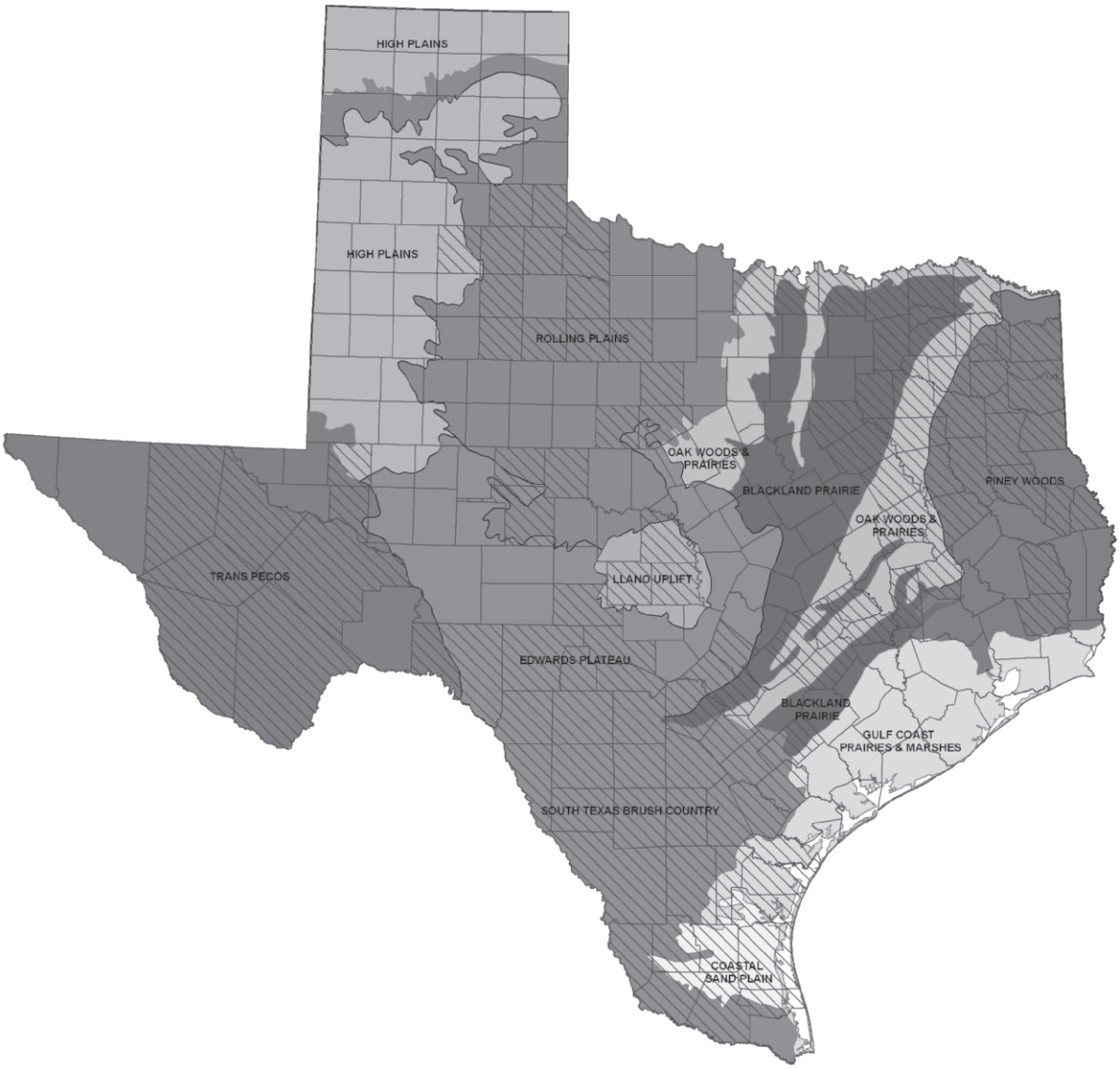

Figure 1. Ecoregions and counties (hatched areas) in Texas where a landowner or manager survey about feral hogs was conducted in 2003.

Feral hogs (*Sus scrofa*) are distributed throughout much of Texas, with the highest population densities occurring in the Piney Woods, Coastal Prairie, Edwards Plateau (includes Llano Uplift), South Texas Brush Country (includes Coastal Sand Plains), and Rolling Plains ecoregions (Figure 1). The Trans-Pecos ecoregion had few feral hogs, but they are beginning to expand their range into this ecoregion (Taylor 1993). By 1990 feral hogs were established in the Davis Mountains, north of Big Bend National Park located in the southern tip of the Trans Pecos ecoregion (Figure 1). By 1998 southward range expansion resulted in feral hogs encroaching on Big Bend National Park located in the western Trans Pecos ecoregion of Texas (R. Skiles, Big Bend National Park, personal communication).

Success of feral hog control anywhere they occur is highly dependent upon the activities of local landowners. Given the potential damage that feral hogs can inflict on the biotic resources of park and private lands, one plan of action was to determine how landowners address feral hog management. An objective assessment of landowners concerning feral hog management was needed (Gipson et al. 1998). In addition, educational programs are need-

ed to provide factual information about feral hogs to landowners and special interest groups. Previous published studies of landowner surveys concerning feral hogs on their property focused on potential economic returns from feral hogs (Degner et al. 1982); and landowners' attitudes toward feral hogs, management activities, and property-damage estimates (Barrett and Pine 1980). As interest in feral hogs and their management increased, a national feral hog symposium was conducted in Kerrville, Texas in 1993 (Hanselka and Cadenhead 1993).

In 2003 we conducted a study to determine the consequences of feral hog invasions in several ecoregions of Texas (Figure 1). The study focused on the observations, experiences, and actions of landowners and managers concerning feral hogs on their property. The objectives of this study were to develop a baseline analysis of landowners' and managers' views on 1) the historical occurrence of feral hogs on their land, 2) origin of feral hogs on their land and present population estimates, 3) the positive and negative values of feral hogs, 4) the types of damage caused by feral hogs and economic losses, 5) control strategies and costs of control, and 6) becoming involved in feral hog management and educational opportunities. To develop educational programs about feral hogs, it was important to determine landowners' knowledge of selected aspects of feral hog biology, natural history, and regulatory status.

Study area

The study area consisted of several ecological ecoregions in Texas (Figure 1). We chose ecoregions based on the historical occurrence (e.g., recent or long-term) of feral hogs within the counties of each region. This study did not include the High Plains ecoregion in Texas (Figure 1). The High Plains and extreme west Texas are outside the present range of feral hogs in the state. Feral hogs cause significant damage to rice fields, levees, fences, and country roads in the Gulf Coast Prairie and Marshes ecoregion (N. Wilkins, Texas Cooperative Extension, personal communication). However, we did not have access to a purposive sample (explained below) of landowners and managers from this region, which prevented its inclusion in this study.

Methods

Purposive sampling was used by Schuett and Selin (2002) to select landowner respondents based on their involvement in 5 different forest management initiatives. In our study, we selected participants that represented a particular ecological region (Figure 1), facilitated the management of the natural resources on their properties, and were accessible through an existing database or activity. Our selection of survey participants was not designed to represent a cross-section of all rural landowners in Texas. Rather, we wanted to obtain a representative sample of the total number of farms and ranches at the region level.

One part of the surveyed population consisted of landowners and managers representing the South Texas Brush Country, Edwards Plateau, Rolling Plains, and Trans Pecos ecoregions of Texas (Figure 1). These landowners and managers were sent a self-administered, mail-out questionnaire by the agency representatives (e.g., Texas Parks and Wildlife, Texas Cooperative Extension, and Wildlife Services) who had the names and addresses of the types of landowners who fit our selection criteria. Two weeks later a reminder card was sent to each landowner or manager by the agency representative.

Landowners and managers who participated in pesticide-applicator workshops (mandatory for recertification) fit our selection criteria and represented the Piney Woods, Blackland Prairie, and Oak Woods Prairies ecoregions of Texas (Figure 1). These landowners and mangers were given a copy of the questionnaire at the beginning of the workshop. Completed questionnaires were collected at the end of the workshop.

Completed questionnaires were sent back to the Human Dimensions in Wildlife Management Research Laboratory and Texas A&M University in a return mailer. Our anonymous survey administration prevented a second mailing of the questionnaire, nonresponse follow-ups, and a determination of nonresponse bias. A more important concern was item nonresponse discussed later in the paper.

The questionnaire

The questionnaire began by determining whether feral hogs existed on the properties owned or managed by respondents. If there were feral hogs, a follow-up question asked for the county name(s) and the year hogs were first observed. The questionnaire asked how hogs got on the land, and whether the numbers had changed since they were first observed. We asked questions regarding values (positive and negative) of having hogs on the

Table 1. Results of a feral hog quiz taken by 775 Texas landowners and managers in 2003.

Statements: "Feral hogs -"	Agree	Disagree	Not sure
a. compete with other wildlife species for food.	622*	34	60
b. are a serious threat to ground-nesting birds.	514	29*	163
c. prey on snakes – even rattlesnakes.	327*	35	321
d. prey on healthy newborn livestock, e.g., lambs.	314*	84	298
e. destroy game feeders.	570*	37	95
f. that root in the soil benefit some game birds.	203*	179	295
g. are an exaggerated risk to other wildlife.	224*	213	231
h. eat anything they can catch alive or find dead.	456	66*	179
i. carry diseases harmful to humans.	286*	73	328
j. eat mostly plant material.	351*	189	143
k. compete with other wildlife at unknown levels.	531*	23	136
l. do not appear to pose a significant threat to wildlife.	118*	418	146
m. are opportunistic feeders.	571*	26	97
n. breed year-round.	611*	22	76
o. have, on average, 12 piglets/litter.	331	142*	220
p. are good to eat.	421*	123	135
q. have their numbers controlled primarily by human activity.	459*	132	106
r. carry diseases harmful to domestic livestock.	308*	52	328
s. generate a significant source of income for some landowners.	308*	180	192
t. carry diseases harmful to other wildlife.	311*	46	329
u. number in the millions in Texas.	487*	16	194
v. are expanding their range in Texas.	649*	13	51
w. are a game animal regulated by Texas Parks and Wildlife.	50	492*	140
x. are found in most Texas counties	457*	46	197
y. can only be shot by someone with a valid Texas hunting license.	167	386*	138
z. can be moved anywhere in the state without restrictions.	213	202*	277

* = correct answer

property and types and cost of damage done to the property by feral hogs. We asked questions about the intensity, methods, and costs of feral hog control on the property, and the individuals and agencies involved. One question determined respondents' willingness to participate in several feral hog management programs. We then determined how the respondent was associated with the land in terms of how he/she used it and ownership status. A feral hog quiz tested respondents' knowledge of the biology, natural history, and control of feral hogs (Table 1).

Data analysis

Much of the information derived from landowners' responses to questionnaire items is reported as frequencies and summary statistics. We compared regional differences in responses to some questions using chi-square or paired *t*-tests.

Results

Response rates

There were 775 survey participants. The effective response rate from those landowners who received ($n = 455$) a mailed questionnaire was 62% ($n = 284$). The response rates by region ranged from 26% in the Trans Pecos region to 86% in the Edwards Plateau region. Nearly all (95%, $n = 491$) of the pesticide-applicator workshop participants turned in a completed questionnaire.

One hundred and fifty-three of the 775 respondents (20%) reported hogs were not on their property. Unfortunately, they could not be assigned a region because they were not asked to identify their county. This omission produced conservative response rates by farm and ranch and region.

This study included 115 of 254 counties and 954 of the 194,301 farms (includes ranches) in Texas (Wilkins, N., A. Hays, and D. Kubenka. 2003. Texas land trends. Land information systems. http://landinfo.tamu.edu/frag). Sampling error based on the total farms in Texas and in each region was ±3%, $\alpha = 0.05$. Therefore, study results can be generalized at the farm and region level.

Respondents

The majority (74%) of respondents ($n = 775$) were ranchers, and 18% were farmers. Eight percent identified other associations with the land including lease-hunt operators, state land managers, and those who leased the land for grazing cattle or hunting. Absentee landowners represented 21% of

the respondents compared to 72% and 7% who lived on the land>and<than 6 months/year, respectively.

Response patterns to selected questions

Most (56%) respondents reported that feral hogs appeared on their land as a result of immigration from the neighbor's property. Twenty-six percent were not sure where the hogs came from. Only 7 and 8%, respectively, thought the hogs escaped from a domestic herd or were transplanted intentionally. Most (71%) reported that feral hog numbers were increasing on their property compared to 14% who reported hog numbers were stabilizing or decreasing (5%).

Respondents reported feral hogs to be an agricultural pest (89%), a disease hazard (34%), and an environmental (45%) and economic (50%) liability. Only 30% considered feral hogs to be a recreational asset for hunters.

Types of damage reported most often by respondents were rooting damage to roads, ponds, or fields (87%); wallowing in tanks and streams (65%); and crop damage (53%). Fence damage and loss of supplemental feed for livestock or wildlife were reported by 47 and 49% of the respondents, respectively. Less than 10% of respondents reported loss of or disease transmission to livestock, and no damage caused by feral hogs. The average economic loss due to hog damage reported by 344 respondents in 67 counties was $7,515 ± $1,619 (SE) (U.S.). The total reported economic loss since feral hogs appeared on the respondents' property was $2,585,200 (U.S.).

Hog control was an incidental process (i.e., only when the respondent had the time and the situation allowed it) for 61% of the respondents. Intensive hog-control programs (i.e., specific control measures carried out on a regular basis) were conducted by 23% of the respondents. Only 18% did not control hogs. The majority of respondents used trapping (75%) or shooting (87%) methods to control hogs. Only 19% attempted to control hogs with the use of trail-and-catch dogs. Less than 13% used guard animals, hog-proof fences, electric fences, or aerial hunting to control feral hogs. The average economic cost for feral hog control reported by 164 respondents in 51 counties was $2,631± $461 (U.S.). Total reported control costs since feral hogs appeared on the respondents' property was $431,485. Respondents identified themselves (90%) or recreational hunters (48%) as the individuals who conducted feral hog management. Wildlife Services (WS) and private control operators were used by <10% of the respondents.

There was majority (60–66%) support for 1) forming a feral hog control coalition consisting of stakeholders representing private and public lands, state and federal agencies, nongovernmental organizations, and private citizens; 2) establishing a program that monitored the impacts of feral hog expansion; and 3) attending training workshops on feral hog management. However, non-response on this question was high. Only half of the sample population answered ≥1 of the 3 aspects of this question listed above.

Respondents' knowledge of selected aspects of feral hog biology and natural history

We asked respondents to complete a 26-point quiz (a to z) on selected aspects of feral hog biology, natural history, and regulatory control (Table 1). We determined "correct" responses to some questions from information provided in many publications found in Wolf and Conover (2003). The average quiz score for 775 respondents was 11.5±0.17 (range = 0–21). There was no difference on quiz scores between those who did (n=618) and did not (n=154) report hogs on their property.

Ecoregion comparisons

Ecoregion (Figure 1) was considered an appropriate independent variable that would predict how respondents answered selected questions. Ecoregion was selected because of the history of feral hog range expansion in Texas (Taylor 1993) and different ecosystem types and land uses in each region (Wilkins, N., A. Hays, and D. Kubenka. 2003. Texas land trends. Land information systems. http://landinfo.tamu.edu/frag). We found ecoegion to have an effect ($P \leq 0.05$) on all questions that were tested except one. For example, how (χ^2 = 36.4, P = 0.006) and when (χ^2 = 143.3, P = 0.0001) feral hogs appeared on the respondent's land were dependent on region. The majority (range = 51–60%) of the respondents in all ecoregions except the Blackland Prairie reported that hogs immigrated from adjacent properties. However, more respondents in the Blackland Prairie (42%) and South Texas Brush Country (40%) ecoregions did not know where the feral hogs came from compared to only 19–26% of respondents in the other ecoregions. The reported times of first appearance

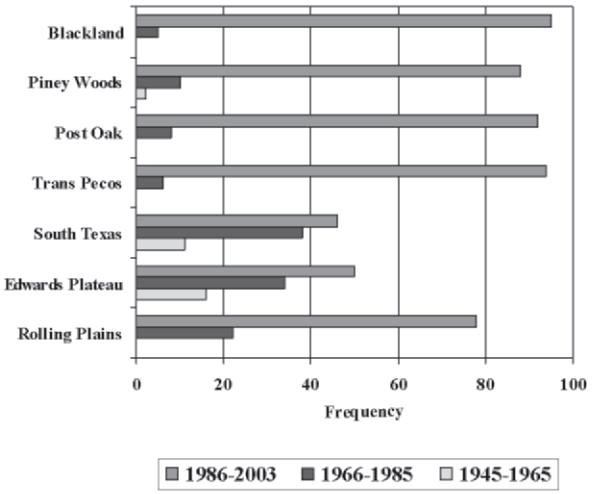

Figure 2. Feral hog arrival times in 7 ecoregions in Texas excluding 1 report of 1900.

of feral hogs ranged from 1900 (one case) to 2003. The earliest arrival times were from 1945–1965 in the Edwards Plateau, South Texas Brush Country, and Piney Woods ecoregions (Figure 2). The most recent (1986–2003) feral hog invasions were in the other ecoregions.

Respondent perceptions of whether the number of feral hogs was increasing, remaining stable, decreasing, or unknown was dependent upon region ($\chi^2 = 35.6$, $P = 0.008$). More South Texas Brush Country and Trans Pecos respondents (11 and 16%, respectively) reported that feral hog populations were decreasing when compared to those in the other ecoregions (range = 0–6%). On the other hand, 13% of the Blackland Prairie and Oak Woods Prairies respondents did not know how the feral hog numbers were changing on their land compared to ≤9% in other ecoregions.

The values that respondents attributed to the existence of feral hogs on their property were dependent on region ($\chi^2 = 156.8$, $P = 0.0001$). Response differences were attributed to higher level of agreement that feral hogs were a recreational asset for hunters in the Edwards Plateau (13%), Rolling Plains (19%), and South Texas Brush Country (23%) ecoregions compared to ≤7% in the other ecoregions. More respondents in the Edwards Plateau, Rolling Plains, and South Texas Brush Country also considered feral hogs as a source of income (7%) compared to ≤4% in the other ecoregions.

Types of damage caused by feral hogs on respondents' property also were dependent on region ($\chi^2 = 167.9$, $P = 0.0001$). Crop damage was reported more often in the farming ecoregions including the Blackland Prairie (18%), Piney Woods and Oak Woods Prairies (16%), and Rolling Plains (21%), and, to a lesser degree, in South Texas Brush Country (12%) compared to ≤7% in the remaining ecoregions. Loss of livestock was reported more in the Edwards Plateau (10%) and Trans Pecos (6%) ecoregions than any of the other ecoregions (≤1%). Finally, more Blackland Prairie respondents (4%) reported no hog damage compared to ≤1% of those in other ecoregions.

How respondents described their feral hog management program ($\chi^2 = 42.8$, $P = 0.0001$) was dependent on region, as was the question on who conducted the management program ($\chi^2 = 100.0$, $P = 0.0001$). Intensive feral hog control was reported most often in the Edwards Plateau and South Texas Brush Country ecoregions. Incidental feral hog control was a prevailing pattern throughout all ecoregions. Nearly a quarter of the respondents in 5 ecoregions reported that they did not control feral hogs (Table 2).

Respondents themselves or recreational hunters were the individuals most involved in feral hog con-

Table 2. Comparisons of the level of feral hog control and who conducted the feral hog program in 7 ecological ecoregions in Texas in 2003.

		Level of feral hog control (%)		
Ecoregions	*N*	Intensive[a]	Incidental[b]	Nothing
Blackland Prairie	32	19	63	19
Edwards Plateau	37	46	46	8
Piney Woods	155	18	63	19
Oak Woods Prairies	182	19	57	24
Rolling Plains	62	11	71	18
South Texas Brush Country	85	39	57	5
Trans Pecos	34	24	59	18

Who conducts feral hog control (% on multiple responses)?				
	Myself	WS[1]	Hunters	Private[2]
Blackland Prairie	68	0	32	0
Edwards Plateau	44	23	34	0
Piney Woods	67	1	29	2
Oak Woods Prairies	69	1	28	3
Rolling Plains	54	7	38	0
South Texas Brush Country	54	2	43	2
Trans Pecos	67	9	23	0

[a] Specific control measures carried out on a regular basis.

[b] Only when the respondent had time and the situation allowed it.

1 = Wildlife Services, 2 = Private control operators.

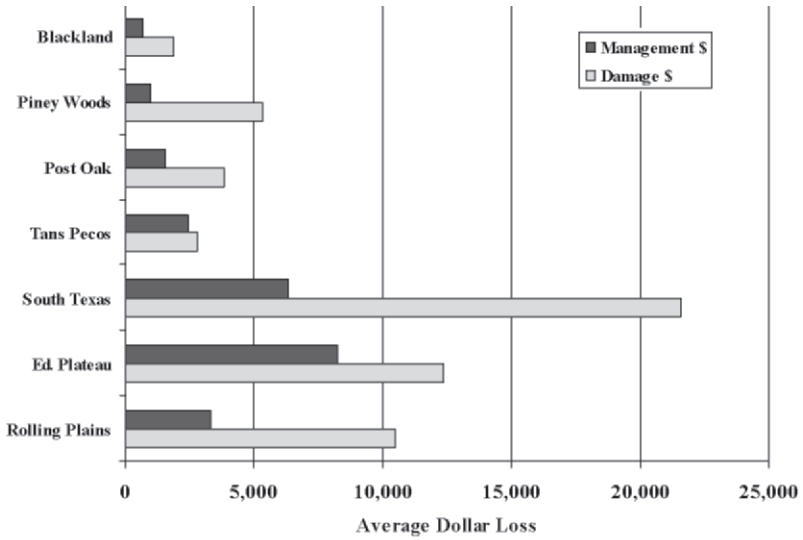

Figure 3. Average dollar losses due to feral hog damage and management in 7 ecoregions in Texas, as determined by survey conducted in 2003.

trol. Wildlife Management Services (WMS) was responsible for hog control only in the Edwards Plateau ecoregion (Table 2).

The 2 primary methods of feral hog control across all ecoregions were trapping (23–41%) and shooting (27–44%). However, the higher use of aerial hunting in the Edwards Plateau (16%) and South Texas Brush Country (14%) compared to ≤8% in other ecoregions and trailing and catch dogs in the Piney Woods (12%) compared to ≤8% in other ecoregions produced a response pattern that was dependent on region ($\chi^2 = 234.7$, $P = 0.0001$).

Region was not a factor that contributed to the respondents' (those with and without feral hogs) desire to participate in the 3 feral hog management opportunities listed earlier ($\chi^2 = 10.5$, $P = 0.772$).

Region accounted for differences in economic losses due to feral hog damage to respondents' property ($F_b = 2.3$, $P = 0.02$) and management costs ($F_b = 5.1$, $P = 0.001$). The highest average economic losses due to feral hog damage and management costs were in the South Texas Brush Country, Edwards Plateau, and Rolling Plains ecoregions (Figure 3).

Discussion

There is a great need for studies that address the attitudes, activities, and knowledge of landowners and managers regarding feral hogs. Such information is important to address the management concerns and educational needs of those who confront the problems of feral hog management on a daily basis. In this regard we discuss study results in terms of respondents' attitudes toward feral hogs, knowledge about feral hogs, and level of control and management including respondents' desire to participate in feral hog control and management opportunities.

Attitudes toward feral hogs

Respondents viewed feral hogs more as a negative aspect of the landscape rather than a positive opportunity to promote recreational hunting or realize some economic gain. Frederick (1998) reported $1,731,920 worth of damage caused by feral hogs in 40 California counties. Nearly 40 percent of the feral pigs in California are killed by hunters each year (Waithman et al. 1999). The income potential from feral hogs was millions of dollars based on the recreational value of hogs to hunters, lease hunting opportunities for landowners, taxidermy, and trapping (Degner et al. 1982).

There is some debate in Texas as to whether feral hogs are of any ecological importance, an economic liability, or an under-utilized asset (Tolleson et al. 1995). For example, many landowners support the spread of feral hogs because it offers a hunting opportunity that is more affordable than hunting other big game species. A 1992 survey indicated feral hog hunters paid in a range of $25–1,000 for a hog hunt with the average price paid being $169 (Rollins 1993). However, not enough people are hunting feral hogs to reduce their already enormous population ($n = 1{,}500{,}000$) in Texas. In Fort Riley, Kansas, public hunting proved to be relatively unsuccessful in controlling a feral hog population (Richardson et al. 1997).

Respondents' knowledge about feral hogs

The average quiz score of 11.5 indicated that respondents could correctly respond to <50% of the 26 questions. On several questions nearly 50% of the respondents were "not sure" which response was appropriate. Five statements (b, h, and o; Table 1) revealed a particular lack of understanding about feral hog biology in terms of the impact the animals

have on other wildlife, what feral hogs eat, and how many offspring they can have per litter. Respondents were either not sure or responded incorrectly to 2 regulatory statements (y and z; Table 1) related to the requirement of a hunting license to shoot feral hogs (44%), and restrictions on moving feral hogs in Texas (71%).

The impact of feral hog depredation on quail (*Colinus virginianus*) is still unclear due to the abundance of hogs in areas that simultaneously support the largest quail populations (Rollins and Carroll 2001). Others concluded that bobwhite quail decline was due to degradation and reduction of habitat, caused partly by changing land-use practices and urbanization across the bobwhite's range (Church et al. 1993). However, 68% of respondents believed that feral hogs were a serious threat to ground-nesting birds.

The diet of feral hogs consists primarily of plant material, whereas animal material represented a small portion of the hog's diet (Baber and Coblentz 1987, Taylor and Hellgren 1997). Yet 60% of respondents believed that feral hogs will eat anything they can catch alive or find dead. Litter sizes ranged from 4.8–7.5 young/litter (Taylor et al. 1998). Nearly half (44%) of respondents reported that 12 piglets per litter was the norm.

There are regulations concerning the movement of feral hogs throughout the state. The Texas Animal Health Commission (TAHC) has regulatory authority over feral swine in Texas. The TAHC regulation concerning feral swine trapped on a premise is that they are to be tested negative for brucellosis and pseudorabies within 30 days before they are moved to a game preserve or site where they will be maintained for hunting. This 1992 TAHC regulation was intended to prevent the spread of brucellosis and pseudorabies from feral swine to domestic stock. Nearly two-thirds of the respondents agreed or were not sure that feral hogs could be moved anywhere in the state without restrictions.

Over half (51%) of the respondents disagreed with the statement that feral hogs can be shot only by someone with a valid Texas hunting license. The TPWD code, chapter 42, (42.002c) states that a resident or the landowner's agent or lessee may take feral hogs causing depredation on the resident landowner's land without having acquired a hunting license. This law pertains also to nonresident landowners in TPWD code, chapter 42 (42.005f). It is uncertain whether those who correctly disagreed with the statement actually knew the TPWD codes pertaining to hunting license requirements or whether they considered the feral hog to be a nongame pest and therefore unregulated.

Level of control and management

Our results indicated that the level of control and management of feral hogs on respondents' property was incidental (when opportunity presented itself), did not involve professional animal damage control specialists, and was not a bottom-line operational cost. Incidental management of feral hogs also was common by California landowners (Barrett and Pine 1980). The feral hog problem is so enormous and pervasive throughout most of Texas that management attempts by 1 or a few landowners can be costly in time and money but fairly ineffectual in making any significant impact on the overall problem. The TPWD provides guidelines on how to form Wildlife Management Associations (WMAs) or Co-ops at the county level. The focus of WMAs is wildlife management on private lands by landowners with the assistance of TPWD field biologists. While typically focused on white-tailed deer (*Odocoileus virginianus*) management, the organizational paradigm that produces WMAs could be used to coordinate feral hog control and management at the county or regional levels. Half of the respondents were interested in doing something to become better prepared to control and manage feral hogs on their properties.

Management implications

Based on the respondents' knowledge of feral hogs, information and education should be expanded. This could include more informational brochures, seminars, and workshops. Knowledge and understanding of the basic biology of feral hogs will help manage the species. It also is important that the public understands the laws and regulations regarding feral hogs. Unfortunately, in Texas the feral hog is regulated by multiple agencies. Most sportsmen consider the feral hog wildlife, and, indeed, it is the second-most-huntable large-mammal species in Texas behind the white-tailed deer (Rollins 1993). The TPWD establishes hunting regulations; however, it considers the feral hog as an exotic game animal. The TAHC establishes movement regulations and Texas Department of Agriculture (TDA) regulates domestic hog producers including free-ranging marked hogs. The United States Department of Agriculture has regulations

governing the slaughter of feral hogs. The lack of single regulatory authority adds to the confusion among landowners about sources of information about feral hog management.

The feral hog is an underutilized resource in Texas. The amount of damage caused by feral hogs could be reduced if landowners would use the hog as an economic resource. Landowners could charge leasing rights, trophy fees, day fees, or barter for ranch improvements. In essence, they could turn an economic liability into an asset or at the very least, lower the liability. Landowners must be willing to change their outlook and incorporate hog management into their overall ranch-management plan. The average economic cost to control hogs was $2,631 (U.S.), and $169 (U.S.) was the average income per hog (Rollins 1993). If the average landowner sold 16 hogs, it would offset the average economic cost of feral hog control.

The ultimate application of our results is the impact they had on the public policy and decision-making processes. By providing briefings to state policy-makers, the outreach effort associated with the project has resulted in early efforts to provide financial resources for dealing with feral hog issues. For example, an extension specialist's briefing to the state Agriculture Commissioner and Agriculture Committee of the Texas House of Representatives highlighted these survey results. As a follow-up, in a subsequent issue of the State Comptroller's monthly financial report, a summary of these results was included as a feature. By presenting landowner perspectives on the issue along with some reliable estimates of economic damage, the policy-makers involved have been able to move from a question of "is this a problem?" to "how big a problem is this?" and then finally to "what can we do to manage this problem?" As a result, with an effort now supported by the TDA, the state is in the early stages of designing a pilot feral hog abatement program that is likely to receive legislative funding. In our view this is a classic case of complementary roles among research, extension, and policy-making.

Acknowledgments. The authors wish to thank A. Manley and T. Schields for data entry and D. Kubenka for constructing Figure 1. The project was funded by the National Park Service. The Texas A&M University Institutional Review Board on human subjects approved this study (Project # 2002-493).

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Associate editor: *Krausman*

Human–Wildlife Conflicts 1(2):192–198, Fall 2007

Appreciating feral hogs: extension education for diverse stakeholders in Texas

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Abstract:
Texas harbors the largest population of feral hogs (*Sus scrofa*) in the United States, with populations estimated at >2 million. Depending on one's perspective, feral hogs are either a pariah (from the farmer's standpoint) or a popular sporting animal (from a hunter's standpoint). As feral hogs increase in range and density, conflicts among stakeholders are sure to increase. Texas Cooperative Extension (TCE) initiated educational programs in 1991 to address concerns regarding the presence and management of feral hogs. Since that time, we have developed various workshops, symposia, and educational materials (e.g., print, videotape, and website) as means of addressing "the good, the bad, and the ugly" aspects of feral hogs in Texas. Texas Cooperative Extension involves various stakeholder groups, including agriculturalists, biologists, hunters, and wildlife damage management professionals in its efforts to provide a thorough, balanced approach to management of feral hogs. Our goal is to increase critical thinking skills among stakeholders while seeking consensus on local damage issues caused by feral hogs.

Key words: conflict resolution, extension education, feral hogs, human–wildlife conflicts, immunocontraception, integrated pest management, invasive species, *Sus scrofa*, Texas

Populations of feral hogs (*Sus scrofa*) occur in at least 39 states (Gipson et al. 1998, J. Mayer, Westinghouse Savannah River Company, personal communication), with Texas harboring the greatest population, estimated at >2 million. Feral hogs currently occupy about 240 of Texas' 254 counties—basically all of the state with the exception of the western portion of the High Plains and Trans-Pecos ecoregions (Adkins and Harveson 2007, Mersinger and Silvy 2007; Figure 1). As one might expect, the increasing population of feral hogs brings with it both assets and liabilities, depending on stakeholders' perspective.

The high fecundity of feral hogs (Taylor et al. 1998) and the activities of hunters, who at times transported them to different locations, have resulted in rapid feral hog population increases over the past 20 years. Burgeoning populations of feral hogs cause various problems for private landowners and public agencies. Stakeholders impacted by feral hogs include agriculturalists, conservationists, hunters, and the general public (Figure 1). Commercial pork producers and cattle ranchers are concerned about the spread of swine brucellosis and pseudorabies (Hartin et al. 2007). Feral hogs are second only to coyotes (*Canis latrans*) as predators of sheep and goats in some areas of Texas (Mapston 2004). A 2004 survey of Texas landowners found that since feral hogs first appeared on private property, damage estimates averaged $7,515 per landowner statewide, with an estimated

Figure 1. Feral hogs are common in many parts of the United States.

$2,631 per landowner spent on control efforts and damage correction (Adams et al. 2005). Feral hogs accounted for 10 to 25% of losses of simulated quail and turkey (*Meleagris gallopavo*) nests in the rolling plains of Texas (Tolleson et al. 1995). Besides having agricultural impacts, feral hogs are a serious exotic threat to sensitive ecosystems (Engeman 2007*a*, 2007*b*; Cearley 2005). While hog hunters and outfitters often tout feral hogs as a popular, affordable species of big game (Chambers 1999), agriculturalists and conservationists are united in their dislike of the marauding exotics. Feral hogs can have detrimental impacts on local water quality and aquatic biota (Kaller et al. 2007). Expansion of feral hogs westward in Texas threatens nesting success of rare birds (e.g., lesser prairie chicken [*Tympanuchus pallidicinctus*]).

When any free-ranging ungulate exceeds its carrying capacity, educational strategies should be developed to address management alternatives for that species (Rollins and Higginbotham 1997). In this paper we describe extension education programs used by Texas Cooperative Extension (TCE) since 1990 to increase public awareness of assets and liabilities associated with the increasing population of feral hogs.

TCE's approach to provide information about feral hogs

As the outreach arm of Texas A&M University, TCE is charged with providing factual, research-based information to clientele (Higginbotham 1999). When dealing with controversial species (e.g., feral hogs), our strategy is not to teach stakeholders *what* to think, but instead *how* to think. Our goal is to present unbiased, research-based information to stakeholders so that they may make informed decisions to best serve their individual needs while being aware of the consequences of their management practices.

TCE often markets educational programs on feral hogs as Feral Hog Appreciation Days (FHAD), a play on words that serves to both arouse and intrigue potential participants. The dictionary defines the word *appreciate* in basically 3 contexts—all of which are relevant to a discussion of feral hogs among a diverse group of stakeholders:

- "to value or admire highly;"
- "to judge with heightened awareness;" and
- "to be cautiously or sensitively aware of" (Webster's 1975).

TCE agents incorporate the various contexts of appreciation in our educational strategies to ensure that the multifaceted nature of feral hog issues is addressed.

How TCE helps the public develop empathy for the perspectives of others

Stakeholder audiences in Texas relative to feral hogs include landowners, hunters, meat processors, natural resource agencies, nongovernmental conservation organizations, and, increasingly, urbanites. We recognize that stakeholder perspectives on feral hogs include the "good", the "bad", and "the ugly." Accordingly, we design educational programs that include all 3 aspects. And as our audiences are usually cross-sections of the local community, certain participants may not agree with their neighbors' opinions.

We often use a simple geometric image of rectangles (Figure 2) to force the audience to think critically, and to underscore the complexity of various ecological issues associated with the management of feral hogs. Figure 2 is projected before audiences who are asked to count the number of squares they see. After 20 seconds, the image is removed, and answers are solicited from the audience. Answers typically vary from 16 to 27 squares. Once audiences see that not everyone

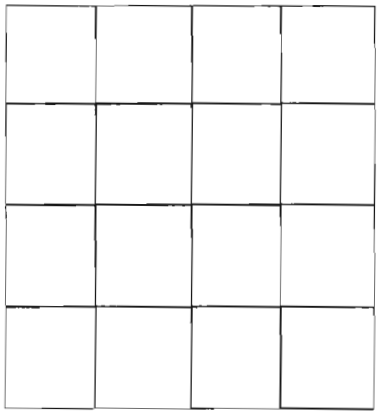

FIGURE 2. "How many squares can you find in this diagram?" (See text for answer.) Diagram used during extension education programs in Texas to illustrate the individual differences in perception of the multifaceted nature of feral hog issues.

arrived at the same answer, they are shown the image and are given another 20 seconds to recount the squares. Their answers still vary, but most audience members now see more squares than they did previously. The correct number is 30 squares (i.e., 16 squares involving 1 cube, 9 involving 4 cubes, 4 involving 9 cubes, and 1 involving 16 cubes).

This simple exercise gets the audience involved and underscores 2 important teaching points. First, although everyone looks at the same figure, they do not have the same solution to the problem. Second, we discuss the fact that the more one studies an issue (especially issues dealing with ecology), the more complex the situation becomes. In other words, there likely is not a simple solution to ecological problems, and no one solution is likely to satisfy everyone.

"The Good"

Hunters and landowners who cater to hog hunters view feral hogs as a challenging, tasty species of big game that may be hunted year-round in Texas. The mean value of a feral hog hunt to landowners in 1994 was $164 (Rollins 1994), and some landowners derive income by developing hunting enterprises around feral hogs (Chambers 1999). Hunting feral hogs is especially popular among bow hunters. The demand for so-called wild boar meat, especially in European markets, has increased the price for live feral hogs; and prices offered usually exceed those for domestic pork (Weems 1999; Figure 3). Accordingly, trapping feral hogs in various cage-traps has become increasingly popular in recent years.

Figure 3. Commercial demand for "wild boar" meat in upscale restaurants in the northeastern United States and abroad has spawned a demand for feral hogs.

While the rooting behavior of feral hogs is generally regarded as an ecological liability (Engeman 2007*a*, 2007*b*), feral hogs can also have a positive effect on the environment. For instance, the soil disturbance associated with rooting promotes early successional species (e.g., *Croton* spp., *Helianthus* sp.), which are important seed-producing plants for upland game birds (Rollins 1999).

"The Bad"

Economic liabilities associated with the presence of feral hogs include agricultural damage, such as crop depredation, damage to netwire fences, and predation on lambs and kid goats (Mapston 2004, Conover and Vail 2007, Hartin et al. 2007). These also include disease transmission to livestock and humans (Lawhorn 1999), hog–vehicle collisions, and degradation of parks and golf courses (Engeman 2007*a*, 2007*b*).

"The Ugly"

Feral hogs are a serious competitor for mast with white-tailed deer (Yarrow 1987), and high hog densities can adversely impact amphibian populations. While feral hogs are considered to be serious predators of ground-nesting birds (Tolleson et al. 1995), their impact on abundance of northern bobwhites (*Colinus virginianus*) and wild turkeys is unclear (Rollins 1999).

TCE's education and information programs

Extension education programming comes about through the interaction of county extension agents, local input by extension clientele, and subject matter specialists. The array of responses includes one-on-one communication, local county meetings, symposia, public demonstrations of research findings, printed publications, and electronic outlets (e.g., video programs, web-based information; Table 1).

Requests for information about feral hog management were common by the late 1980s. Such requests were handled initially through individual communication until 1990, when we conducted the first educational program dealing with feral hogs in Cayuga, Texas (Higginbotham 1999). Since then, the basic program presented in Cayuga has been replayed several times across

Table 1. Examples of educational programs and products developed to educate stakeholders about feral hog management in Texas.

Effort	Medium	Stakeholders
Individual requests	Letter, e-mail, telephone call	Various
County meetings	Slide presentations	Diverse, but usually agriculturalists; meetings last <2 hours
Feral Hog Appreciation Days	Slide presentations; demonstrations; videos	Landowners, hunters, holders of private applicators licenses
Symposia	Slide presentations	Diverse; including landowners, hunters, agency biologists
Publications	Printed and electronic Printed: Mapston (2004) Web-based: (www.feralhog.tamu.edu) Video/DVD: Rollins (1994); Cearley (2005)	Various

Texas. Interest in the management of feral hogs increased to the point that a national symposium on feral hogs was convened in 1993 in Kerrville, Texas (Hanselka and Cadenhead 1993). The symposium consisted of presentations by authorities from across the nation on both the positive and negative aspects of feral hogs.

Extension publications on feral hogs (Stevens 1997, Coats 1999, Mapston 2004) often reference information from proceedings of the 1993 symposium (Hanselka and Cadenhead 1993) and a symposium conducted in 1999 by the Texas Animal Health Commission. Several of these documents are also available for sale or free online in Portable Document Format (PDF) from the Texas Cooperative Extension's online bookstore (www.tcebookstore.org).

TCE complements its educational programs with columns in various periodicals (e.g., *Farmer-Stockman* magazine, *Texas Wildlife* magazine) to raise public awareness about feral hog management. In 2004, we developed a website (http://feralhog.tamu.edu) to provide an Internet source for information about feral hog management alternatives.

Texas stakeholders include farmers and ranchers who need pesticide recertification training to meet regulatory requirements. Anyone who administers restricted-use pesticides during farming and ranching operations in Texas must possess a pesticide applicator license from the Texas Department of Agriculture (TDA). Private applicators must become recertified every 5 years by completing 15 hours of continuing education. Prior to 2004, information on feral hog management did not qualify for recertification training, as there are no pesticides registered for use in controlling feral hogs. In 2004, however, TDA permitted programming on feral hogs to be eligible for continuing education units.

Developing TCE's Feral Hog Appreciation Days

We conducted the first daylong program of FHAD in Jacksboro, Texas, in 1997 and nine more since then. These programs are typically 6 hours long and qualify for 5 educational units for participants holding certified pesticide applicators licenses. Local county extension agents typically partner with their local representatives of Texas Wildlife Services (affiliated with the U.S. Department of Agriculture's Animal and Plant Health Inspection Service-Wildlife Services and administratively housed under TCE), a local Texas Parks and Wildlife game warden, a representative of the Texas Animal Health Commission, and other local experts, as appropriate.

A standard agenda for a FHAD program includes:

- A pre-test consisting of an interactive slide presentation called "What's Your Feral Hog I.Q.?" that is used to assess participants' knowledge of feral hogs;
- A discussion of the idea of appreciation

applied to the multifaceted aspects of feral hogs;

- Biology of feral hogs, including diet, reproduction, diseases and parasites, movements, and interactions with wildlife and domestic livestock;
- Management alternatives for minimizing damage by feral hogs;
- Discussion of how to capitalize on hunting and commercial demands for feral hog meat;
- Discussion of human health issues (e.g., swine brucellosis) that may arise from handling feral hogs (Figure 4);
- Regulatory concerns regarding hunting, trapping, transporting, or selling feral hogs;
- Demonstration of control alternatives by Texas Wildlife Services personnel; and
- A post-test to gauge learning.

The presentation, titled "What's Your Feral Hog I.Q.?", consists of 20 true-or-false and multiple choice questions that evoke audience participation. We complement slide presentations with 1 of 2 video programs, as time permits: "Feral Hogs in Texas: the Good, the Bad, and the Ugly" (Rollins 1994) and "Coping with Feral Hogs" (Cearley 2005). Each video program provides a synopsis of various perspectives on feral hogs and their management in Texas.

Evaluating the effectiveness of FHAD

In 2006, we used TCE's customer satisfaction survey to evaluate the effectiveness of FHAD. Using this protocol, participants (n = 88 responses) at a FHAD in Mason County, Texas, in September 2006 provided the following results:

- 95% were "mostly" or "completely" satisfied with the activity;
- 89% were "mostly" or "completely" satisfied with the information being helpful for making decisions relative to their own situation;
- 91% considered the information "extremely" or "quite" valuable;
- 57% indicated they planned to take action based on information from this program;
- 61% anticipated benefiting economically; and
- 98% would recommend this particular activity to others.

Also in 2006, we conducted statewide awareness programs at 24 locations in 23 counties and reached a total of 1,725 clientele.

FIGURE 4. Feral hogs are often butchered on site as a convenient source of pork, but they can provide an opportunity for disease transmission.

Participants returning surveys indicated that damage attributable to feral hogs totaled 1.5 million dollars ($3,086/respondent) for the previous year (2005). Because of the knowledge they acquired, each of these same respondents believed that they would be able to reduce their annual damage caused by feral hogs by 42% or $1,281. Participants were asked to rate the likelihood of their recommending TCE as an information source on feral hogs. The mean rating was 8.7 (on a Likert scale of 0 = not likely and 10 = likely). This resulted in a Net Promoter Score (Reichheld 2006) of 54% (ratings of 50% to 80% are considered to be a measure of high efficiency).

Conclusions

As the range and density of feral hogs continue to increase, conflicts caused by them will continue to increase. We suggest the establishment of formal state working groups like those initiated in Missouri as a means of organizing and implementing action plans at the state level. While the first response of some states is a management plan to contain or eradicate feral hogs, we submit that educational efforts should be included in the plan. We offer our extension education model as a vehicle to increase awareness among diverse stakeholders.

Acknowledgments

We thank the many county extension agents who provided local assistance for conducting educational efforts. L. Hysmith has provided

technical assistance in delivering educational programs. Texas Wildlife Services employees, notably R. Gilliland, M. Mapston, V. Wilson, and G. Riley, have assisted with Feral Hog Appreciation Days. C. Adams has been a valued partner in conducting human dimension research germane to feral hog issues. Funding for the "Coping with Feral Hogs" video program was provided by the Sheep and Goat Predator Management Board, Texas Farm Bureau, and the National Park Service. T. Nicolette and T. Patterson of Texas Farm Bureau produced the video. A. Hays and G. Anderson were instrumental in development of the feral hog website. S. T. Byrns developed and disseminated timely new releases for various related educational efforts. Texas Department of Agriculture provided funding for a pilot effort on feral hog abatement.

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Dale Rollins (photo) is a professor and extension wildlife specialist with Texas Cooperative Extension and headquartered in San Angelo. He has produced several video programs on wildlife damage management of coyotes, bobcats, and feral hogs. He also holds a quarter-time research appointment with the Texas Agricultural Experiment Station. He has spent much of his career advancing the cause of quail conservation in Texas.

Billy J. Higginbotham is a professor and extension wildlife and fisheries specialist headquartered in Overton, Texas. His innovation in multimedia school enrichment curricula for elementary school students has earned him national recognition. He is currently overseeing implementation of a feral hog abatement effort over several areas in the eastern half of Texas.

Kenneth A. Cearley is a program specialist in wildlife for Texas Cooperative Extension stationed in Canyon. He recently produced a video program, titled "Coping with Feral Hogs."

R. Neal Wilkins is director of the Institute for Renewable Natural Resources at Texas A&M University, where he is an associate professor. Previously, he was an extension wildlife specialist located in College Station.

AgriLIFE EXTENSION
Texas A&M System

Final Report

STATEWIDE FERAL HOG ABATEMENT PILOT PROJECT, 2006-2007

Submitted to:
Texas Department of Agriculture




Texas AgriLife Extension Service

May 2008

FAST FACTS

Direct Control – (Texas AgriLife Extension Service - Wildlife Services)

Directly assisting agricultural producers with abatement of feral hog damage by utilizing individual or multiple integrated control strategies (i.e. trucks and people on the ground and helicopters in the air).

Scope: 48 cooperators with 223,017 acres owned/leased
Hogs Removed: 3,799 (Aerial-36%, trap-33%, firearm-26% snare 5%)
Customer Satisfaction: 9.1 (0 to 10 scale)
Net Promoter Score: 71%
Direct Control Economic Impact: $1,480,491
Benefit : Cost Ratio = $6.20 to $1.00

Indirect Control/Education/Technical Assistance - (Texas AgriLife Extension Service-County Extension Agents/Wildlife Specialists/Wildlife Services Troubleshooters and Technicians)

Indirect Control - Providing agricultural producers and other landowners (i.e. those managing natural resources) with the tools necessary to facilitate feral hog abatement through legal control methods. This includes providing life history and behavior information as it relates to the use of control options and procedures.

Education - Websites and written information on research-based control options and methodology to support landowner's efficient abatement of feral hog damage.

Technical Assistance – One-on-one contacts with landowners to advise on control methodologies with response provided by Wildlife Services Troubleshooters and Technicians.

Scope: 66 counties conducting indirect control/education
Number of educational events: 67
Total clientele attending: 5,197
Increased Knowledge: 68%
Number of New Management Practices to be Adopted: 3.2 per participant
Website Statistics: 31,374 unique hits and 76,830 pages accessed
Media Contacts: 31 (tv interviews-9, news releases-2, newspaper and radio interviews-20)
Customer Satisfaction: 8.7 (0 to 10 scale)
Net Promoter Score: 51%
Indirect Control/Education Economic Impact: $2,978,821
Benefit : Cost Ratio = $19.60 to $1.00

Project Summary

Total Economic Benefit as a Direct Result of Project: $4,459,312
Benefit : Cost Ratio = $11.42 to $1.00

Table of Contents

FINAL REPORT

STATEWIDE FERAL HOG ABATEMENT PILOT PROJECT
TDA GRANT # FHA06-01

Billy Higginbotham-Principle Investigator, Professor/Extension Wildlife and Fisheries Specialist
Greg Clary- Cooperating Investigator, Professor and Extension Economist
Larry Hysmith- Project Manager and Extension Program Specialist – Wildlife and Fisheries
Michael Bodenchuk-Cooperating Investigator and Director, Wildlife Services

ABSTRACT

The two year Feral Hog Abatement Project was implemented in January 2006. On-site technical assistance (direct control) was provided to landowners at three pilot sites (Post Oak Savannah/Pineywoods, Blacklands Prairie and Coastal Prairie) while group educational events (indirect control) emphasizing adoption of efficient landowner-initiated control methods were conducted statewide. Both groups of clientele participating in the project and were surveyed to measure the overall economic impact of this Texas Department of Agriculture-funded initiative. Data spanned the period 2005-2007 so as to estimate the economic impact of technical assistance and educational programs to the agricultural community.

Wildlife Service technicians worked with a total of 48 cooperators during the course of this project. However, eight participants did not provide data for a variety of reasons for all three years concerned. Data from all cooperators are included in the main body of this report as results from these eight participants do not significantly impact totals.

The 48 participating cooperators owned or controlled 230,017 acres and estimated damages and expenditures totaling $2,228,076 directly attributable to feral hogs at the three pilot sites for 2005. These same cooperators estimated a decline in damage to $1,261,520 in 2006 as a direct result of Wildlife Service abatement efforts that included the removal of 1,930 feral hogs. In 2007, a decline in damage of $513,935 from the previous year (2006) was noted following the removal of 1,869 hogs. As a result, cooperators saved a total of $966,556 through the direct technical assistance provided by Wildlife Services during Year 1 and $513,935 in Year 2 of the project for a total savings of $1,480,491. On a scale of 0 to 10, cooperators participating in technical assistance efforts via Wildlife Services rated the services provided as a 9.1 based on the likelihood of their recommending Wildlife Services to friends, family and colleagues as a source of technical assistance for feral hog control. A Net Promoter Score of 71% among the cooperator group also indicated that Wildlife Services was efficiently assisting landowners with direct control via on-site technical assistance. The benefit to cost ratio of direct control efforts was 6.2 to 1.0 ($6.20 saved for each $1.00 invested).

Texas AgriLife Extension Service (formerly Texas Cooperative Extension) educational/ outreach efforts/technical assistance (indirect control) were conducted statewide for 5,197 landowners attending 67 educational events in 66 counties and by one-on-one contacts. Educational program efforts included seminars, workshops, field days and pesticide recertification trainings. Participants were surveyed to determine damage type, control methods employed, number and type of practices to

be adopted, knowledge gained and economic value of knowledge gained. A total of 2,281 participants (return rate = 44%) completed surveys. While this rate of survey return was considered to be high, it was actually higher then reported because multiple program participants often represented a single landholding, thus only one survey was completed per landholding/family in attendance at an educational event. Indirect control programming resulting in knowledge gained were valued at $2,978,821 by landowners, based on previous year's damage estimates ($6,252,044) vs. the upcoming year's damage estimates ($3,273,223). This equates to an average information value/economic savings of $2,108 per each of the 1,413 survey respondents answering the economic impact questions. The benefit to cost ratio of indirect control efforts was 19.6 to 1.0 ($19.60 saved for each $1.00 invested). On a scale of 0 to 10, landowners participating in educational events scored AgriLife Extension with a Customer Satisfaction Rating of 8.7 (on a 0 to 10 Likert scale) based on the likelihood of their recommending our agency as an information source and for feral hog control to their family, colleagues and friends. A Net Promoter Score of 51% among the landowner group also indicated that AgriLife Extension was efficiently reaching the needs of clientele with educational/outreach information on abating feral hog damage. The feral hog website (http://feralhog.tamu.edu) was a popular source of information on feral hogs, their control and the project's progress with 31,374 unique hits and 76,830 pages accessed. Tremendous media interest in the project resulted in 9 television interviews, 2 news releases and 20 radio and newspaper interviews.

In total, the Feral Hog Abatement Pilot Project has saved landowners/agricultural producers $4,459,312 during resulting in benefit to cost ratio of 11.42 to 1.00 ($11.42 saved for each $1.00 invested).

BACKGROUND

The Texas AgriLife Extension Service (formerly Texas Cooperative Extension) provides quality, relevant outreach and continuing education programs and services to the people of Texas. These outreach and educational programs, relative to the feral hog abatement project, were delivered to the public by county Extension agents at the county, multi-county, regional and state levels with the support of Extension Specialists within the Extension Wildlife and Fisheries Project Group/Department of Wildlife and Fisheries Sciences-TAMUS. Direct control services relative to this project were provided by Wildlife Services, a unit within Texas AgriLife Extension Service that serves urban and rural areas with technical assistance, education and direct control in wildlife damage management in order to alleviate negative impacts of wildlife (See Appendix 1 for a listing of project personnel). The Texas AgriLife Extension Service is the only state agency uniquely positioned to address both the educational/outreach (indirect control) and technical assistance aspects (direct control) of this project focusing on feral hogs and their damage to Texas agriculture.

In 2005, the Texas Department of Agriculture issued a request for proposals for projects that could address feral hog damage abatement issues in Texas. AgriLife Extension was successful in obtaining funds to conduct a pilot project that encompassed both education of and direct assistance/service to landowners negatively impacted by feral hogs. The project was initiated in January 2006 and continued for a two year period through December 2007.

INTRODUCTION

Hogs were first introduced to the New World in Florida in 1539 and later into Texas by the mid-1500's. This, along with free-ranging hog production practices and purposeful introductions of hogs, has contributed to the present status of feral hogs in the state. Today, the feral hog is considered to be an exotic species with populations estimated at 2 million head in Texas and 4 to 5 million head nationwide. Populations occur in approximately 85% of Texas counties, in 38 other states and in 4 Canadian provinces. A team led by Dr. Clark Adams (Department of Wildlife and Fisheries Sciences-TAMU) surveyed 775 Texas landowners in 2003-04 regarding their attitudes toward and economic impact of feral hogs. The study determined that the vast majority of Texas landowners viewed feral hogs as both economic and environmental liabilities.

Average economic loss per survey respondent was $7,515 since hogs first appeared on their properties. An additional average expenditure of $2,631 was required to correct damage and/or institute control efforts. Extrapolation of these data revealed that a conservative estimate of feral hog damage to Texas agriculture is $52 million annually, with additional annual expenditures of $7 million for repairing damage and/or controlling hogs. These economic impacts do not include damages occurring to urban/suburban landscapes and personal property/injuries due to disease transmission and/or vehicle/hog collisions. As feral hog populations continue to increase in Texas and other states, these economic impacts are expected to also continue to increase. Currently, the best course of action is to adopt integrated control strategies (direct control) in association with landowner education efforts (indirect control) to manage feral hog populations and the damage they cause.

METHODOLOGY

Three sites composed the pilot project for on-site direct control: Post Oak Savannah/ Pineywoods, Blacklands Prairie and Coastal Prairie. These sites were selected because they were very different ecoregions within the state representing a variety of agricultural enterprises, soil types, and climates. Within each ecoregion, specific counties were chosen based on the agricultural enterprises represented and the willingness of county Extension personnel and Wildlife Services personnel to coordinate and cooperate on this project. These included Hill, Navarro and a portion of Henderson County representing the Blacklands site, Camp County representing the Post Oak Savannah/Pineywoods site and Matagorda County representing the Coastal Prairie site.

Cooperator/landowner listening sessions were held at each pilot site at the beginning of the study in order to characterize agricultural damage caused by feral hogs and facilitate a tailored survey design. Cells of cooperators were identified and enrolled in the project by Wildlife Services personnel. All cooperators were required to provide detailed damage and economic impact information for pre- and post- abatement activities for each year of participation during one-on-one interviews (Appendix 2). Cooperators consisted of landowners that participated in: 1) both years (2006 and 2007) of the study or 2) only one year (2006 or 2007) of the study. Customer Satisfaction, Net Promoter Score and testimonial data were also collected during the survey process. Cooperators in these three identified pilot sites (Figure 1) received direct control from Wildlife Services personnel using all legal means practical and necessary to abate feral hog damage on their properties.

A second clientele group reached during the project was landowners participating in indirect control efforts. Indirect control included educational/outreach efforts conducted via seminars, field days, workshops and pesticide applicator recertification trainings. In addition, Wildlife Services troubleshooters and technicians provided limited one-on-one technical assistance to landowners upon request. Unlike Wildlife Services cooperators, these landowners did not receive direct one-on-one onsite direct control assistance but rather were participants in educational events conducted across the state and sponsored by county Extension agents throughout the two year project. All program participants were asked to complete a one page survey form at the conclusion of each educational event to characterize damage caused by feral hogs, identify current control methods employed, determine the economic value of information provided to them (i.e. reduced damage, increased yields) and calculate a Customer Satisfaction Rating and a Net Promoter Score (Appendices 4a and 5). The survey instrument was modified in September 2007 to facilitate the collection of additional information on the 1) type and number of management practices to be adopted, 2) knowledge gained and 3) income generated from sales of feral hogs and/or leasing of hunting rights (Appendix 4b).

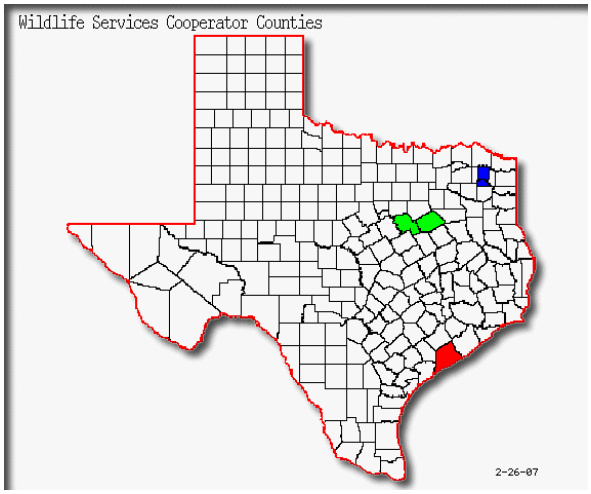


Figure 1. The three cooperator pilot sites of the Feral Hog Abatement Project are the Coastal Prairie (red), Blacklands (green) and Post Oak Savannah/Pineywoods (blue).

RESULTS

PROJECT PILOT SITE COOPERATOR ACTIVITIES-BY SITE (DIRECT CONTROL)

Post Oak Savannah/Pineywoods

Cooperators owning or controlling 19,994 acres participated in direct control via Wildlife Services at the POS/PW Site. The 2005 cooperator total damage estimate of $1,495,910 declined 51% to $734,020 in 2006 for a savings to cooperators of $761,890 (Figure 2). The 2006 cooperator total damage estimate declined another 40% to $436,835 for an additional savings of $297,185. A total of 615 hogs were removed during 2006 and 502 were removed in 2007 for a total of 1,117 over two years

of direct control. The majority of hogs taken at this site over two years were by trapping (574 or 51%) and use of firearms (321 or 29%) (Figure 3).

Because of tree canopy cover and vegetation density characteristic of the Post Oak Savannah and Pineywoods Ecological Regions, aerial shooting via helicopter was not a viable control option.

Cooperators rated Wildlife Services (on a scale of 0 to 10) a 9.6 as to their likelihood to recommend them as a source of technical assistance to family and friends. A Net Promoter Score of 87% is further indication of cooperators' confidence and satisfaction with WS technical assistance at this site.

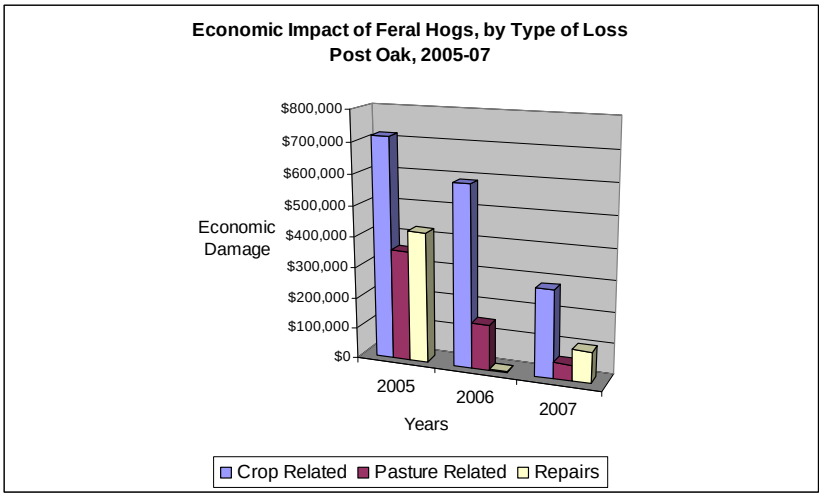


Figure 2. Cooperators' economic impact by damage type in the Post Oak Savannah/Pineywoods pilot site.

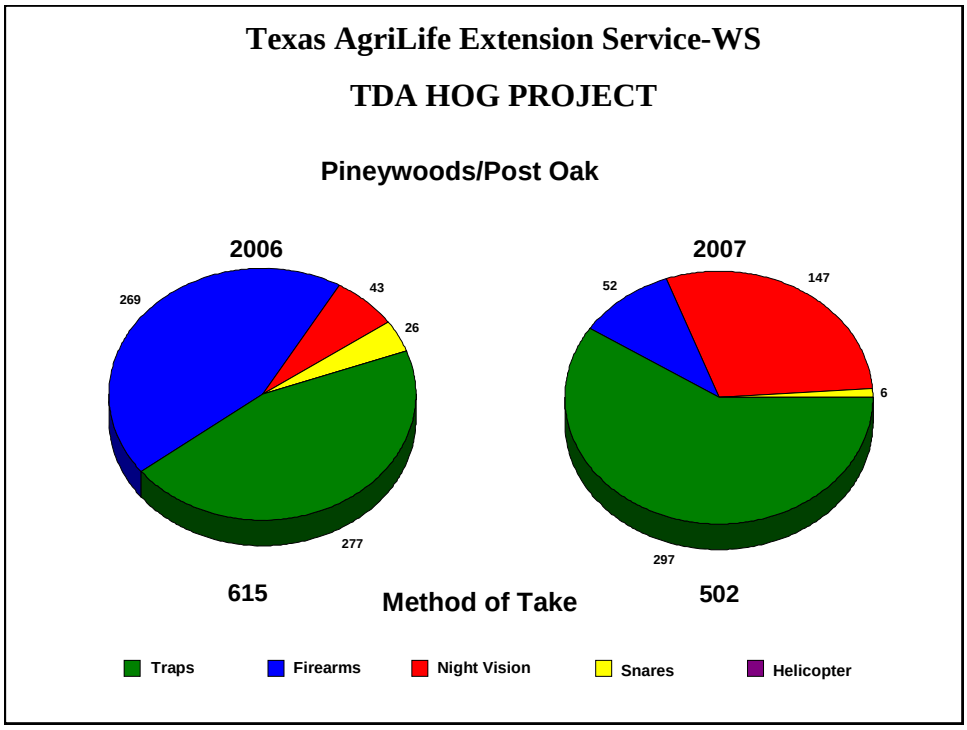


Figure 3. Number of hogs removed from the Pineywoods/Post Oak site by year and method.

Blacklands

Cooperators owning or controlling 56,040 acres participated in direct control via Wildlife Services at the Blacklands Site. The 2005 cooperator total damage estimate of $254,505 declined 45% to $139,170 in 2006 for a savings of $115,335 (Figure 4). The 2006 cooperator total damage estimate declined another 48% to $71,820 for an additional savings of $67,350. A total of 684 hogs were removed during 2006 and 544 in 2007 for a total of 1,228 over two years of direct control assistance. The majority of hogs were removed by trapping (660 or 54%) and shooting (236 or 26%). (Figure 5). Aerial shooting via helicopter accounted for 119 feral hogs (10%) at the Blacklands Site, but this method was employed only in 2007.

Cooperators rated Wildlife Services (on a scale of 0 to 10) an 8.6 as to their likelihood to recommend them as a source of technical assistance to family and friends. A Net Promoter Score of 56% is an indication of cooperators' confidence and overall satisfaction, although it was considerably less than the value assigned by cooperators in the POS/PW site.

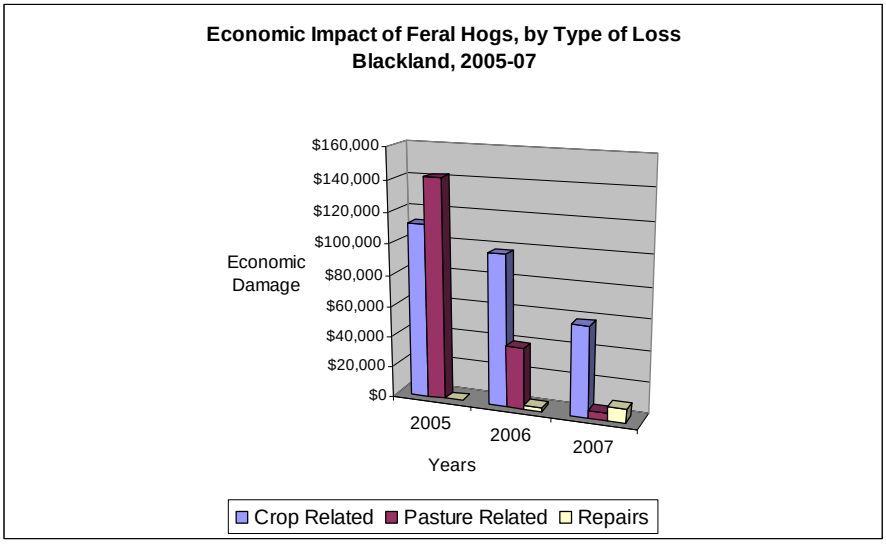


Figure 4. Cooperators' economic impacts by damage type in the Blacklands pilot site.

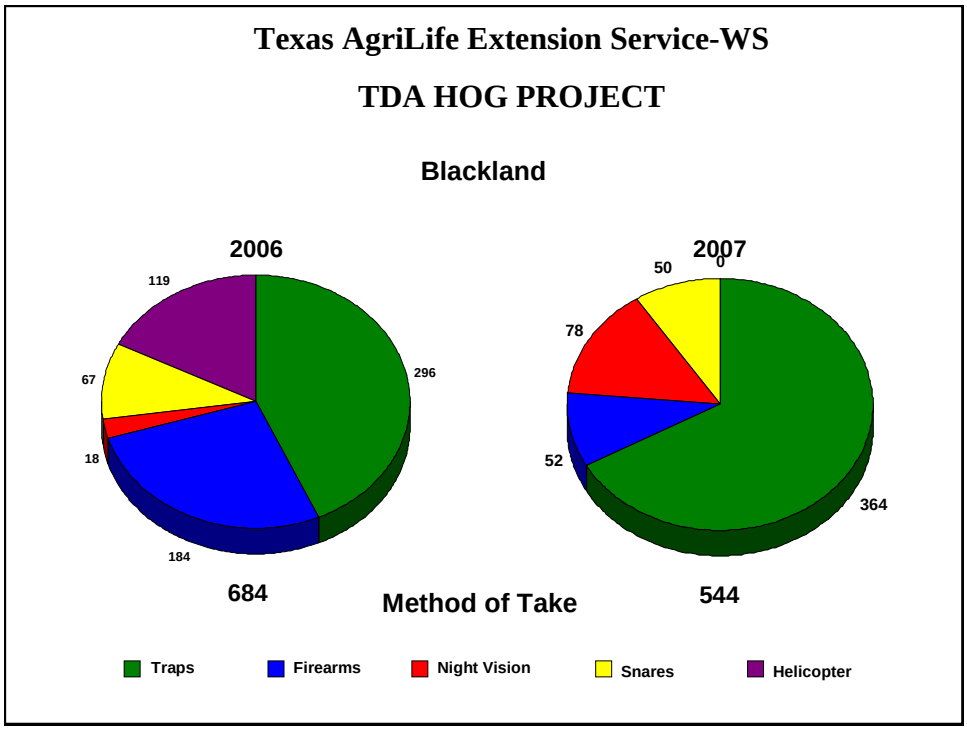


Figure 5. Number of hogs removed from the Blacklands Site by year and method.

Coastal Prairie

Cooperators owning or controlling 146,983 acres participated in direct control via Wildlife Services at the Coastal Prairie Site. The 2005 cooperator total damage estimate of $477,661 declined

19% to $388,330 in 2006 for a savings of $89,331 (Figure 6). The impact of control efforts from 2005 to 2006 is not as great as in the other two regions, primarily due to the successful control efforts conducted by WS on cooperators' properties in 2005, the year just prior to the initiation of the Abatement Study. The 2006 cooperator total damage estimate declined another 38% to $238,930 for an additional savings of $149,400. During 2005, 897 hogs were removed from cooperator's properties via aerial shooting before the actual pilot study began, which makes the Coastal Prairie location unique among the three pilot sites. For this reason, the observed program savings in the Coastal Prairie site is a very conservative estimate of damage averted by control.

In 2006, 631 hogs were removed and in 2007 another 823 were removed for a total of 1,454 over two years of direct control assistance. The majority of hogs removed during 2006-07 were via aerial shooting via helicopter (1,245 or 86%) (Figure 7). Aerial shooting was the most effective control method employed at this site because the more open terrain and lack of tree canopy cover were more conducive for helicopter flights (Figure 8). Hog removal per hour of flying time was highest in 2005 (25.0 hogs/hour) before decreasing in 2006 and 2007 (16.3 and 21.3 hogs/hour, respectively).

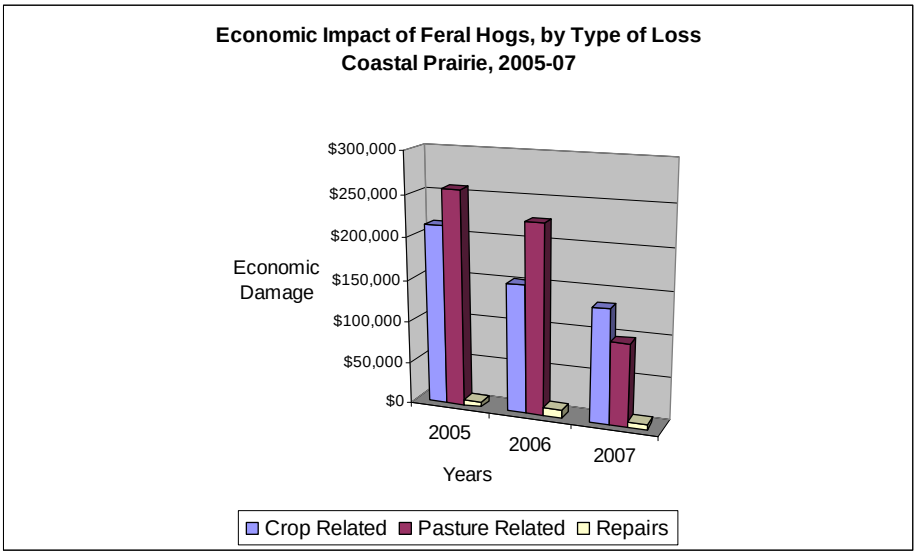


Figure 6. Cooperators' economic impacts by damage type in the Coastal Prairie pilot site.

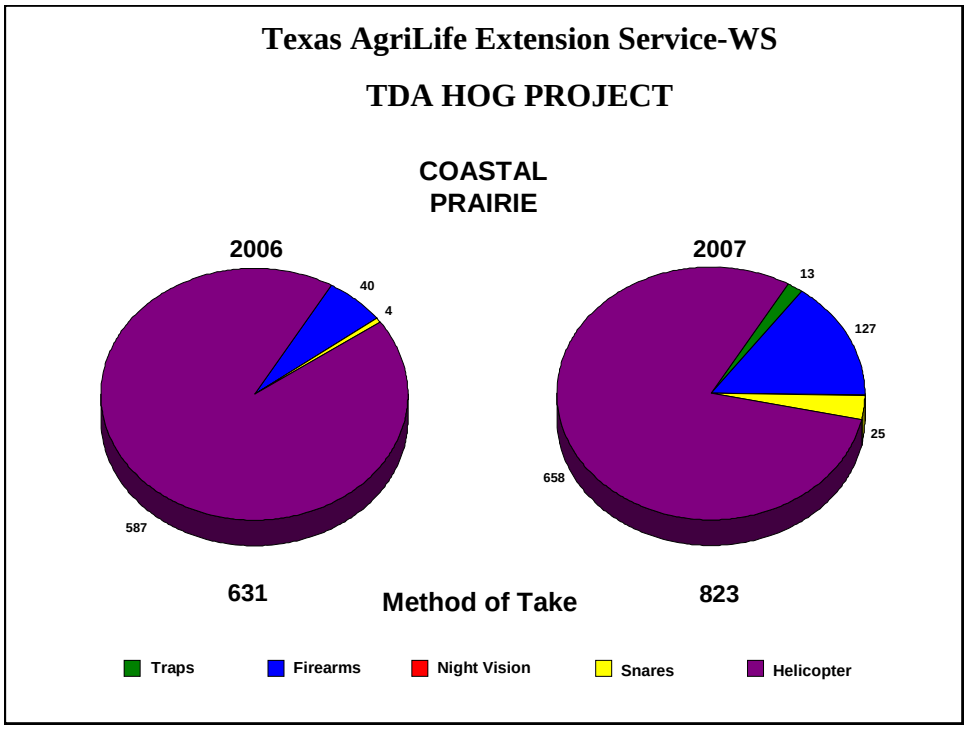


Figure 7. Number of hogs removed from the Coastal Prairie Site by year and method.

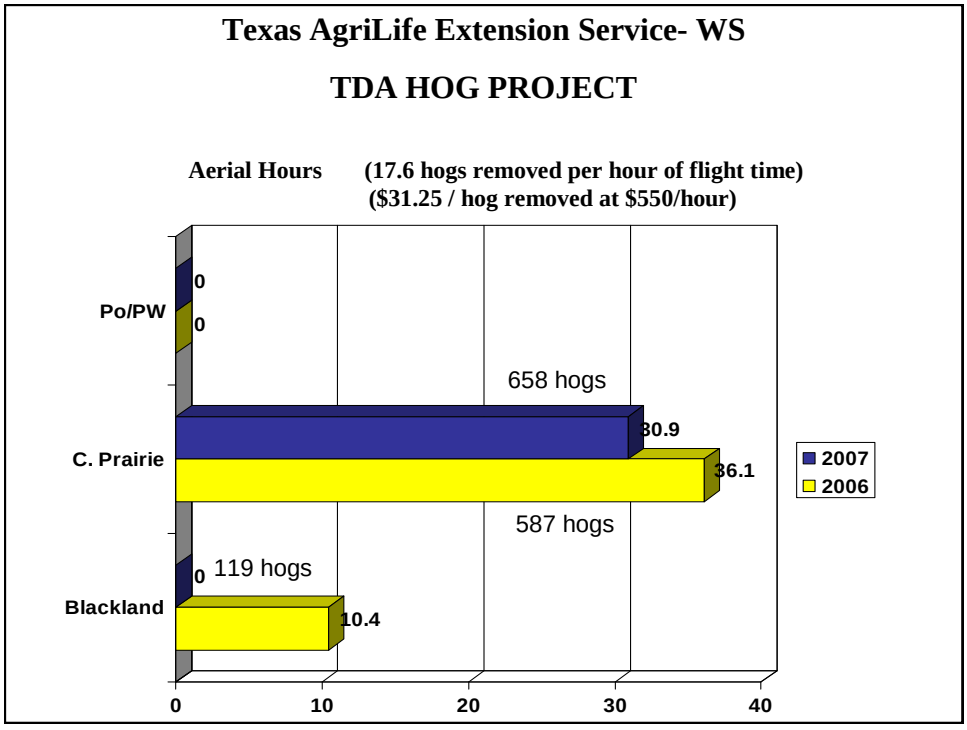


Figure 8. Hogs removed by aerial shooting by site.

Cooperators rated Wildlife Services (on a scale of 0 to 10) a 9.2 as to their likelihood of recommending them as a source of direct control assistance to family and friends. A Net Promoter Score of 78% is further indication of cooperators' confidence and satisfaction with WS technical assistance at this site.

PROJECT PILOT SITE COOPERATOR ACTIVITIES-SUMMARY OF ALL PILOT SITES

Each cooperator was surveyed to characterize damage type and assign economic impact of feral hogs before the abatement efforts were initiated on their property (Figure 9). Baseline data were collected on customized pilot site survey forms via one-on-one interviews with each cooperator prior to any direct control efforts (Appendix 2). Following each year of direct control effort, economic impact data were collected via the same style of survey instrument used to collect baseline (pre-control) data. Most cooperators (40) participated in both years (2006 and 2007) of the project. However, 8 cooperators participated in only one year of the pilot project (i.e. dropped out after 2006 or participated only in 2007).

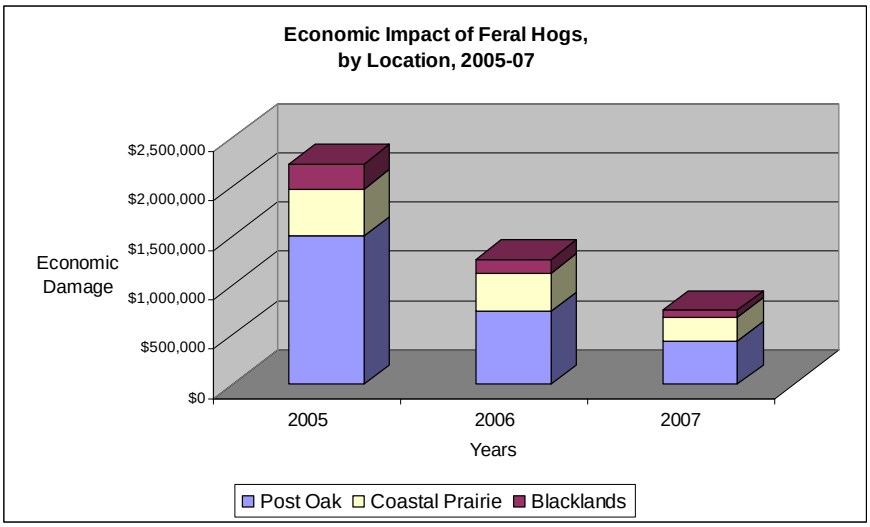


Figure 9. Economic impact on cooperator properties, by location.

The economic impact surveys following direct control efforts were completed and collected through cooperating landowner meetings within each project site in January 2007 and again in January 2008 (Figure 10). During these meetings, discussions were held with the cooperators covering the progress of the project, their views as to the success of the project and their opinions on the use of future abatement funding if available. These meetings were valuable for collecting data but also for obtaining anecdotal feedback from the cooperators. Testimonials were collected from the one-on-one interviews and surveys and are summarized in Appendix 3.

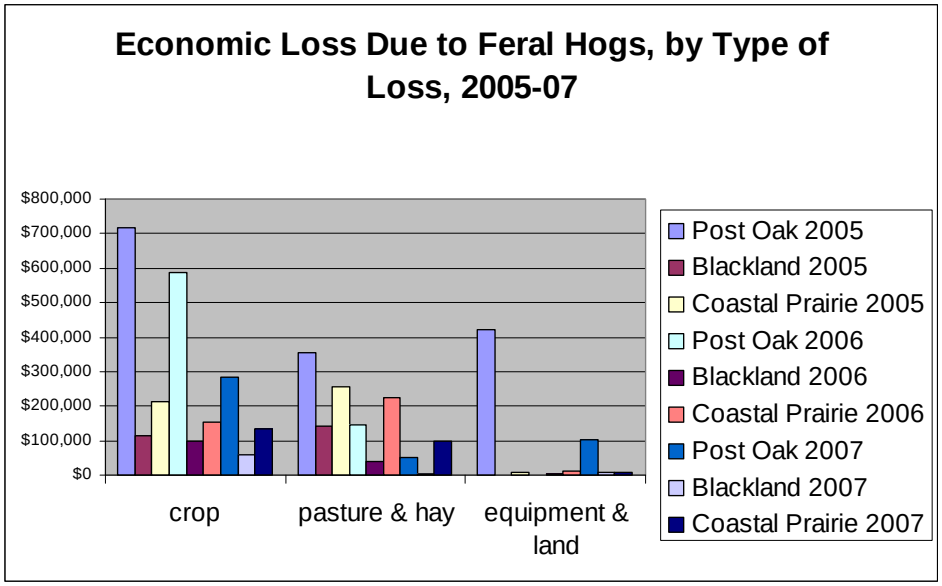


Figure 10. Economic impact of feral hogs on cooperator properties by damage type.

These survey data were collected, analyzed and compiled by project site and then totaled for a statewide summary. A total of 48 cooperators (representing 230,017 acres) have been involved at the three pilot sites throughout the project (Figure 11).

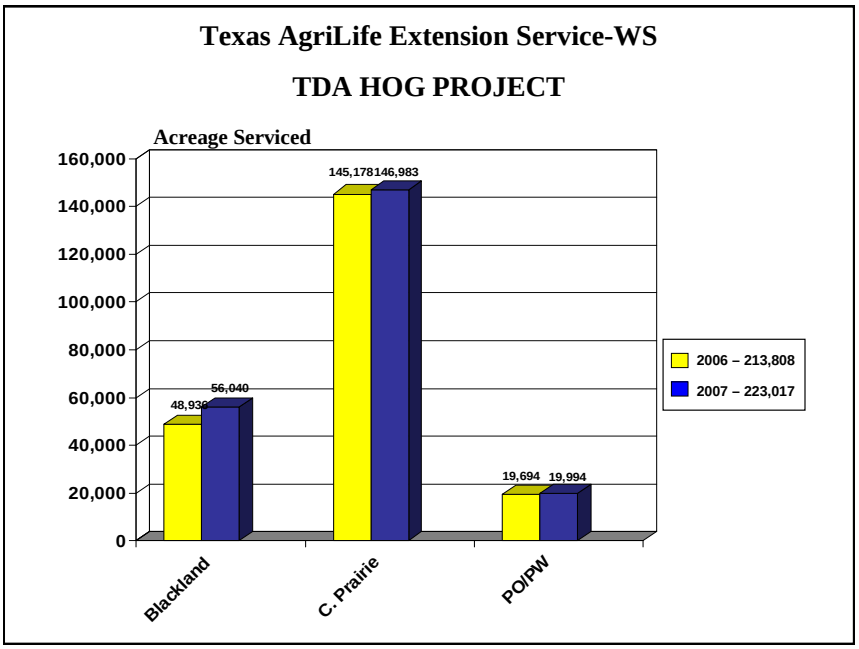


Figure 11. Cooperator acreage by site and year.

Hog removal by site was Post Oak Savannah/Pineywoods (1,117), Blacklands (1,228) and Coastal Prairie (1,454) for a total of 3,799 (Figures 12, 13 and 14). At all three sites combined, the

cooperators experienced a total decrease in economic losses due to feral hog damage of $1,480,491 from 2005 ($2,228,076) to 2007 ($747,585). Individually, the economic differences within the sites equated to a 71% decrease ($1,495,910) in the Post Oak Savannah/Pineywoods Site, a 72% decrease ($254,505 vs $71,820) in the Blacklands Prairie Site, and a 50% decrease ($477,661 vs $238,930) in the Coastal Prairie Site (the removal of 897 hogs from the Coastal Prairie Site in 2005 before the project began was responsible for the reduced economic impact of 2006 control efforts). The total decrease in economic damage for all three pilot sites combined was 66%.

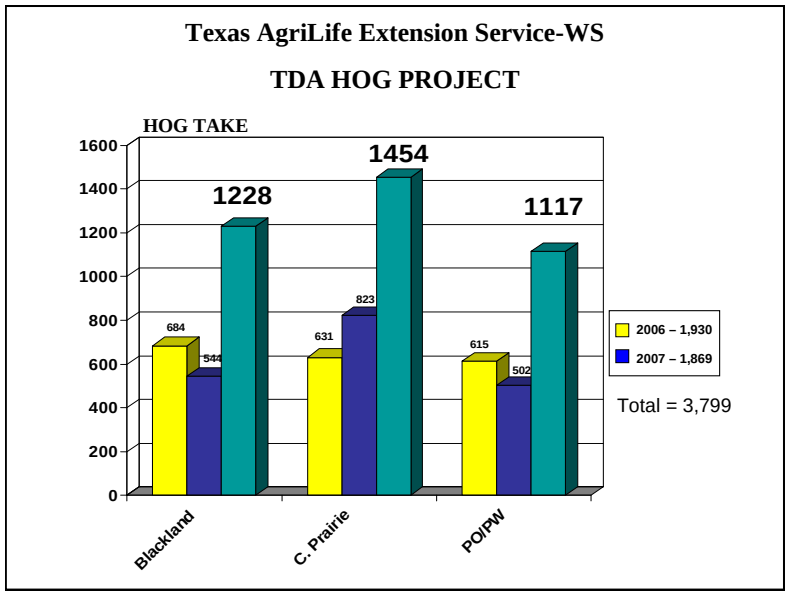


Figure 12. Number of hogs removed by site and year.

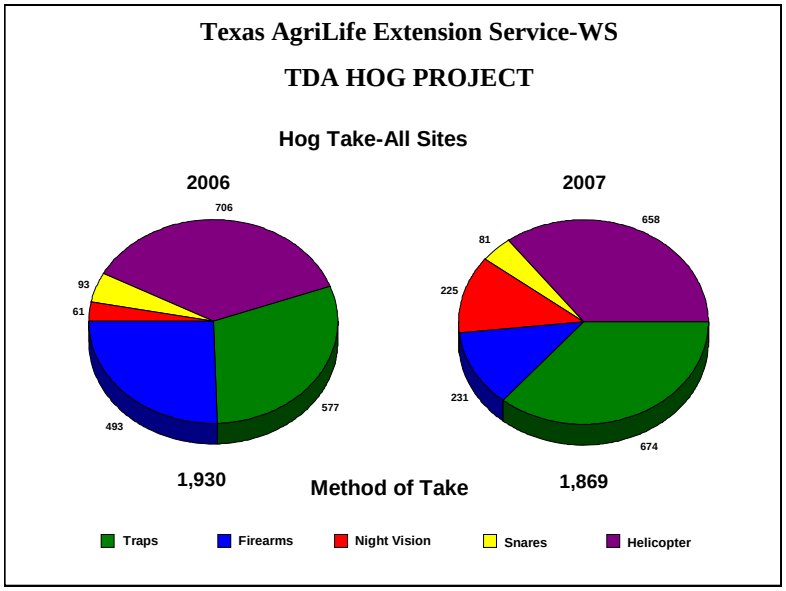


Figure 13. Control methods used to remove hogs by year from all sites combined.

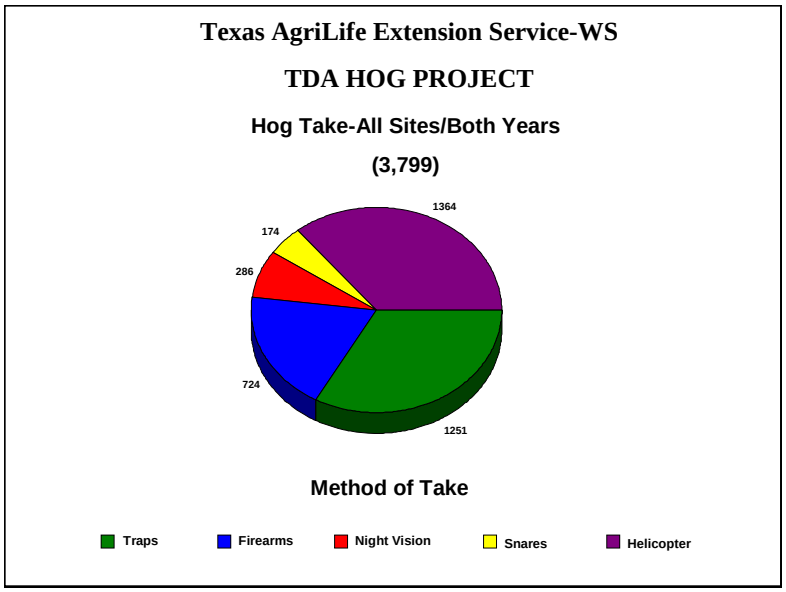


Figure 14. Total number of hogs removed by method, 2006-07.

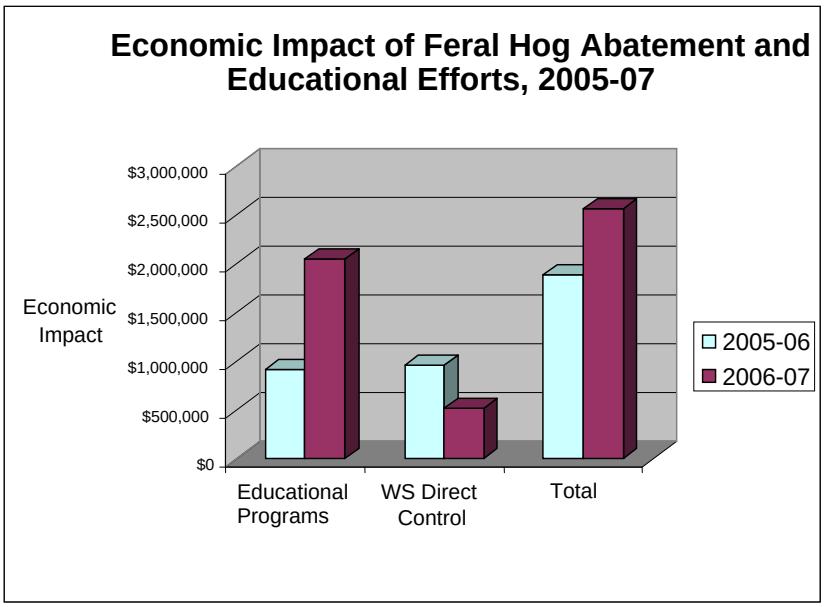


Figure 15. Total economic impact of AgriLife Extension educational programs and WS technical support.

On a Likert Scale of 0 to 10 (with 0= Not Likely and 10 = Likely), a statewide Customer Satisfaction Rating of 9.1 was recorded for cooperators when asked the likelihood of recommending Texas AgriLife Extension Service-Wildlife Services as information sources/technical assistance for controlling feral hogs. In addition, a Net Promoter Score calculated from the Likert Scale data revealed

that cooperators (Net Promoters) of the program rated 71% (NPS scores of 50% to 80% are indicative of highly efficient agencies/companies). See Appendix 5 and Figures 16 and 17.

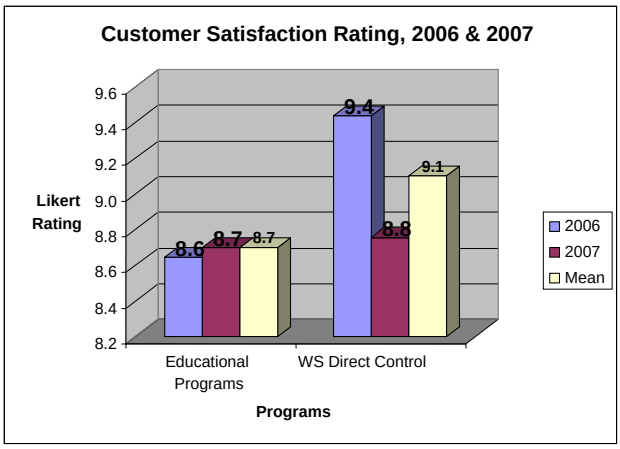


Figure 16. Customer Satisfaction Ratings among WS cooperators and educational program participants.

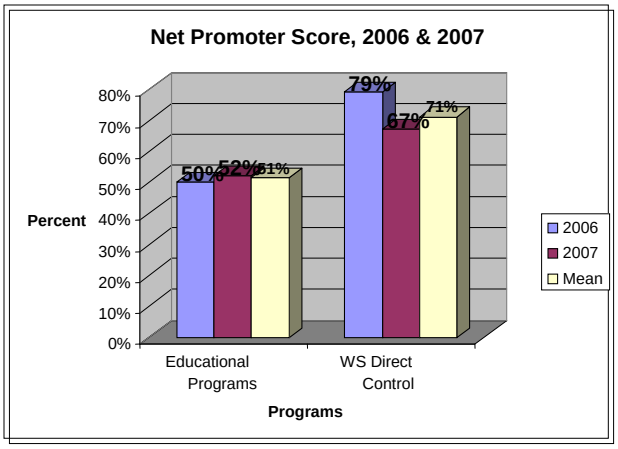


Figure 17. Net Promoter Scores among WS cooperators and educational program participants.

Wildlife Services technicians and troubleshooters worked daily with cooperators using various legal means to abate damage via control of feral hog populations (Figure 14). Over two years, a total of 3,799 feral hogs have been removed from 48 cooperator's properties representing approximately 223,017 acres.

STATEWIDE EDUCATIONAL/OUTREACH PROGRAMS (INDIRECT CONTROL)

A major component of the Feral Hog Abatement Project conducted by the Texas AgriLife Extension Service was indirect control in the form of education/outreach programming conducted statewide by county Extension agents, Extension wildlife specialists and Wildlife Services biologists and technicians. At many educational events, a multi-agency approach was utilized to deliver information to clientele. An example of a particularly successful program format included presentations made by AgriLife Extension faculty/staff, Texas Parks and Wildlife (Wildlife and Law Enforcement Division personnel) and Texas Animal Health Commission representatives. Additional speakers utilized when available included hog buyers representing various processors and local private trappers.

A total of 67 educational events were conducted in 66 counties for an estimated 5,197 participants during 2006-07. Programs varied in length from one hour (presentations as part of pesticide re-certification programs and wildlife management seminars) to ½ to full day programs (indoor and/or outdoor). A particularly effective format involved including multiple agency

speakers (Texas Parks and Wildlife, Texas Animal Health Commission, Texas AgriLife Extension Service and individuals (landowners, private trappers, processors). Samples of program agendas are provided in Appendix 6.

A total of 2,281 surveys (Appendix 4a and 4b) were completed for a return rate of 44%. The survey return rate would have been even higher since multiple program participants often represented the same landholding (i.e. families). Survey respondents reported that the most common types of negative impacts caused by feral hogs were to pastures (82%), fences, water troughs or other improvements (46%) and loss of owner/employee time (44%). See Figure 18.

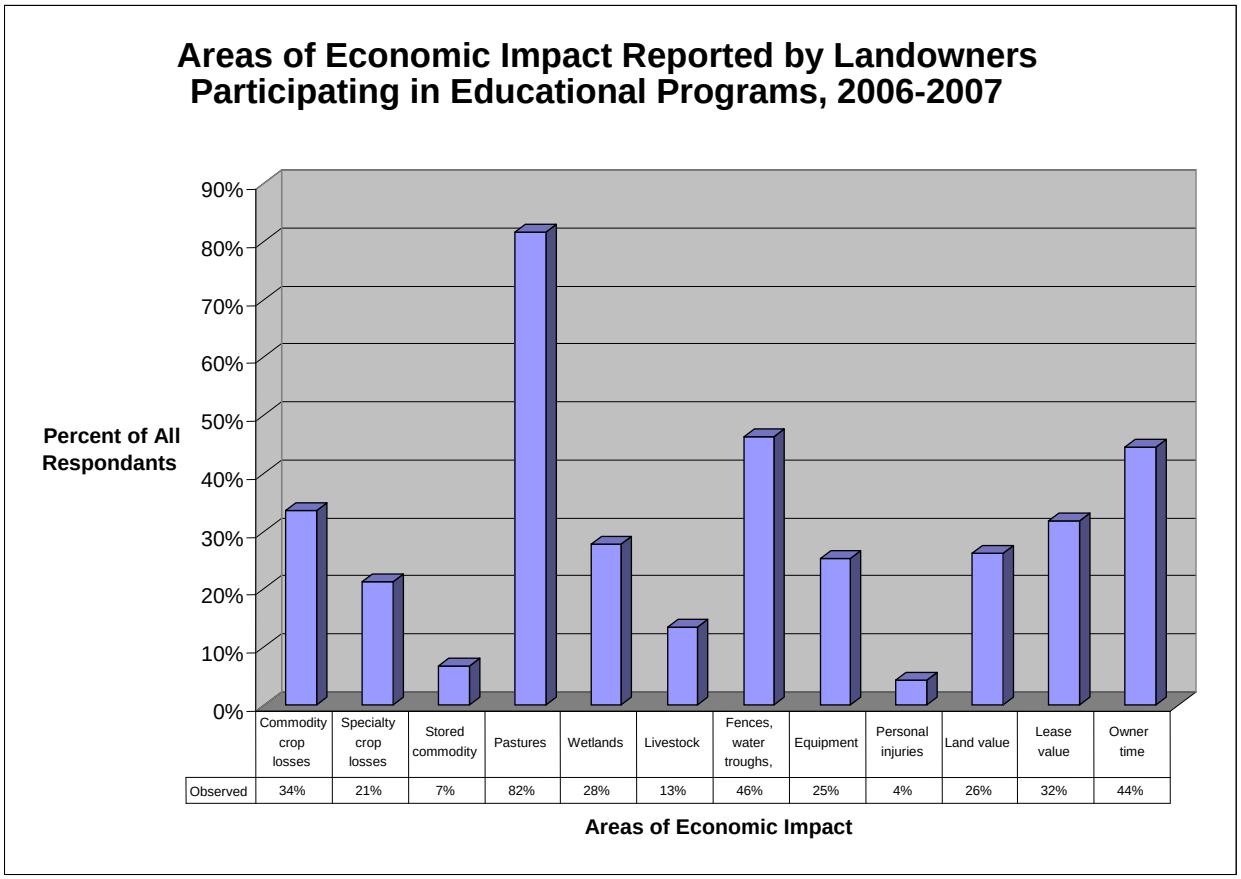


Figure 18. Areas of economic impact reported by landowners participating in TCE educational programs, 2006-2007.

Respondents indicated that landowner hunting (57%) and trapping/destroying feral hogs (57%) were the most common control methods employed to abate feral hog damage (Figure 19). Despite being extremely popular, conventional hunting/shooting by untrained personnel is known to be a highly inefficient method of controlling feral hog populations by causing them to become more nocturnal and/or more difficult to trap. However, landowner-initiated trapping using recommended equipment and techniques has proven to be a much more effective method for hog removal. Much of the positive feedback from program participants centered upon

information delivered relative to the proper design and use of traps, bait selection and determining the most effective locations to place traps (Figures 20 and 21).

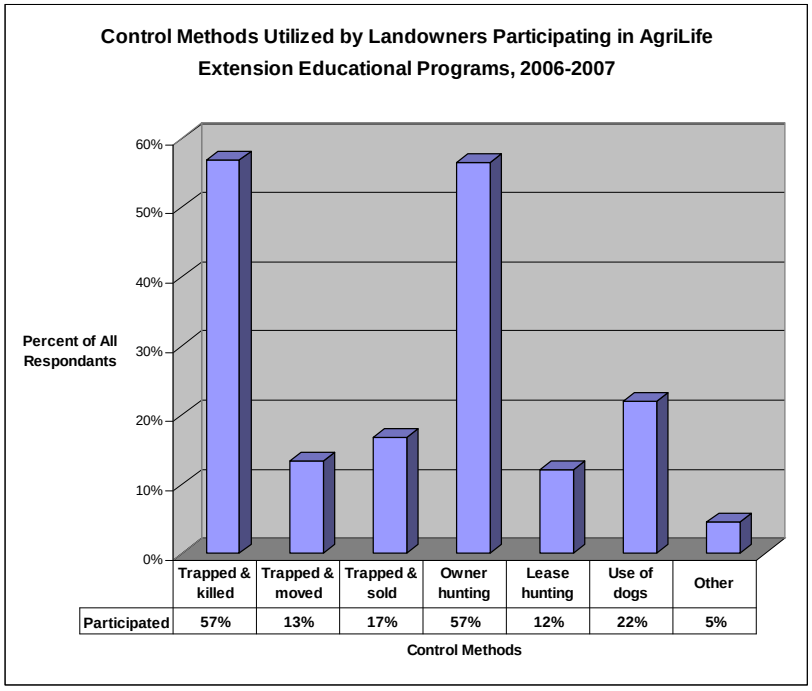


Figure 19. Control methods utilized by landowners participating in educational programs conducted in 2006-07.

Figure 20. A well designed large hog trap.

Figure 21. Landowners inspect a feral hog trap during a multi-county field day.

Based on data collected from the modified survey form (Appendix 4b), a total of 702 of 721 respondents (97%) indicated that they had increased their knowledge of feral hogs and their control by attending an AgriLife Extension program. Program participants were also asked to rate their knowledge levels before and after the program they attended on four different topics using a Likert Scale with rating 1 through 5 where 1=no knowledge, 3= some knowledge and 5=a high level of knowledge. Percent knowledge gains by topic were 53.3% for types/extent of damage, 72% for legal control options, 74% for feral hog biology and 75% for efficient trap/bait techniques. The knowledge gained averaged 68% across all four topics for respondents (Figure 22).

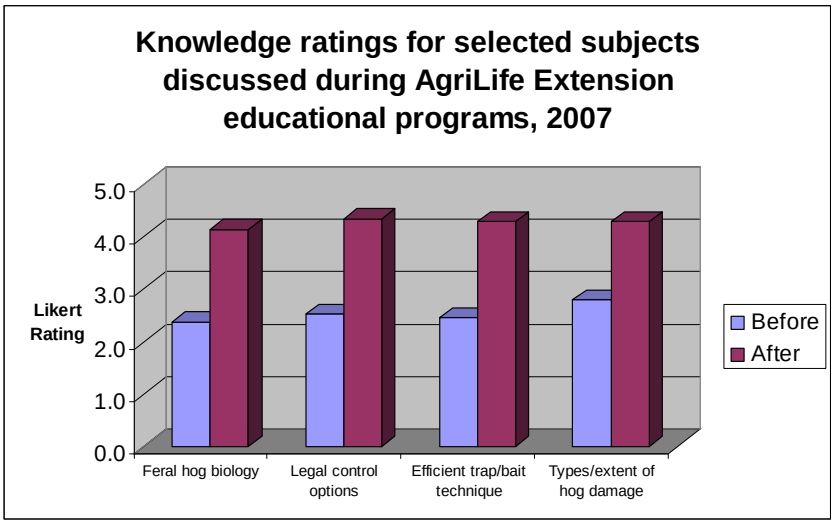


Figure 22. Knowledge gained based on results of Appendix 4b.

When asked which new practices they planned to adopt, 55% indicated they planned to use larger traps, 45% planned to wear protective eyewear and gloves when field-dressing feral hogs to avoid disease transmission, 44% planned to pre-bait traps to encourage consistent hog visits and 41% planned to utilize baits with scent appeal in order to attract feral hogs to traps (Figure 23). Interestingly, only 22 of 721 respondents (3%) reported receiving income from feral hogs. This equated to an average income of $1,489 during the previous year for the 22 landowners reporting that they sold feral hogs and/or leased hunting rights. Overall, respondents planned to adopt an average of 3.2 practices of the 8 practices identified to better manage future feral hog damage.

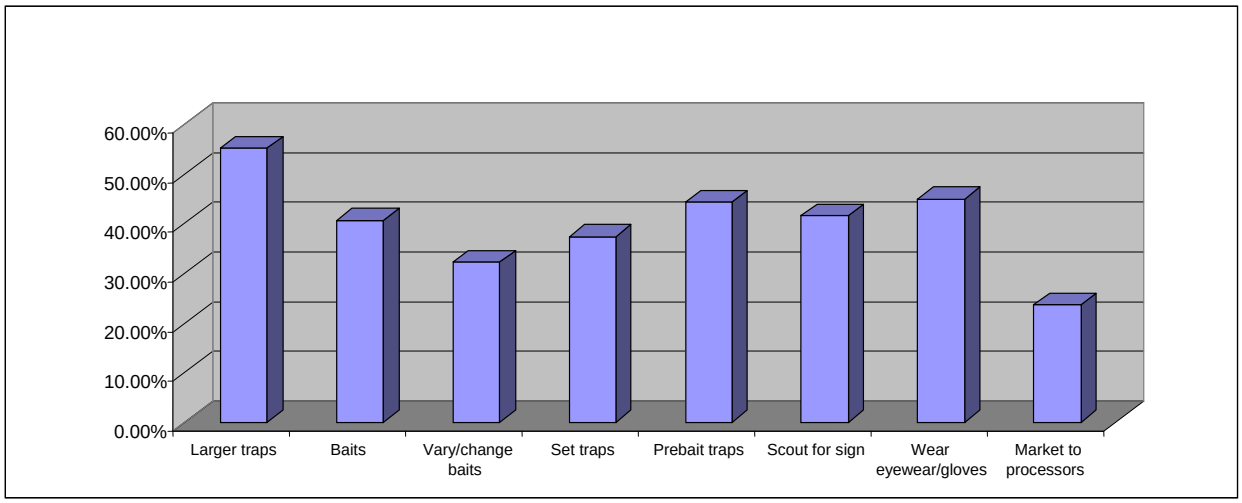


Figure 23. Proportion of respondents planning to adopt selected practices after attending AgriLife Extension educational programs, September-December, 2007.

All program participants were asked to rate the likelihood of them recommending the Texas AgriLife Extension Service to family, colleagues and friends as an information source on feral hogs. The mean statewide Customer Satisfaction Rating was 8.7 (on a Likert Scale of 0 = Not Likely and 10 = Likely). As expected, the rating by clientele receiving indirect control was slightly lower than the 9.1 CSR assigned by cooperators that received benefited from direct (one-on-one assistance) control (Figure 16).

The Net Promoter Score (a measure of your entity's or program's growth engine and efficiency) identifies a company's or agency's program promoters (defined here as the % of clientele rating AgriLife Extension as a 9 or 10) minus the program detractors (defined as the % of clientele rating AgriLife Extension as a 6 or below) using the previously described Likert Scale (Appendices 4a and 4b). Companies/agencies with the most efficient growth engines receive Net Promoter Scores of 50% to 80% from their customers (Appendix 5). The NPS that AgriLife Extension received from participants in these feral hog abatement awareness programs was 51% indicating that indirect control efforts were effective (Figure 17). As expected, the NPS among educational program participants was also lower than the 71% value assigned by cooperators receiving one-on-one assistance in the form of direct control via Wildlife Services.

Education/outreach program participants were also asked to rate the economic impact or value of the information they received. A total of 44% of the program participants provided economic data via the survey (Appendices 4a and 4b). Respondents estimated the total economic impact of feral hog damage incurred in the previous year (prior to attending the program) at $6,252,044. They anticipated damage to decrease during the upcoming year to a total of $3,273,223 based on their knowledge gains and the information they received. Therefore, as a result of what they learned at these programs, participants valued the information received at $2,978,821—resulting in an estimated 48% decrease in anticipated economic losses attributable to AgriLife Extension's indirect control efforts. This equates to an average savings of $2,108 per survey respondent that responded to the economic impact questions (n = 1,413) and a benefit to

cost ratio of 19.60 to 1.0 or $19.60 return on every $1.00 invested in indirect control efforts over the two year life of the project.

Following the project, comments were solicited from random program participants as to the utility and effectiveness of direct and indirect control efforts/education. Samples of testimonials are shown in Appendix 3.

ADDITIONAL ACTIVITIES

Internal Project Management/Training Efforts

The project manager hosted voluntary teleconferences for team members from each site, including landowners, and the statewide team. Teleconferences included administrative personnel from AgriLife Extension regions and districts where project sites are located. Teleconferences assisted in maintaining contact with project sites, coordinating additions to project areas within each of the three sites, planning educational events and served as a sounding board for ideas and problems encountered by each project site team and their landowner cooperators.

A 2006 project staff meeting was held for all Texas AgriLife Extension Service personnel involved in the project. Also in attendance were the Director of AgriLife Extension, Director of Wildlife Services and the Extension Wildlife and Fisheries Program Unit Head. The meeting was held to coordinate activities, discuss progress and problems, direction of the project and to monitor impact data from all direct and indirect control efforts.

The project manager, principle investigator, and project economist also met routinely to compile, analyze and report survey data. Progress reports were prepared and forwarded to the Texas Department of Agriculture each quarter throughout 2006-07, an annual report was produced following Year 1 of the project in 2007 and a final report was submitted after project completion in 2008.

Invited in-service trainings were provided to the AgriLife Extension Entomology Project Group and District 5 county Extension agents on integrated pest management strategies for feral hogs.

Feral Hog Website

A feral hog website (http://feralhog.tamu.edu) was developed and maintained to provide the public and media with information on feral hog life history and control as well as the status of the abatement project. During the two year project, there were a total of 31,374 unique hits and 76,830 pages accessed from the website.

Media Efforts

Media interest in feral hogs, their damage and the Feral Hog Abatement Pilot Project remained high throughout the entire project. The principal investigator was charged with the primary responsibility of providing interviews upon request to various print, television and radio media outlets. Television interviews regarding the Feral Hog Abatement Pilot Project were provided and aired on the

national broadcasts of ABC's Evening News and Nightline, National Geographic Television, CBS and ABC (both Tyler, Texas affiliates), CBS (Longview, TX affiliate), ESPN Outdoors, Iowa Public Television and The History Channel (Figure 24). Newspaper interviews were conducted with the New York Times, Associated Press, Bryan Eagle, San Antonio Express (3), Houston Chronicle (2), Tyler Morning Telegraph (2), Mount Pleasant Daily Tribune, Salem (OR) Statesman Journal, Nacogdoches Sentinel, Longview News Journal, Hillsboro Reporter, Lockhart Sentinel Times, Dallas Globe, Business Weekly, Los Angeles Times and the Dallas Morning News. One magazine article was authored for Texas Wildlife Association's magazine. Numerous other newspaper articles and radio interviews (i.e. Farm Bureau, Lone Star Outdoor News) resulted from AgriLife Extension statewide news releases (agnews.tamu.edu) on feral hogs and the Abatement Project. One podcast on feral hogs was prepared and placed on the AgriLife Extension feral hog website.

Figure 24. A television station interviews a Texas landowner in a feral hog damaged hay meadow.

National/International Interest

Interest in this project among other states was also extremely high. These states range from those with almost no hog populations present to those, like Texas, that have almost all available feral hog habitat occupied. A variety of agencies dealing with feral hog abatement contacted AgriLife Extension for additional information and updates on the pilot project. Presentations that detailed the design and results of the Feral Hog Abatement Pilot Project were presented by the principal investigator at National Symposium on Wild Pigs in Mobile, Alabama (2006) and by the principal and co-principal investigator in St. Louis, Missouri (2008).

One cooperating principal investigator was an invited speaker at the Maui (Hawaii) Ungulate Management Conference in 2008. Information provided included an overview of successful hog removal techniques as well as performance measures.

SUMMARY

The Feral Hog Abatement Project resulted in the removal of 3,799 feral hogs from 48 cooperator properties totaling 230.017 acres and resulting in a savings of $1,480,491. Education/outreach efforts reached 5,197 clientele via 67 educational events and were valued at

$2,978,821. Survey respondents increased their knowledge of feral hogs by an average of 68% and planned to adopt 3.2 new management practices. In total, the abatement study provided $4,459,312 in direct economic benefit resulting in a benefit to cost raio of $11.42 for every $1.00 invested in the project.

Citation: Higginbotham, Billy, Greg Clary, Larry Hysmith, and Michael Bodenchuk. 2008. Statewide feral hog abatement pilot project. Texas AgriLife Extension Service. 45 pp.

Appendix 1

Texas AgriLife Extension Service-Project Personnel

Galen Logan-Camp County Extension Agent-Agriculture

John Hill-Wildlife Services Technician-Camp County

Gideon Jennings-Hill County Extension Agent-Agriculture

Mike Gage-Navarro County Extension Agent-Agriculture

Derek Scasta-Navarro County Extension Agent-Agriculture

Dustin Parker-Wildlife Services Technician- Hill and Navarro Counties

David Pipken-Wildlife Services Technician-Hill and Navarro Counties

Terry Shriver-Wildlife Services Damage Management Biologist-Ft. Worth District

Steve Meek-Wildlife Services Assistant District Supervisor-Ft. Worth District

Jan Loven-Wildlife Services District Supervisor-Ft. Worth District

Brent Batchelor-Matagorda County Extension Agent-Agriculture

Jerry Falke-Wildlife Services Damage Management Biologist-Bryan District

T.J. Muir-Wildlife Services Damage Management Biologist-Bryan District

Tommy Taylor-Pilot-Wildlife Services

Kelly Spinks-Pilot-Wildlife Services

Doug Steen-Wildlife Services Assistant District Supervisor-Bryan District

Gary McEwen-Wildlife Services District Supervisor-Bryan District

Eddie Davis-Wildlife Services-Wildlife Biologist-College Station District

Marty Sedden-WS-Wildlife Damage Management Specialist-Mobile Forces-San Angelo District

Gary Stevens-Wildlife Services-Troubleshooter-College Station District

Chris McPherson-Wildlife Services-Wildlife Damage Management Technician-College Station Dist.

Bruce Leland-Wildlife Services Assistant Director-San Antonio

Mike Bodenchuk-Wildlife Services State Director-San Antonio

Larry Hysmith-Project Manager and Extension Program Specialist-College Station

Greg Clary-Project Co-Investigator and Extension Economist-Overton

Billy Higginbotham-Principal Investigator and Extension Wildlife and Fisheries Specialist-Overton

Special thanks to former TAMU-WFS Associate Department Head Neal Wilkins, Extension Wildlife Specialists Jim Cathey, Ken Cearley, Jim Gallagher and Dale Rollins and numerous county Extension agents for supporting indirect control educational program efforts conducted statewide.

Ap**pendix 2**

2006 Cooperator Survey Forms By Pilot Site

Coastal Prairie
2006 Economic Impact Survey
Feral Hog Management Pilot Program

The initial survey you completed nearly a year ago for Texas Cooperative Extension's Wildlife and Fisheries and Wildlife Services Units established baseline estimates of economic losses during 2005. We now need estimates of economic losses on your property and of costs associated with control measures used throughout 2006.

This survey is for you to share information about control and management measures employed on your property and the economic value of losses you observed during 2006.

As before, all individual information remains confidential. Reports will include only summaries of landowner information. Contact information is necessary to insure participants receive all correspondence and reports associated with the project. ***YOUR PARTICIPATION IN THIS PROJECT IS APPRECIATED.***

Contact _____Farm Name _____

Address _____City _____ Zip _____

Office Phone _____Email _____

Current Wildlife Services cooperator: Yes_____ No_____

Please provide as much detail as possible about the control measures used on your property and the best estimate of your losses documented for the entire year *2006*.

Control Activities during 2006

Control measure	**Estimated number of hogs removed**	**Estimated number of events**
Trapped & destroyed		
Trapped & moved from premise		
Trapped & sold		
Owner & employee hunting		
Lease hunting		
Use of dogs		
Flown with helicopter		
Other:		
Other:		

Please list any other control measures that have been taken that are not accounted for in the above table:

Economic Losses during 2006

Please provide as much detail about economic losses in your crop and livestock enterprises during 2006. Note additional information concerning crop, commodity or property losses and additional expenditures and time spent to repair damages attributed to feral hogs that are not reflected in the table. Information you provide this year will be compared with previous surveys to evaluate the impact of control measures. Please be as realistic as possible so we get an accurate account of what is happening on your property, whether positive or negative.

Crop and commodity losses in 2006				***Livestock, property and other losses in 2006***			
Crop or Commodity	**Total Net Loss ($)[1]**	**Addnl losses ($)[2]**	**Addnl owner and unpaid labor (hrs)**	**Property or Livestock**	**Total Net Loss ($)[1]**	**Addnl losses ($)[2]**	**Addnl owner and unpaid labor (hrs)**
Corn				Pasture			
Grain Sorghum				Other Land			
Cotton				Wetlands			
Hay				Fences			
Soybeans				Livestock specify type:			
Rice				Disease transmission			
Turf				Equipment: (specify type)			
Orchards, incl. native pecans				Vehicles			
Stored commodities				Personal injury			
Other:				Water losses			
				Loss of land value			
				Other			

Make any additional notes on bottom or back of this page

[1]Total losses minus payments from insurance plus cost of insurance premiums

[2]Additional cash expenses not included in crop or commodity losses, such as farm operations to level land, repair levees, repair equipment, etc.

Please note any additional losses not covered by the above tables that you faced during 2006. Provide some details about the type of loss, the dollar value of losses, and other costs incurred to bring the situation back to its original condition. This might include loss of lease value, damage to food plots, or damage to wildlife feeders.

Please share any additional comments about how you have benefited from working with Wildlife Services.

"Based on the information and technical assistance you have received as a result of the Feral Hog Abatement Project, what is the likelihood that you would recommend Texas Cooperative Extension (includes Wildlife Services) to your family and friends as a contact for information and assistance on feral hogs and their control" ***Circle only one number below with 0 = not likely and 10 = likely.***

0	1	2	3	4	5	6	7	8	9	10
not likely										likely

Thank you very much for your time and interest in solving feral hog problems in Texas. Your response to this survey will be reported to policy makers and will be used in educational programs conducted by Texas Cooperative Extension. Reports generated by this project will be made available to all active participants. Anyone with questions about this survey can contact either of the following:

Please return completed survey to one of the following individuals:

Brent Batchelor, CEA-Ag/NR
Matagorda County Extension
2200 7th St 4th Floor
Bay City, TX 77414
979-245-4100
Fax: 979-245-5661
BBatchel@ag.tamu.edu

Larry Hysmith, Ext Assoc
Nagle H113
Wildlife & Fisheries Sciences
Texas A&M University
College Station, TX 77843-2258
979-845-4865
Fax 979-845-7103
lhysmith@ag.tamu.edu

Blacklands
2006 Economic Impact Survey
Feral Hog Management Pilot Program

The initial survey you completed nearly a year ago for Texas Cooperative Extension's Wildlife and Fisheries and Wildlife Services Units established baseline estimates of economic losses during 2005. We now need estimates of economic losses on your property and of costs associated with control measures used throughout 2006.

This survey is for you to share information about control and management measures employed on your property and the economic value of losses you observed during 2006.

As before, all individual information remains confidential. Reports will include only summaries of landowner information. Contact information is necessary to insure participants receive all correspondence and reports associated with the project. ***YOUR PARTICIPATION IN THIS PROJECT IS APPRECIATED.***

Contact _____Farm Name _____

Address _____City _____ Zip _____

Office Phone _____Email _____

Current Wildlife Services cooperator: Yes_____ No_____

Please provide as much detail as possible about the control measures used on your property and the best estimate of your losses documented for the entire year *2006*.

Control Activities during 2006

Control measure	**Estimated number of hogs removed**	**Estimated number of events**
Trapped & destroyed		
Trapped & moved from premise		
Trapped & sold		
Owner & employee hunting		
Lease hunting		
Use of dogs		
Flown with helicopter		
Other:		
Other:		

Please list any other control measures that have been taken that are not accounted for in the above table:

Economic Losses during 2006

Please provide as much detail about economic losses in your crop and livestock enterprises during 2006. Note additional information concerning crop, commodity or property losses and additional expenditures and time spent to repair damages attributed to feral hogs that are not reflected in the table. Information you provide this year will be compared with previous surveys to evaluate the impact of control measures. Please be as realistic as possible so we get an accurate account of what is happening on your property, whether positive or negative.

Crop and commodity losses in 2006				***Livestock, property and other losses in 2006***			
Crop or Commodity	**Total Net Loss ($)[1]**	**Addnl losses ($)[2]**	**Addnl owner and unpaid labor (hrs)**	**Property or Livestock**	**Total Net Loss ($)[1]**	**Addnl losses ($)[2]**	**Addnl owner and unpaid labor (hrs)**
Corn				Pasture			
Grain Sorghum				Other Land			
Cotton				Wetlands			
Hay				Fences			
Orchards				Livestock specify type:			
Specialty crops				Disease transmission			
Stored commodities				Equipment: (specify type)			
Other				Vehicles			
				Personal injury			
				Water losses			
				Loss of land value			
				Other			

Make any additional notes on bottom or back of this page

[1]Total losses minus payments from insurance plus cost of insurance premiums

[2]Additional cash expenses not included in crop or commodity losses, such as farm operations to level land, repair levees, repair equipment, etc.

Please note any additional losses not covered by the above tables that you faced during 2006. Provide some details about the type of loss, the dollar value of losses, and other costs incurred to bring the situation back to its original condition. This might include loss of lease value, damage to food plots, or damage to wildlife feeders.

Please share any additional comments about how you have benefited from working with Wildlife Services.

"Based on the information and technical assistance you have received as a result of the Feral Hog Abatement Project, what is the likelihood that you would recommend Texas Cooperative Extension (includes Wildlife Services) to your family and friends as a contact for information and assistance on feral hogs and their control" ***Circle only one number below with 0 = not likely and 10 = likely.***

0 1 2 3 4 5 6 7 8 9 10
not likely likely

Thank you very much for your time and interest in solving feral hog problems in Texas. Your response to this survey will be reported to policy makers and will be used in educational programs conducted by Texas Cooperative Extension. Reports generated by this project will be made available to all active participants. Anyone with questions about this survey can contact either of the following:

Please return completed survey to one of the following individuals:

Mike Gage, CEA-Ag/NR 300 West Third Navarro Co. Ext. Office PO Box 1679 Corsicana, TX 75151 903-654-6075 ext 3077 Fax 903-654-3026 MGage@ag.tamu.edu	Gideon Jennings, CEA-Ag/NR 126 S. Covington Hill Co. Courthouse Annex PO Box 38 Hillsboro, TX 76645-0318 254-582-4022 Fax 254-582-4021 MGJennings@ag.tamu.edu	Larry Hysmith, Ext Assoc Nagle H113 Wildlife & Fisheries Sciences Texas A&M University College Station, TX 77843-2258 979-845-4865 Fax 979-845-7103 lhysmith@ag.tamu.edu

Post Oak Savannah/Pineywoods
2006 Economic Impact Survey
Feral Hog Management Pilot Program

The initial survey you completed nearly a year ago for Texas Cooperative Extension's Wildlife and Fisheries and Wildlife Services Units established baseline estimates of economic losses during 2005. We now need estimates of economic losses on your property and of costs associated with control measures used throughout 2006.

This survey is for you to share information about control and management measures employed on your property and the economic value of losses you observed during 2006.

As before, all individual information remains confidential. Reports will include only summaries of landowner information. Contact information is necessary to insure participants receive all correspondence and reports associated with the project. ***YOUR PARTICIPATION IN THIS PROJECT IS APPRECIATED.***

Contact _____Farm Name _____

Address _____City _____ Zip _____

Office Phone _____Email _____

Current Wildlife Services cooperator: Yes_____ No_____

Please provide as much detail as possible about the control measures used on your property and the best estimate of your losses documented for the entire year *2006*.

Control Activities during 2006

Control measure	**Estimated number of hogs removed**	**Estimated number of events**
Trapped & destroyed		
Trapped & moved from premise		
Trapped & sold		
Owner & employee hunting		
Lease hunting		
Use of dogs		
Flown with helicopter		
Other:		
Other:		

Please list any other control measures that have been taken that are not accounted for in the above table:

Economic Losses during 2006

Please provide as much detail about economic losses in your crop and livestock enterprises during 2006. Note additional information concerning crop, commodity or property losses and additional expenditures and time spent to repair damages attributed to feral hogs that are not reflected in the table. Information you provide this year will be compared with previous surveys to evaluate the impact of control measures. Please be as realistic as possible so we get an accurate account of what is happening on your property, whether positive or negative.

Crop and commodity losses in 2006				***Livestock, property and other losses in 2006***			
Crop or Commodity	**Total Net Loss ($)[1]**	**Addnl losses ($)[2]**	**Addnl owner and unpaid labor (hrs)**	**Property or Livestock**	**Total Net Loss ($)[1]**	**Addnl losses ($)[2]**	**Addnl owner and unpaid labor (hrs)**
Corn				Pasture			
Grain Sorghum				Other Land			
Peaches				Wetlands			
Pecans				Fences			
Other Orchards				Livestock specify type:			
Hay				Disease transmission			
Stored commodities				Equipment: (specify type)			
Specialty crops				Vehicles			
Other				Personal injury			
				Water losses			
				Loss of land value			
				Other			

Make any additional notes on bottom or back of this page

[1]Total losses minus payments from insurance plus cost of insurance premiums

[2]Additional cash expenses not included in crop or commodity losses, such as farm operations to level land, repair levees, repair equipment, etc.

Please note any additional losses not covered by the above tables that you faced during 2006. Provide some details about the type of loss, the dollar value of losses, and other costs incurred to bring the situation back to its original condition. This might include loss of lease value, damage to food plots, or damage to wildlife feeders.

Please share any additional comments about how you have benefited from working with Wildlife Services.

"Based on the information and technical assistance you have received as a result of the Feral Hog Abatement Project, what is the likelihood that you would recommend Texas Cooperative Extension (includes Wildlife Services) to your family and friends as a contact for information and assistance on feral hogs and their control" ***Circle only one number below with 0 = not likely and 10 = likely.***

0	1	2	3	4	5	6	7	8	9	10
not likely										likely

Thank you very much for your time and interest in solving feral hog problems in Texas. Your response to this survey will be reported to policy makers and will be used in educational programs conducted by Texas Cooperative Extension. Reports generated by this project will be made available to all active participants. Anyone with questions about this survey can contact either of the following:

Please return completed survey to one of the following individuals:

Galen Logan, CEA-Ag/NR
Camp County Extension
115 North Ave Ste D
Pittsburg, TX 75686-1399
Phone: 903-856-5005
Fax: 903-856-3078
GRLogan@ag.tamu.edu

Larry Hysmith, Ext Assoc
Nagle H113
Wildlife & Fisheries Sciences
Texas A&M University
College Station, TX 77843-2258
979-845-4865
Fax 979-845-7103
lhysmith@ag.tamu.edu

Appendix 3

Landowner Testimonials Regarding AgriLife Extension's Direct and Indirect Control Efforts

Post Oak Savannah/Pineywoods

Additional losses - $10,000 in deer corn, food plots, pond dam. Wildlife Services have helped with control in corn fields, hay meadows and chicken houses. I have noticed a decline in feral hog damage since the inception of the abatement project, not only on my property, but Pilgrim's Pride property as well. This is a direct correlation between the educational efforts of Texas AgriLife Extension as well as Wildlife Services support staff. I wish the program could continue and I continue to place calls to legislators to notify them of the major concerns associated with crop damage, pasture damage and other ecological impacts, such as erosion and loss of top soil. I am very adamant about feral hog control and continue to utilize fencing as a source of exclusion. We need help! There is money available to build ponds but no help to control hogs.

Hogs have virtually destroyed the hay meadows and pasture land, making it almost impossible to travel over with hay equipment, sprayers or shredders. All land needs to be dished and leveled and replanted due to hog damage the past several years. This was a great program from Extension. I appreciate the opportunity to learn from the experts on how to control our feral hog populations. The trapping and hunting of the wild hogs on our ranch and the other ranches adjoining us greatly reduced our problems. Unfortunately, most landowners do not have the time or make time to devote to feral hog control on their property. Your assistance was a tremendous asset. We are just now starting to see hogs drift back onto our property. If programs like this could be expanded, we would prevent the rapidly growing feral hog populations in East Texas.

I lost about 10 acres of pasture for grazing due to the hogs. Due to the amount of damage that has been done to the pastures over the 20 years I have owned the ranch you would have to disc and level the entire 400 acres. I have seen a reduction in the hog population. The hunting activity and trapping reduced some of the hogs and also kept them moving to different areas. This will help in the reduction of the population, but it will not eliminate them. (2005) - To repair the total damage caused by the hogs over the years, it would cost $16,240. $40 per acre to plow. I have planted ryegrass in the past, but hogs have destroyed about 1/3 of it. The hogs have made it difficult to shred pastures. It takes twice as long due to the roughness of the pastures.

Additional losses – Damage to erodable land. Soil erosion caused by disturbed soil. Cost share for hog proof perimeter fencing through EQUIP program would be beneficial.
How hogs might be contaminated - Eating spoiled poultry feed containing certain antibiotics. Eating gopher poison. Need info on types of fences proven to control wild hogs.
Benefits of Wildlife Services – During the time WS are actively working my area, damage is much less. Wildlife Services has provided me with valuable experience and information about controlling wild hog damage on my farm near Pittsburg. The educational outreach programs conducted in cooperation with my local county agent have helped me better manage my

resources and time in my efforts to control this costly problem. The direct control portion of the Wildlife Services, however, proved to be the single most effective method in controlling hog damage. Through actual hunting and trapping, and assisting me in establishing my own hunting and trapping methods, Wildlife Services has proven to be a valuable resource to landowners and producers in my area.

Benefits of Wildlife Services – I feel that WS have done an excellent job keeping the numbers down at a steady rate. However, I am still losing pasture, hay meadows, etc. as a result of this feral hog infestation. This program needs to be reinstated with more manpower, not less.

Blackland Prairie

Significant difference in number of hogs, which is evident from hay fields and lack of damage on my properties. Educational program benefits: Increased knowledge of variable methods allows person ability to continue removing hogs when other methods are simply not working.

Benefits of Wildlife Services: They helped control hogs during the critical growing season. Hogs became harder to trap once grain matured.

Additional Losses: Hog roots were so bad and rough on equipment and operator (myself) over the past few years that it has shook my mowing tractor to pieces and also hurt my back to where I'm having to see a Dr. It has also affected my lifestyle or what I'm able to do.
Wildlife Services: Not as many fresh hog roots due to the reduction in numbers of the hogs rooting in pastures. David Pipkin did the trapping and hog management on my place south of Kerens. He did a good job in reducing the numbers of hogs and I hope you will continue the program in future years.

Additional Losses: This situation has caused us not to be able to harvest and has reduced the amount of hay we could bale. Wildlife Services: The WS was very helpful and willing to do whatever it took to help us out.

Wildlife Services: Since hog traps have been taken up, hog numbers have significantly increased. After just one year of the program, damage to my milo was reduced probably by 75%. It is my belief that if assistance is not provided by the state, hog numbers will become unmanageable and grain crops will be very difficult to grow as previous history on my farm has shown up to 50% of my crops have been damaged by hogs. The Feral Hog Program has been a benefit for all grain farmers and should be continued and supported by the state to help farmers continue to learn new control methods.

Wildlife Services: Due to WS, we had very little to no damage to our row crops compared to 2006. Job well done! Without this service, future row crop plantings would be questionable. Have been pleased with working with the staff in Hill County. Great reduction in numbers of feral hogs. Huge success due to multiple techniques used. Noticeable difference! Educational program benefits of familiarity with hog traps, snares and hunting is very beneficial in the overall removal of feral hogs.

Wildlife Services: I have realized about 50% decrease in damage.

Wildlife Services: This effort is worthwhile and would like to see the program continued.

Coastal Prairie

Wildlife Services: Hogs are an extremely aggressive exotic animal that are devastating to native, natural habitats, as well as agricultural areas. The assistance from WS is a good start on eradicating feral hogs.

Additional losses: Our main damage is to the rice levees that maintain our flood situation. These levees are damaged randomly by hogs which makes it expensive and time consuming to locate such damage. Additional comments: Your help is greatly appreciated. It is hard to pinpoint actual losses, but they can be very substantial. I even quit leasing a farm because they would not let me try to control the hogs. The control program needs to expand!

Wildlife Services: Helicopter control has been a large economic value. The airplane is greatly appreciated – the results are great. I see much less feral hog damage in our rice due to the aerial hunting. The spring and summer hunts eliminate problem hogs and the population in the area hunted is less than a few years ago when the project began. I can honestly say this program has saved me money in levy repair damage cost and less grain loss in the fields.

Additional Losses: Have experienced considerably less damage in 2007 as compared to 2006. Wildlife Services – Would like to see WS come back to continue removing hogs.

Wildlife Services: Bring the helicopter back – very beneficial!

Additional losses: The torn-up pastures make ground application of pasture herbicides very difficult. Two miles per hour is maximum speed possible for this process.

Additional losses: Hogs also damage levees on wildlife ponds.
Wildlife Services: They are a professional group. Good to work with. We need to keep this program.

Wildlife Services: Earlier in the year would be more helpful.

Wildlife Services: Really like the helicopter because they can really do some good control. That we can't do on the ground on tractors.

Additional losses: Dry weather has caused hogs to move, not near as much activity as '05.

Wildlife Services: Helped slow hog damage.

Additional losses: Additional $7,500 loss of rice due to hogs.

Additional comments: We estimate 50 acres pasture land taken out of production due to hog rooting. At $25/acre on 50 acres would be $1,250/year. The things I learned at the feral hog program have allowed me to come up with a better feral hog management plan for my ranch. We have incorporated many of the suggestions into our program and have seen an improvement in our situation.

Additional losses: I do a lot of cattle assessment on foot. I constantly have to watch for hog holes so I don't twist an ankle. We live on bottom land along Lineville Creek, along the Brazoria Co line. We are bordered by several sets of woods. My last count on several groups of hogs last week was 20-30 large hogs, 50-60 (25-30 lbs) and many babies. Additional comments: We had to have a dozer come in and smooth out our pond. When the water started to dry up, the hogs came in and completely destroyed the bottom and sides.

Additional losses: On another farm I lease, an additional $10,000 damage to rise by hogs has occurred in 2006. This farm is not covered by this survey.

Wildlife Services: Landowners working together is the only way we can control this issue. WS makes that happen!

Due to my current job, I am unable to give the time to control efforts needed, but I do not observe near as many ruttings as I have seen in many years. Wildlife Services: I am also cooperating with WS on coyote control. I see less coyotes when I go to the pastures.

Wildlife Services: Aesthetically, the property is improving with a noticeable decline in rooted up areas, particularly along the roadways. The aerial hunting has helped reduce our feral hog population on the Hawkins Ranch a significant amount. The damage is less in all the pastures and we see fewer hogs in general.

We are able to drive through some areas that we were unable to access previously due to feral hog damage. The aerial hunting has allowed us to improve our management on the Hawkins Ranch.

Additional Comments

As a result of attending the July 26, 2007 Cooperative Extension feral hog program, we invited Richard Kincaid to trap hogs on our property. Two traps, designed and built by Mr. Kincaid, were placed in areas where there was overwhelming evidence of hog presence. Two sows and five piglets were caught and eradicated. After capturing the seven hogs, there was little evidence of hog activity in the area for several months. Upon observing new traces of hogs in the area, one trap was set. One feral gilt was captured and eliminated. The information provided by Brock Fry, Billy Higginbotham and Greg Hawkins during the program plus the opportunity to network with Mr. Kincaid has been beneficial to us. The program is an excellent program and we recommend it for everyone who has feral hogs on or near their property.

"The educational program made me very aware of the problem with feral hogs. We have not been dealing with hogs as much as some landowners, but we know it will only get worse over time. The program taught us what to do as the problem escalates such as: moving traps around, changing baits and considering snaring as a control option".

I enjoyed the feral hog program you provided during the past year. I was surprised at how much of a problem the control of these hogs seems to be. I hope we can have another program on the same topic – maybe bring a couple of the smaller ones to show.

I thought the program at Welder Wildlife was excellent. Following the program, we had 8 traps made and has been trapping hogs. I sells some, give some to friends and has shot some in the field. As a result, I have seen a slight reduction, however, the hogs continue to come to his fields. I suggest you (AgriLife Extension) do more programs with speakers that get to the point and give tricks to catching hogs.

We have not had as much of a problem with feral hogs as some, but will be plowing about 40 acres in a hay field to fix damage that feral hogs did cause. We have used hunters a few times to kill hogs, but we know that we have to use the trapping methods taught by Wildlife Services staff. I think this program is necessary because feral hogs are a growing problem.

We need continuing information and help regarding the control of feral hogs. Dr. Higginbotham's presentation was a good start. However, we need more. I have a significant problem with the hogs digging up my orchard and breaking irrigation risers in the orchard. I have used many of the methods described by Dr. Higginbotham as it has helped. But I find that the hogs learn fast and trapping them becomes harder each year. New ideas and methods are critical for the control of the hogs. I would also like more information regarding any research that is being done to reduce populations.

I am not a "hog hunter" so I didn't know much about feral hog habits except that they can do much damage to your property. Dr. Higginbotham said shooting at them with firearms would cause them to not visit your property as often. I was not aware of this, but after his presentation, the "good Lord called 2 or 3 of them home" and after that, they visited me less often. I have not yet trapped any, but he gave many good ideas of trap construction, location of traps, etc. Not that I miss them, but so far in '08, I have seen very few hog sightings, very few hog signs and very little damage. I am puzzled!

Appendix 4a
TEXAS COOPERATIVE EXTENSION –INDIRECT CONTROL
FERAL HOG DAMAGE AND CONTROL AWARENESS PROGRAMMING SURVEY

Dear Landowner:

You recently heard discussions about feral hog life history, behavior and control information at a program hosted by Texas Cooperative Extension. Please take a minute to complete the following so we can gauge the economic impact feral hogs in Texas and the value of information you received. Please return the completed survey as soon as possible. Your response will assist us in planning future educational programs and possibly to obtain resources for programs to control feral hog populations in Texas.

1. **Place a check mark next to all the areas in which feral hogs had a negative impact on your property(s) *in the past year*.**

Possible Area of Loss	Please check all areas that apply
Growing or planting commodity crop losses	
Growing or planting specialty crop losses	
Stored commodities	
Pastures	
Wetlands	
Livestock (deaths, diseases, etc.)	
Fences, water troughs, or other improvements	
Equipment or vehicles	
Personal injuries	
Loss of land value	
Loss of lease value, damage to food plots, or wildlife feeders.	
Owner and/or employee time	

2. **Place a check mark next to all the control methods you use on your property(s).**

Control measure	Please check all areas that apply
Trapped & destroyed	
Trapped & moved from premise	
Trapped & sold	
Owner & employee hunting	
Lease hunting	
Use of dogs	
Other:	

3. "I estimate my total economic losses due to feral hogs during the ***previous year*** to be about $_____on all my property(s). This includes all items checked above.

4. **As a result of implementing what I learned at Texas Cooperative Extension workshop(s**), I expect my losses due to feral hogs to be approximately $_____ during the ***upcoming year.***

5. Based on the information provided at the program, what is the likelihood that you would recommend Texas Cooperative Extension (includes Wildlife Services) to your family and friends as a contact for information on feral hogs and their control? Circle one number below with 0 = not likely and 10 = likely

0 1 2 3 4 5 6 7 8 9 10
Not Likely **Likely**

Appendix 4b

TEXAS COOPERATIVE EXTENSION - FERAL HOG SURVEY-INDIRECT CONTROL

You have recently participated in a program on feral hog life history, behavior and control information hosted by Texas Cooperative Extension. Please complete the following on the economic impact of feral hogs and the value of information you received. Your survey will assist us in planning future programs.

1. Place a check mark next to all the areas in which feral hogs had a negative impact on your property(s) *in the past year.*

_____ Growing or planting commodity crop losses
_____ Growing or planting specialty crop losses
_____ Stored Commodities
_____ Pastures
_____ Wetlands
_____ Livestock (injury, deaths, diseases)
_____Fences, water troughs, or other improvements
_____Equipment or vehicles
_____Personal injuries
_____Loss of land value
_____Loss of lease value, damage to food plots/feeders
_____Owner or employee time

2. Place a check mark next to all the control methods you use on your property(s).

____ Trapped & destroyed
____ Trapped & moved from premise
____ Other (snares, aerial gunning)
___Trapped & Sold
___Owner/Employee hunting
_____ Lease hunting
_____ Use of dogs

3. "I estimate my total economic losses due to feral hogs during the ***previous year*** to be about $_____ on all my property(s). This includes all items checked above in Question 1.

4 **As a result of implementing what I learned at Texas Cooperative Extension workshop(s),** I expect my losses due to feral hogs to be approximately $_____ during the ***upcoming year.***

5. Did you increase your knowledge of feral hogs & control by attending this program? Yes___ No___

6. Rate your knowledge ***before and after*** the program on these subjects. Circle only one number for each answer choice with 1 = no little knowledge, 3 = some knowledge, 5 = high level of knowledge.

A. Feral hog biology	Before	1	2	3	4	5
	After	1	2	3	4	5
B. Legal control options	Before	1	2	3	4	5
	After	1	2	3	4	5
C. Efficient trap/bait techniques	Before	1	2	3	4	5
	After	1	2	3	4	5
D. Types/extent of hog damage	Before	1	2	3	4	5
	After	1	2	3	4	5

7. Please place a checkmark by all practices that you plan to adopt in order to better manage feral hogs on your property:

___Use larger traps
___Use baits with scent appeal
___Vary/change baits at different locations
___Set traps whenever fresh sign appears
___Pre-bait traps to encourage consistent hog visits
___Scout for hog sign (tracks, wallows, rubs, hair)
___Wear eyewear and gloves during field dressing
___Market trapped hogs to processors to recoup losses

8. Based on the information provided at the program, what is the likelihood that you would recommend Texas Cooperative Extension (includes Wildlife Services) to your family & friends as a contact for information on feral hogs & their control? Circle one number below with 0 = not likely and 10 = likely.

0 1 2 3 4 5 6 7 8 9 10

Not Likely **Likely**

Appendix 5

NET PROMOTER SCORE

The Net Promoter Score is used to index company or program effectiveness. It is based on a book entitled "The Ultimate Question" by Fred Reichheld. It is in wide use among Fortune 500 companies and asks one simple question: **How likely are you to recommend us to family, friends and colleagues?** The "us" for this project is Texas Cooperative Extension as a source of information and technical assistance—in this case on feral hogs and their control. The calculation is simple—The clientele groups are asked to rate the likelihood of their recommending TCE on a 0 to 10 Likert Scale with 0 being "Not Likely" and 10 being "Likely". Take the percentage of clientele receiving information at a program or receiving services that rated your entity either a 9 or 10 (called promoters) and subtract the percentage of clientele that rated you a 6 or below (called detractors). Don't use the 7s and 8s (called passives) except to determine sample size percentages of the other two groups. The result of this calculation is your company's or agency's Net Promoter Score. The most efficient companies (or programs) usually rate 50% to 80%. A score of 5% to 10% means a company is sputtering along with its promoters barely outnumbering its detractors. Some companies even have negative Net Promoter Scores, meaning they are creating more detractors than promoters every business day. A brief example—100 clientele were surveyed following a TCE feral hog control program. A total of 25 clientele rated the program a 6 or below, 40 rated it a 7 or 8 and 35 rated it a 9 or 10. Therefore, the promoters, expressed as 35/100 = 35% minus the detractors, expressed as 25/100 or 25% = 10% NPS. Examples of Net Promoter Scores for some well known corporations include Amazon (73%), Ebay (71%), Apple (66%), Southwest Airlines (51%) and Dell (50%). For a more detailed explanation of NPS, web search "The Ultimate Question" or see www.netpromoter.com.

Appendix 6

Examples of Educational Program Agendas

Feral Hog Abatement Project - Fast Facts

- Two year project funded by Texas Department of Agriculture at a cost of $390,000

- Involves educational programming conducted statewide

- Involved 42 cooperators owning or controlling 175,000 acres in 6 pilot counties (three geographical locations)

- In 2006, economic impact of educational programs was $919,471 and direct assistance to cooperators $944,591, for a total economic impact of the Project of $1,864,062

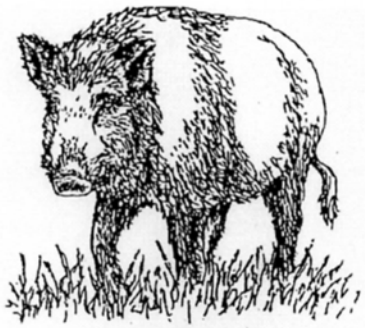
- Benefit to cost ratio in 2006 alone of 7.2 to 1 or $7.20 return for each $1.00 spent on the project

Directions to Field Day Site:

From Hwy 271 in Pittsburg, turn East on Lafayette Street, go ½ mile. Turn left onto Arch Davis Road (FM 2254) and go 1.9 miles - continue on FM 2254 for 1.6 miles. Turn right onto CR 1120 for 0.4 miles. Arrive at 1047 CR 1120 - turn right. Signs will be posted at site.

Texas Cooperative Extension

Feral Hog Management Field Day



May 17, 2007

Program conducted by

Texas Cooperative Extension

(Camp, Titus, Wood, Rains, Franklin, Delta and Upshur County Extension Offices)

Program Co-Sponsors:

Pilgrim Farms
Texas Parks and Wildlife
Texas Animal Health Commission
Texas Department of Agriculture

Agenda

2:00 pm **View exhibits/pickup information packets**

2:30 **Welcome/Orientation**
Pat Pilgrim, Pilgrim Farms
Galen Logan, Camp CEA

2:40 **The Feral Hog Abatement Project**
Larry Hysmith, Texas Cooperative Extension
Jeff Kilburn, Landowner/Cooperator

3:00 **Stop 1 - Teardrop-shaped trap**
John Hill and Terry Shriver, Wildlife Services;

Disease Concerns and TAHC Regulations Regarding Trapping, Holding and Releasing Feral Hogs - Dr. Gregory Hawkins, TAHC

4:00 **Stop 2 - Round Trap**
John Hill and Terry Shriver, Wildlife Services;

Licensing Requirements for Hog Hunters
Jerry Ash, Texas Parks and Wildlife

4:45 **Stop 3 - Box Trap/Snares/Firearms**
John Hill and Terry Shriver, Wildlife Services

5:30 **Hamburger Supper**

6:15 **Marketing Opportunities of Feral Hogs to Processors**
Billy Smith, certified USDA buyer

6:30 **Life History and Control Strategies for Feral Hogs**
Billy Higginbotham, Texas Cooperative Extension

7:30 **Administer Feral Hog Survey**
Announce Grand Door Prize Winner
Pickup Pesticide Certificates
Adjourn

Useful Websites

Texas Cooperative Extension
http://feralhogs.tamu.edu
http://wildlife.tamu.edu
http://wls.tamu.edu (Wildlife Services)
Texas Animal Health Commission
www.tahc.state.tx.us
Texas Department of Agriculture
www.agr.state.tx.us
Texas Parks and Wildlife
www.tpwd.state.tx

County Extension Agents

Galen Logan, Camp CEA, 903-856-5005
Mike Berry, Franklin/Delta CEA, 903-395-4400
Stephen Gowin, Rains CEA, 903-472-2412
Brian Hill, Upshur CEA, 903-843-4019
Clint Perkins, Wood CEA, 903-763-2924
Kenny Rollins, Titus CEA, 903-572-0261

Texas Cooperative EXTENSION

Coastal Bend Feral Hog Management Symposium

Thursday, October 11, 2007
9:00 a.m. to 3:30 p.m.

Welder Wildlife Refuge
(Hwy 77, North of Sinton)

Registration fee $10 per person.

Pre-registration is required by October 10th.
To register please call (361)364-6234

Topics include:

- Feral Hog Biology/Life History
- Feral Hog Research Update
- Feral Hog Disease Implications & TAHC Regulations
- Hunting License Requirements for Hog Hunters
- Value and Marketing of Feral Hog
- Feral Hog Control Options

CEU's: 1 Laws & Regulations & 1 General

Symposium Objective: Participants become familiar with feral hog biology and options available to help manage feral hog populations in order to reduce rangeland erosion, field crop destruction, mammal predation, and improve stream water quality.

Sponsored by:
Texas Cooperative Extension -
San Patricio, Bee, Live Oak, Jim Wells, Nueces, Aransas, and Refugio Counties

Co-Sponsors:
Welder Wildlife Refuge, Texas Parks & Wildlife, Texas Animal Health Commission, and Wildlife Services

Texas Cooperative EXTENSION
The Texas A&M University System

FERAL HOG PROGRAM

Ben E Keith Meeting Room
2019 West Oak St., Palestine, Texas
Monday, March 26, 2007

Program start time 6:00 p.m.

AGENDA

5:30 p.m. .....Registration & Meal

Topics and Speakers

6:00 - 7:00 p.m. .....Dr. Billy Higginbotham, Texas Cooperative Extension
Feral Hog Background Biology and Life History

7:00 - 7:30 p.m. .....Dr. A.B. Jenning, Texas Animal Health Commission
Feral Hog Regulations and Disease Transmission

7:30 - 7:40 p.m. .....David Raybin, Texas Parks and Wildlife
Hunting Regulations Regarding Feral Hogs

7:40 - 8:10 p.m. .....Terry Shriver, Texas Wildlife Management
Control Techniques of Feral Hogs

8:10 - 8:30 p.m. .....Hog Buyer Discussion

2 hours CEU toward recertification
1 hour Laws and Reg
1 hour IPM

Texas Cooperative Extension participating counties:

Anderson County Extension, Agent Truman Lamb
Cherokee County Extension, Agent Jack White
Freestone County Extension, Agent Shane McLellan
Henderson County Extension, Agent Rick Hirsch
Houston County Extension, Agent Eddie King

IV. CONTROL TECHNIQUES
Best Management Practices

Billy Higginbotham, Texas AgriLife Extension Service, POB 38, Overton, TX 75684, 903-834-6191, b-higginbotham@tamu.edu

Abating Wild Pig Damage Using Trapping Best Management Practices

Billy Higginbotham
Texas AgriLife Extension Service-The Texas A&M University System, Overton, Texas

Abstract: The wild pig is an invasive exotic introduced into what is now Florida in 1539 by the explorer Hernanado de Soto. Texas has been home to wild pigs since 1565 with a current population estimate of 2.6 million animals. From 1980 to 1990, a perfect storm of clandestine releases, access to vast amounts of wildlife supplement and the highest reproductive rate of any ungulate found worldwide led to a wild pig population explosion in Texas. As the range and population of this intelligent omnivore increased over the ensuing 25 years, agronomic damage alone increased to over 50 million dollars annually. Inter-specific competition with and/or predation upon native wildlife species, damage to wetlands and sensitive plant communitites and water quality degradation have also been attributed to wild pigs in Texas. Damage to urban and suburban landscapes has also increased sharply over the past decade and negatively impacted humans via pig-vehicle collisions, greenscape damage to lawns, sports fields, golf courses, parks and cemeteries. Legal control methods include shooting, snaring, dogging and trapping. Among these methods, trapping is often cited as the first line of defense for private landowners. However, many landowners fail to employ "best management practices" when attempting to abate damage through population reduction. Trapping wild pigs is a process, not an event. The process includes the following steps: 1) pigs must be trained to bait, 2) sounder size must be estimated via the use of remote-sensing cameras to determine the size of trap needed, 3) pigs must accept the trap presence and 4) pigs must be trained to routinely enter and feed inside the

trap. Following this trapping protocol can save landowners tremendous amount of time and money in the war on wild pigs.

Key Words: Control, damage abatement, trapping, wild pigs

INTRODUCTION

The wild pig (*Sus scrofa*) found in what is now the continental United States has numerous sources of origin. In 1493, Christopher Columbus brought domesticated pigs to the West Indies. Hernando de Soto also used the descendants of these West Indies pigs as a food source when he explored Florida beginning in 1539 and also introduced them into what is now Texas in 1565 (Mayer and Brisbin 1991). As human colonization increased across the south, free-ranging of domesticated pigs was commonly practiced by settlers. Also, beginning in the 1890's , introductions of the Eurasian wild boar for hunting purposes were made in a number of states including New Hampshire, North Carolina, California and Texas. Therefore, the wild pig found in the United States today can be directly related to feral domesticated pigs that have spent from just a few to many, many generations in the wild, Eurasian wild boar where those stocks have perhaps remained relatively "pure" and the crosses between the two.

Regardless of the source, wild pigs cause a tremendous amount of damage each year. Total losses in the United States attributable to wild pigs exceed 800 million dollars annually (Pimmental et al. 2005). In Texas, a conservative estimate of agricultural damage alone exceeded 50 million dollars annually, with landowners spending an additional 7 million dollars to correct the damage and attempt to control the pigs (Higginbotham et al. 2008).

However, the damage has extended well beyond the agricultural community in recent years as the pig population has continued to increase its range and number. Damage to urban and suburban areas has increased to include pig-vehicle collisions, damage to green spaces such as parks, riparian areas, athletic fields, home lawns, parks and even cemeteries. This does not

include ecological damage to sensitive wetland areas and their plant communities or inter-specific competition with or direct predation upon many native wildlife species.

The most recent wild pig population estimate for Texas is 2.6 million animals (Texas A&M University-Institute of Renewable Natural Resources 2010). Approximately 79% of the Texas landscape is deemed suitable habitat for wild pigs. This has given rise to the saying of "There are but two types of landowners in Texas: Those with wild pigs and those about to have wild pigs".

With the current population reduction tools available, eradication of wild pig populations in Texas is not a feasible option. Nevertheless, the economic impact caused by wild pigs to agriculture can be greatly reduced via control efforts (Higginbotham et al. 2008). In Texas, landowners and others interested in abating damage by reducing wild pig populations have four legal options: Trapping, snaring, shooting (from ground and air) and dogging. Of these choices, trapping is often the first line of defense. However, few landowners are employing what are considered to be "best management practices" when trapping. As a result, they often become discouraged and give up while the damage the pigs inflict continues.

METHODS

Identification of wild pig presence prior to the initiation of damage is critical. Common signs of pig presence include tracks (e.g., more "rounded" shape than deer tracks), hair and mud on the bottom strand of barbed wire fences, wallows, rubs on wooden telephone, highline and fence posts and rooting in wetlands, fields and pastures (Lewis et al. 2011a). Unfortunately, a considerable pig presence may exist on a property without any actual sightings by the landowner. Human pressure often causes wild pigs to become highly nocturnal. As a result, they may move

considerable distances between the safety of daytime bedding cover and their nightly feeding sites.

Trapping wild pigs is a process, not an event. The process includes the following steps: 1) pigs must be trained to bait, 2) sounder size must be estimated via the use of remote-sensing cameras to determine the size of trap needed, 3) pigs must accept the trap presence and 4) pigs must be trained to routinely enter and feed inside the trap.

If open pastures or crop fields are the sites of initial damage, do not start baiting (chumming) at the site where that damage occurred. Rather, back track the pigs to their daytime cover (e.g., dense understory vegetation) and begin chumming at a potential trapping site. If multiple sites are to be chummed, vary the baits employed.

Potential trapping sites should be selected that are directly upwind of daytime cover allowing the bait's scent to carry toward the pigs (Lewis et al. 2011b). In addition, the site selection process should include access by a vehicle and trailer if pigs are to be loaded from a trap and moved from the capture site. State and local regulations should be checked to determine legal options for pig disposal, which may range from euthanasia to selling live pigs to buying stations.

In some cases, the chum site is predetermined (e.g., deer feeder) but always check state game agency regulations to make sure baiting/chumming is legal. Many trappers start the chumming process with shelled corn--the gold standard of wild pig baits. However, if the bulk of the corn is being consumed by non-target species (e.g., deer, crows, raccoons), switch to another chum such as fermented corn, rice or milo—to discourage non-targets while appealing to the wild pig's acute sense of smell!

Additional baits used successfully include used fish fry grease mixed with corn, cheese-flavored catfish baits, spoiled produce, over-ripe fruit (e.g., peaches, bananas), dry dog food and commercial pig baits. Campbell and Long (2008) found that strawberry-flavored baits were attractive to wild pigs. As a result, strawberry flavored gelatin or soda have often been incorporated into other baits to enhance their scent appeal.

Along with this initial chumming step, employing a remote-sensing camera eases the task at hand. Although you can make on-site observations of bait consumption and check for other signs of pig activity (e.g., tracks), a camera is instrumental to the trapping process since it allows for continuous monitoring and records the dates and times of pig activity while minimizing disturbance (Hamrick et al. 2011).

A question that arises with remote-sensing cameras is whether models with infra-red features are necessary to avoid spooking the pigs with a flash when the camera is triggered at night. In my experience, the flash is not a deterrent. However, if preferred, infra-red models are available from a variety of manufacturers.

In addition to confirming response to chumming efforts, the camera will also reveal the approximate number of pigs in the sounder. These data determine the size of trap that will be needed. Once the pigs are responding to bait, a trap of appropriate size can be assembled.

Generally, wild pig traps can either be characterized as box traps or corral traps (Choquenot et al. 1993). The box traps are usually small, six-sided and portable while corral traps are larger, open-topped and more semi-permanent. In addition to size differences, trap materials, trigger mechanisms and gate design used in these two trap designs often varies (West et al. 2009).

Another consideration in trap selection is the potential capture of non-targets. For example, deer often respond to corn-based baits and if accidentally captured can usually escape a corral trap while injury in box traps is a common occurrence.

When it comes to trap size—bigger is usually better! A recent study conducted in Georgia found that the capture rate of wild pigs was 4 times greater in corral traps than box traps (Williams et al. 2011). I seldom construct a corral trap with less than five 16 foot long livestock panels and often construct traps that may contain as many as 8 to10 panels. If the sounder of pigs is large (e.g., 15 to 25 pigs), the distance from the gate to the trigger mechanism should be maximized to increase the number of pigs captured in a single event. This requires the use of a larger trap. If you catch two pigs and six are still standing around outside of the trap when you arrive to check it, your trap was too small!

The shape of the trap is also a critical consideration. Small corral traps are often round. The box traps require a top while corral traps with corners must also have them covered to prevent escape. However, we recommend using a “tear-drop” shaped corral trap, especially if the landowner plans to load the pigs into a trailer for transport away from the trap.

Corral traps should be made of 16 or 20 foot long livestock panels that are 60 inches tall and contain mesh of 4” by 4” square (Lewis et al. 2011c). The panels should be overlapped one mesh width and secured to sunken t-posts erected every 4 to 5 feet around the outside perimeter of the trap. Panels should be wired to the posts at the top, middle and bottom. The bottom of the panels must sit flush on the ground without gaps present.

The trigger mechanism used is largely a matter of personal preference. I prefer a simple tripwire. A tripwire can be fashioned from either high test braided (non-monofilament) fishing line, a plastic-coated steel clothesline or a combination of the two. Since the tripwire may be up

to 50 feet long in the largest traps, it should be run above “pig height” from the gate to the trigger through pulleys mounted on a series of t-posts. The t-posts supporting the tripwire should be erected 10 to 15 feet apart in a line from 10 feet inside the gate to 10 feet from the back of the trap. The tripwire is angled downward from the next to the last t-post and run from the last t-post and secured to the back of the trap at a height of 15 inches. This allows it to be easily tripped by wild pigs while avoiding false triggering by non-targets species (e.g., raccoons).

Once the trap is erected, continue chumming as it may take a week or more for the pigs to become accustomed to its presence. At this stage, the opening where the gate will eventually be placed should be 10 to 15 feet wide to encourage wild pigs to enter the front of the trap. In addition to the week often needed for the pigs to simply become accustomed to the trap’s presence, another week may elapse before the pigs actually enter it. Bait should always be poured from outside with a trail leading to the inside and on towards the back of the trap where the gate trigger will be positioned.

Eventually, the majority of the sounder should regularly venture inside the trap opening to feed. After the pigs routinely enter the trap opening, set the gate in place, close the panels down and attach them to the gate. The gate should remain wired open so the pigs can be trained to enter the trap through it.

Since the gate end of a tear-drop shaped trap represents a bottleneck, a panel should be cut to fit and secured over the top of the trap neck adjacent to the gate. Wild pigs use corners and tight spots like you and I use a step ladder, therefore covering corners and areas where they could “pile up” is recommended to prevent escape over the top.

A brief discussion of gates is warranted. If multiple trap sites have been established, one gate can be shared among several traps to reduce costs. I also encourage landowners to use whatever gate (e.g., rooter, saloon door, swinging door) gives them the most confidence.

However, I am convinced based on substantial video footage that once a gate is tripped, few if any additional pigs "push through" it although each of these aforementioned gate styles would accommodate that behavior. For this reason, I also recommend that the "guillotine" style gate (e.g., cannot be pushed opened from the outside once tripped) be added to the list of gates that landowners should consider.

While I do not favor any particular gate style, an increasing amount of video evidence provided by remote-sensing cameras does suggest that gate size (particularly width) may be a critical factor in trapping success. Numerous pigs have displayed an aversion to narrower gate openings. This aversion is most common among adults, especially boars. Indeed, some of our "gateless" trap designs where wild pigs must push through a narrow opening formed by panels (after a conditioning period) often catch juveniles while adults refuse to enter.

We are currently evaluating the effect of gate width on capture rates. Preliminary data suggests that gates six feet in width are accepted more readily than those gates that are three feet (or narrower) in width. When in doubt, use the widest gate feasible for your trap design. Nevertheless, pre-baiting is always necessary regardless of the gate style or width utilized.

Over time, bait should be placed further and further inside the trap. Since the trigger is placed at the opposite end of the trap from the gate, the pigs should be gradually trained to accept bait at that location.

Once pre-baiting is successful and the pigs are routinely entering the trap as evidenced by camera data, capture becomes a relatively simple matter. If you have prepared everything correctly up to this point, the actual trapping phase itself becomes a slam dunk.

On the afternoon before the capture date, set the gate to trip and offer the bait sporadically in small piles from just in front of the gate leading all the way back to the trigger. A copious amount of bait should be placed at the trigger mechanism itself to ensure that it will be tripped. The idea is for the wild pigs to slowly "feed their way back" to the trigger mechanism so the last pig in the sounder will be inside the trap before the first pig trips the trigger.

Once the gate is set for capture, it is imperative to check the trap shortly after daylight the following day. The longer wild pigs are left in a trap, the more likely they are to escape.

The camera should continue to record during the actual trapping phase. One picture is worth a thousand words when it comes to determining how many members of the sounder were actually inside the trap when it tripped. Were some pigs still outside when the gate tripped or were they simply AWOL that particular night? For example, pregnant sows are notorious for disappearing from a bait site at farrowing time and remain segregated from other pigs for 3 to 4 weeks before returning to feed with their litter.

After capture, loading the pigs into a trailer becomes a simple matter if the trap was designed in the aforementioned tear-drop shape. A livestock trailer is backed into position against the gate and a board of appropriate height is wedged between the trailer and gate to prevent escape underneath the trailer. One person operates the gate while others present walk wide around the trap and then move toward it from the wide (opposite) end. The pigs will funnel away from the human presence and load into the trailer. They can then be trailered away from the immediate area of the trap location for disposal by legal means.

If camera data indicates that not all of the pigs in a targeted sounder were captured or multiple sounders were responding to the bait on different schedules, the gate can be wired back open and the process repeated. If the remaining pigs respond to baiting outside but refuse to enter the trap, remove the gate and prop the panels open to provide a point of entry back into the trap that is 10 to 15 feet wide. Once camera data indicates the pigs again enter the trap, the capture process can be repeated.

RESULTS AND DISCUSSION

Trapping wild pigs is a process, not an event. The process begins with baiting or "chumming". If you have ever been disappointed when you simply setup a trap one day and didn't catch pigs the next, now you know why.

Select an appropriate location upwind of and in close proximity to the wild pig's daytime cover which is usually comprised of heavy understory vegetation near water. Scouting the sign present will enhance your chances of success by going to the pigs rather than having them come to you. Train the pigs to respond to bait or "chum". If necessary, bait several locations with different baits until the pigs respond.

Once the pigs are on bait, a remote-sensing camera is a vital tool to determine trap size needed based on the number of pigs present. Given the reasonable cost and reliability of today's remote-sensing cameras and the value of landowner's time and increasing fuel prices, I would not recommend attempting to trap wild pigs without one.

Only when the pigs are patterned on the bait source should a trap of the appropriate size and materials be erected. You simply cannot trap what you cannot bait!

The landowner should also consider how the captured wild pigs will be handled before determining the shape of the trap. "Tear-drop" shaped traps facilitate easy loading of pigs to

move away from the immediate trapping site. In Texas, it is legal for landowners to sell wild pigs to a buying station that in turn transports them to a processor where they are destined for human consumption in the United States, Europe and Asia. In fact, from 2004-2009 approximately 460,000 wild pigs underwent pre-mortem inspection and commercial slaughter in Texas (USDA 2009).

Once the trap panels are arranged in the appropriate shape and attached to t-posts, the pigs must be trained to accept the trap's presence. Next, the pigs must be trained to begin routinely entering the opening where the gate will eventually be located. The remote-sensing camera will verify trap acceptance and entry. Once acceptance and entry are verified, the side panels can be attached to the wired-open gate facilitating the pigs to become trained to enter and exit through the narrower opening.

Only then should the trap be set to capture pigs. The good news is that if this protocol is followed and the camera data is reviewed along each phase of the process, the landowner should be able to choose the exact date of capture. The use of an automatic feeder (e.g., deer feeder) where legal in conjunction with a remote-sensing camera will ease this task for absentee landowners who visit their properties on an infrequent basis.

A common occurrence is for multiple sounders to use the same trap bait site, albeit on different time schedules. In addition, boars often travel alone or in small groups and also visit bait sites on different schedules than sounders. The continued use of cameras post-capture will verify these events.

In the case of solitary boars or small groups of pigs remaining after the majority of the sounder has been captured, the landowner may want to employ a "short trigger". The trip mechanism is simply moved forward to within 10-15 feet of the gate since there is no need to

entice the remaining pig(s) all the way to the back of the trap to facilitate capture. This technique is especially effective on mature boars that are often reluctant to venture very far into a trap. Although there may be some learned trap avoidance behavior, we have trapped and released marked sows on multiple occasions only to re-capture them four days later in the same trap!

How long does the trapping process take from start to finish? I have seen it take as little as one week to as long as two months in areas where the pigs have been heavily harassed by human activity, inefficient trapping methods and shooting/hunting. The key for a landowner is to be patient, rely on their camera data and never give up. Only then can one hope to effectively abate damage and work towards winning the war against wild pigs!

ACKNOWLEDGEMENTS:

Special thanks to Don Neuendorff-Texas AgriLife Research at the Texas AgriLife Research and Extension Center-Overton for his assistance in developing this wild pig trapping protocol.

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Abating Feral Hog Damage Using Traps
Texas AgriLife Extension Service
Smith County
Cooperator: Philley Peach Farm
Author: Keith Hansen

Summary

Feral hogs cause an estimated $52 million damage to agricultural enterprises in Texas each year, with landowners spending an addition $7 million dollars to reduce the hog numbers present and/or correct the damage they cause. For most landowners, trapping is the first line of defense in order to manage damage caused by feral hogs. Unfortunately, most landowners do not follow "Best Management Practices" (BMPs) necessary in their trapping efforts to be successful at removing hogs in order to prevent/abate damage. As a result, landowners often become frustrated after a few days of trapping effort and give up--or worse, simply educate the feral hogs to the point that they become even more difficult to capture in the future. AgriLife Extension has established a BMP trapping protocol of: 1) determining the sounder size, 2) selecting the proper trap site, 3) using/constructing the appropriate size trap based on the number of hogs in the sounder and 4) pre-baiting/monitoring to increase the efficiency of trapping efforts. To be successful, landowners must adopt a strategy -- feral hog trapping is a process involving several steps—it is not a single event.

A feral hog trapping demonstration was conducted on the Philley Peach Farm in Smith County from June 30, 2010 through August 1, 2010 in order to abate damage to peach trees and ripening fruit. Upon observing signs of feral hog presence near the orchard, the cooperator established a bait site with ripened peaches adjacent to their daytime cover. Once feral hogs responded to the bait, a remote-sensing camera was placed at the bait site in order to record the number of feral hogs in the sounder. This information was then used to erect a "tear drop" shaped trap of appropriate size to capture as many of the hogs in the sounder as possible. The trap was set in place and feral hogs were pre-baited until camera data indicated that they were acclimated to and regularly entering the trap. At that point, the trap gate was set to trip and 12 feral hogs were captured. Potential damage caused by feral hogs has been estimated at $200 per hog per year. As a result, the successful removal of this sounder of 12 hogs represents the potential damage savings to the Philley Peach Farm and surrounding landowners of $2,400. In addition, the captured hogs were transported and sold to a local buying station which helped to offset trap and bait expenses.

Objectives

1) Demonstrate Best Management Practices (BMPs) in order to increase the efficiency of feral hog trapping efforts

2) Remove as many feral hogs as possible from a property using BMPs in order to prevent/reduce/abate damage they cause to a commercial peach orchard immediately before and during the peach harvest season.

Materials and Methods

Upon discovery of feral hog sign/damage, the cooperator initiated pre-baiting on June 30, 2010 using ripe peaches. It was important to select a pre-bait site that was in close proximity to the feral hogs' daytime cover. Pre-baiting entailed maintaining 1-2 bushels of peaches placed within a 10' x 10' area immediately adjacent to the peach orchard and upwind of heavy cover that the hogs inhabited during daylight hours. The site was checked daily and peaches were replenished as needed. Other equipment/supplies***** included:

1. Infra-red remote-sensing camera ($250) (units range in price from $80 to > $800)
2. Saloon door style gate ($300)
3. 8 livestock/utility panels-5 feet by 16 feet with 4" x 4" mesh (8 @ $45 = $360)
4. 25- six foot t-posts ($95)-To support trap panels every 4'- 5' around trap perimeter
5. 5- five foot t-posts ($18)-To support tripwire from inside of gate to rear of trap
6. Tripwire-40 feet of plastic-coated closeline ($10)
7. Pulleys-To accommodate tripwire (5 at $2 = $10)

***** Useful life expectancy of equipment/supplies listed above is a minimum of 5 years and could be relocated to other sites receiving damage. Costs can be further reduced by sharing one gate among several traps if each site is being monitored for hog activity using remote-sensing cameras.

A remote-sensing camera was placed over the bait site (camera faced north in order to avoid direct sunlight on camera lens) on July 7, 2010. A model that featured the image date and time and infrared (no flash) capability was utilized. All brush was removed between the camera and the bait site in order to minimize false triggers. The camera was mounted on a t-post approximately 25 feet from the bait pile. The bait pile was monitored and the camera images were checked whenever bait removal was noted. Once the sounder was consistently "photo captured", a trap large enough to capture the entire sounder of hogs was erected.

Feral hogs responding to bait.

Since the main sounder of hogs at the Philley Peach Farm was fairly large, emphasis was placed on using a larger corral trap to maximize the distance between the trap gate and the tap trigger. This would ensure that the maximum number of hogs had an opportunity to enter to trap and feed before the first hog tripped the gate trigger mechanism placed at the back of the trap. A trap with eight panels was erected in a "tear-drop" shape to facilitate load out of captured hogs into a trailer for transport to a local buying station. Care was taken to ensure that there were no "gaps" between the bottom of the panels and the ground that could be used by the hogs as escape routes. The longer t-posts were sunk every 4' to 5' outside of the panels, which were overlapped 1 to 2 mesh widths at each panel junction. The panels were secured with wire to each t-post at the bottom, middle and top. Because many hogs are "trap shy", the ends of the panels on the "gate-end" of the trap initially remained splayed open (about 10' apart) in order to encourage maximum hog use of bait placed inside the trap.

Gate end of trap opening splayed opened to maximize feral hog access during pre-baiting.

The shorter t-posts were then set in a straight line about every 5' to 8' beginning a few feet inside the gate end of the trap leading to within 10' of the back of the trap to support the tripwire. The tripwire was run above "hog height" from the gate to the next to the last t-post, then angled down to the last t-post and run approximately one foot above the ground and secured to the back of the trap. This last section of the tripwire was run one foot above ground level to serve as the trigger that would cause the gate to close behind the feeding hogs. Following trap construction, the majority of bait was scattered immediately outside the gate opening and through the gate to about 1/3 to 1/2 of the way to the back of the trap in order to acclimate the hogs to the trap. Once the hogs began to enter the trap to feed on the bait, the ends

of the panels were attached to the gate frame (gate doors remain wired open during this stage) to force the hogs to enter the trap through the gate opening in order to access bait placed inside.

Over time, an increasing proportion of the bait was placed near the back of the trap around the tripwire location. Once camera data indicated that the feral hogs were regularly entering the trap as a group and venturing all the way to the back of the trap to consume bait, the trap gates were unwired and the trigger wire was set to catch. The "tear drop" shape of the trap allowed for the hogs to easily self-load hogs into a trailer backed up to the trap gate to facilitate off-site transport to a commercial buying station.

Completed trap with gate wired open. Note the partial panel placed directly over gate to extend the height to 5 feet.

The majority of the sounder responding to bait near the back of the trap on July 25.

A total of 12 hogs captured on August 1, ready for loading in a trailer for transport off-site.

Results and Discussion

Pre-baiting began on June 30, 2010. Pre-bait consumption was sufficient to justify establishment of a remote-sensing camera over the bait site by July 7. Because the hogs were already well-

trained on the bait at this point, sufficient camera data were obtained by July 10 to determine the size of the trap necessary to potentially capture the entire sounder of 15 hogs photographed. A trap consisting of eight 16' foot panels was erected in a "tear drop" shape and pre-baiting continued from July 18 until camera data revealed the entire sounder was regularly entering the trap (July 25). The trap was set (trigger/gate activated) on August 1 resulting in the capture of 12 feral hogs that same night. In addition to the main sounder, camera data had documented the presence of two large solitary boars utilizing bait outside the gate opening. However, their entry through the trap gate to access additional bait was inconsistent and they generally responded to bait much later at night than the sounder.

Feral hogs funnel toward the trailer.

Feral hogs loaded in trailer and ready for transport to a buying station.

Landowners should view feral hog trapping as a process, not as an event. That process requires 1) determination of the sounder size by direct observation or through the use of a remote-sensing camera monitoring of a bait site, 2) placement of a bait site directly upwind and adjacent to the cover that is suspected as harboring the hogs during daylight hours—this may be at a different location than where the actual damage is occurring. In almost every trapping effort, locating a trap nearest to and immediately upwind from daytime cover occupied by feral hogs is a better location choice than the immediate site where damage is noted. Therefore, landowners are advised to "backtrack" the hogs from the damage site to their daytime cover. Once the sounder size is determined, 3) the construction/use of the appropriate size trap is essential. The landowner's goal should be to use a trap that is large enough to facilitate the capture of the entire sounder of hogs at one time—although follow-up trapping efforts may be necessary. If the camera data indicates the presence of a just a few hogs, then smaller corral or box traps can be effective. However, as sounder size increases, so should the size of the trap utilized in order to capture as many hogs as possible on one gate trip in order to maximize efficiency. This can be accomplished by maximizing the distance from the gate to the trigger (accommodating the last hog's entrance inside the trap before the first hog trips the gate release trigger). Lastly, 4) the importance of pre-baiting cannot be over-emphasized. Feral hogs that have been subjected to various previous failed control efforts or otherwise subjected to pressure by humans must be trained onto pre-bait immediately outside and then into the trap in order to acclimate them to its presence. This process may take as little as a week but often requires 2-3 weeks of pre-baiting

effort until the hogs become accustomed to the trap's presence and consistently enter it and use the bait placed at or near the back of the trap where the gate trigger is located. Then, and only then should the gate and trigger mechanism be set for capture. Landowners following this protocol should be successful at removing feral hogs and thereby reducing damage to their agronomic enterprises.

Trapping Timeline

June 30 - Cooperator establishes a bait site with peaches to attract feral hogs

July 7 – Remote-sensing camera placed over bait pile to determine sounder size

July 18 – Trap erected; panels splayed opened at gate end of trap to maximize entrance size. Bait placed immediately outside and inside of trap. Camera moved to back of trap facing gate while monitoring continued.

July 21 - First feral hogs enter front of trap. .

July 23 - Numerous hogs feeding toward back of trap while increasing amount of bait was placed near trigger mechanism

July 25 - Feral hogs consistently entering trap. Panels connected to the gate and gate doors remained wired open. Increasing amounts of bait placed at rear of trap near trigger.

July 29 - Hog use of entire trap was consistent each night. Sounder is ready for capture.

August 1- Trap trigger set to catch and gate doors unwired. 12 hogs captured that night.

August 2 - Captured feral hogs loaded and transported to buying station. Gate doors were wired back open, pre-baiting and camera monitoring continued.

The tear-drop shape design becomes particularly useful if the landowner intends to market the captured hogs to a buying station in order to offset some of his/her trapping expenses. A trailer can be backed up to the gate and a board placed at the bottom of the trailer immediately outside of the trap gate to prevent hog escape underneath the trailer. Once the trailer is in position and the trap gates are secured open, a person can simply walk to the back of the trap causing the captured hogs to funnel away from human presence toward the gate and self-load into the trailer. A second individual is usually needed to close the trailer gate behind the hogs. The hogs are then ready for transport to a Texas Animal Health Commission approved buying station (http://www.tahc.state.tx.us).

Absentee landowners should find this technique particularly useful if hogs respond favorably to a deer feeder filled with shelled corn. A remote-sensing camera positioned to photograph activity at the feeder will reveal hog response to pre-bait and in turn become accustomed to a trap's presence--allowing the landowner to schedule capture at a time that is most convenient for them.

For additional information on feral hogs and damage abatement go to the Texas AgriLife Extension Service website entitled “Coping With Feral Hogs” found at http://feralhogs.tamu.edu Specific details on this trapping demonstration can be found under the 5 part series entitled “Hogs in the Peaches” located on the website.

Conclusions

This trapping demonstration successfully prevented/reduced damage on the Philley Peach Farm in Smith County with an estimated value of $2,400 based on the removal of 12 hogs. However, while current legal control tools (trapping, shooting, snaring, catch dogs) have proven to significantly reduce agronomic damage, we cannot expect to permanently eradicate feral hog populations by these methods alone. Landowners are advised to monitor their property for feral hog sign and initiate control efforts before damage occurs whenever possible.

Acknowledgements

Special thanks to George Philley (Philley Peach Farm) for providing a demonstration location and trap site monitoring necessary to make this demonstration a success. Also, thanks to Billy Higginbotham, Professor and Extension Wildlife and Fisheries Specialist, for providing the camera, gate and technical advice on demonstration design and completion.

Using Remote-Sensing Cameras To Enhance Wild Pig Trapping Efficiency

Billy Higginbotham
Professor and Extension Wildlife and Fisheries Specialist
Texas A&M AgriLife Extension service

For those areas where hogs have not had negative encounters with humans and/or little or no trapping has been done, you can get away with a lot. However, try those same techniques with hogs that have been hunted, dogged and heaven forbid--trapped and re-released and you are dealing with a completely different species.

So how can landowners stack the odds in their favor when dealing with this super intelligent animal? There are a number of different techniques that lead to trapping success but one of the most important is pre-baiting —or what I like to call chumming for feral hogs. But remember, trapping feral hogs is a process, not an event!

It is important to begin the process of trapping as soon as hog damage is noted or hogs are sighted on the property. Remember, females become sexually mature at 6 to 8 months of age and can have their first litter before their first birthday. Delays in control efforts will only lead to more hogs which mean more problems.

If open pastures or crop fields are the sites of initial damage, do not start chumming right where that damage occurred. Rather, back track the marauding hogs to their daytime cover and begin chumming with shelled corn at or near a location that is trap friendly. Part of that site selection process should include access to a vehicle and trailer if hogs are to be loaded out and moved from the capture site for slaughter or sale to a processor.

In some cases, the chum site is predetermined (i.e. deer feeder) but always check state game agency regulations to make sure baiting/chumming is allowed. Many trappers start the chumming process with shelled corn. However, if the bulk of this bait is being consumed by non-targets such as deer, crows, or raccoons, switch to another chum such as fermented corn, rice or milo—the “smellier”, the better!

Along with this initial chumming step, employing the use of a remote-sensing camera eases the task at hand. Although you can make on-site observations of corn consumption and check for other signs such as tracks, having a camera recording 24/7 to monitor hog response to chum is a big help.

(pp17-18 in A Landowner’s Guide For Wild Pig Management – Practice Methods for Wild Pig Control, Alabama Cooperative Extension System Publication ANRE-1397.)

The question that always comes up with cameras is whether models with infrared features are necessary to avoid spooking the hogs with a flash. In my experience, the flash is not a deterrent on the larger traps that I employ. However, on a smaller trap, the camera should be positioned a comfortable distance away, yet close enough to reliably trigger and capture the action.

In addition to confirming hog response to chumming efforts, the camera will also reveal the approximate number of hogs in the sounder. That speaks volumes as to the size of trap that will be needed to do the job. Also, most cameras record both the dates and the times of events, so it is helpful to know just when those visits occur.

Once the hogs are responding to bait, you can then assemble or position your trap of the appropriate size in that area. Continue chumming as it may take another week for the hogs to become accustomed to the trap itself.

Speaking of appropriate trap size—bigger is usually better! I want to maximize the distance from the gate opening to the trigger mechanism so as many of the porkers as possible are inside before the first one trips the trigger that closes the gate. That is best accomplished by using a larger trap. If you catch two hogs and six are still standing around outside of the trap when you arrive to check it, your trap was too small!

At this stage, the gate or opening should be wired open; it is still way too soon to think about the actual act of trapping. In addition to the week often needed for the hogs to simply become accustomed to the trap's presence, another week may elapse before the hogs actually enter the trap itself. Corn or other chum should always be poured from outside with a trail leading to the inside and on towards the back of the trap where the gate trigger is located.

Once the first hogs enter the trap, it may take an additional week or more for the majority of the sounder to regularly begin going inside to feed. Continue to monitor your camera during pre-baiting or rake areas smooth inside the trap and watch for tracks if a camera is not being employed.

It is not uncommon for at least a couple of weeks to elapse from initial pre-baiting until hogs are regularly entering the trap. Again, pressured hogs will be much slower to respond—and those that have experienced the inside of a trap before may not ever enter one for a second time.

Once pre-baiting is successful and the hogs are routinely entering the trap, capture becomes a relatively simple matter. If you have prepared everything correctly up to this point, the actual trapping phase itself becomes a slam dunk. Set the gate to trip and be prepared to wrangle hogs!

The camera should continue to record during the actual trapping phase. One picture is worth a thousand words when it comes to determining how many members of the sounder were actually inside the trap when it tripped. Were some hogs still outside

when the gate was tripped or were they AWOL that particular night? A quick count of the captured hogs reveals how many more you have to go.

Trapping hogs is a process that begins with chumming. If you have ever been disappointed when you set a hog trap one day and didn't catch hogs the next, now you know why. Chumming, the right equipment set in the right location and patience on your part make for a successful hog trapping formula!

GUILLOTINE STYLE WILD PIG TRAP GATE (Banta Model)

(Or How to Build a Pig Trap Gate for less than $115)

Billy Higginbotham-Professor and Extension Wildlife and Fisheries Specialist
Texas A&M AgriLife Extension Service-Overton

ITEM	QUANTITY	COST/UNIT	TOTAL COST
3/16" chain (1" links)	4'	$1.50	$6.00
5/16" x 2 ½" lag bolts	8	$0.38	$3.04
Gate Door Handle	1	$4.17	$4.17
Trigger Hinge	1	$3.25	$3.25
5/16 x 5 ½" carriage bolts	10	$0.50	$5.00
5/16 x 8" carriage bolts	4	$1.33	$5.32
2" x 1/16" eye screw	1	$0.98	$0.98
5/16" flat washers	20	$0.10	$2.00
5/16" nuts	14	$0.10	$1.40
3" wood screws (25/pkg.)	1	$6.58	$6.58
3" x ¼" hex bolts/wash/nuts	4	$0.25	$1.00
1 ¼" bolts/nuts (4/pkg.)	1	$0.98	$0.98
4' x 8' x ¾" plywood*	1	$35.97	$35.97
2" x 4" x 10' board	2	$5.17	$10.28
2" x 2" x 8' board	1	$3.57	$3.57
2" x 3" x 8' board	3	$4.17	$12.51
1" x 6" x 12' decking board	2	$5.97	$11.94
TOTAL COST			**$113.99**

- **All wood was <u>treated</u> lumber-plywood sheet cut to 4' x 6'**
- **Tools Needed-electric drill, 5/16" x 8" drill bit, ¼ " standard drill bit, Phillips head screw bit, hammer, electric saw, socket wrench set , carpenter's square, tape measure, hacksaw**

- ***Cost savings hints-Use of ½" vs. ¾" plywood would save an additional $10, untreated or old scrap 2 x 4's will save an additional $10 or more on gate cost. Bottom line-If you are a "scrounger" or a "scrooge", you can drop the cost another $10-$20!!!**
- **Total Trap Cost--$115 for gate, $240 for four 5' x 20' (4"x 4" mesh) panels (minimum size of corral trap recommended-may need more panels if pig sounder is large), $100 for twenty 6 1/2' t-posts and $20 for miscellaneous hardware (turnbuckle, coated clothesline, clamps). So, you can build an effective one wide door corral trap for around $475—and just about all of these items have other uses around the farm or ranch once the pig trapping is done!**

SPECIFICATIONS-Four Foot Wide Gate

1. Channels for plywood are 6 feet tall and the channels are at least 1" to 1 ½" wider and 1" to ½" deeper than the plywood's dimensions so it can fall freely without binding when tripped. The channels are formed by using a smaller board between 2 larger boards (Econo Gate uses a 2"x 3"x 6' decking board sandwiched between two 1"x 6"x 6' boards). Long (3") wood screws are sufficient to construct the channels for the Econo Gate. The channels should be set slightly wider apart than the 4' wide plywood, therefore the two channels would be set approximately 4' 1" to 4' 2" apart before being horizontally braced. This will make the gate opening almost 4' wide and 4' tall with the plywood gate set in the raised or catch position. This height coincides closely with the height of the horizontal brace placed 4' above ground level on the inside of the gate.
2. The four horizontal braces that attach the left and right channels together are 5' long 2 x 4s. Carriage bolts of various lengths are needed to secure the braces to the channels on both gates.
3. Plywood sheet is cut to 4' wide x 6' tall. This allows 2' of the plywood to remain in the channels when the gate is raise to its open or catch position 4' above ground level.
4. Eight pieces of chain (6" long for Econo Gate) per gate are lag bolted to each side of the channel at 2' and 4' above the ground and a bolt, washer and nut is used to connect and tighten the chains around t-posts set on each side of the gate frame to provide support and hold the gate erect/in place.
5. A shovel will be needed to dig shallow trench in order to sink the bottom horizontal braces flush with the ground so the pigs do not have to step over them to enter the trap.
6. The trigger is 2"x 3" x 4' long. It is cut in half and the two 2' long sections are connected using a hinge. An eyescrew lag bolt is placed near the center on the opposite side of the trigger from the hinge and the trip wire is connected to the eye screw. When the gate is set, pressure on the trip wire should cause the trigger to fold in the middle releasing it and allowing the plywood door to fall within the channels flush to the ground.
7. Cross braces: These are run horizontally and made from 2 x 4s that are all 5 feet long and the two vertical 6' channels attach to them to form the gate frame. Two are bolted across the bottom (one brace each on the inside and outside, one about 4 feet up on the inside of the gate and the other at the top (6' up) on the outside of the gate. Each cross brace overlapped outside of the frame 2" per side to accommodate t-posts for support.

8. A small block of wood (2” x 3” x 12”) is bolted horizontally on the inside of the plywood door about 52”-54”” above the bottom of the gate. The top of the trigger will rest against the bottom of this board when the plywood is raised approximately 4 feet off the ground. The other end of the trigger will rest on the top of the cross brace (See note in #7 above) placed on the inside of the gate about 4 feet off the ground.
9. The 2” x 2” x 8’ is cut in half to use as stops in the channels to lock the gate up in an open position. Another option is to drill a hole in the plywood and run a foot long piece of rebar or a heavy bolt thru it as it rests on top of the 6’ top horizontal brace to hold the gate open while training the pigs to enter the trap with the door held in the “open position”.

Tip: Build the two channels first, then install them along the sides of the plywood allowing enough room to prevent binding (an extra 1 ½”-2” total width—a 4’ stick of 1” pvc pipe run between the plywood and the channel on each side will serve as a temporary spacer andl insure enough slack side to side so the door can drop without binding). Next, attach the 4 horizontal cross braces using carriage bolts, checking the opening with a carpenter’s square. It should take one person less than 3 hours to construct the gate from start to finish.

THE FOLLOWING IMAGES ARE FROM/FOR A DOUBLE GATE* "FOOTBALL SHAPED" TRAP DESIGN

(You can just use one gate if you prefer)

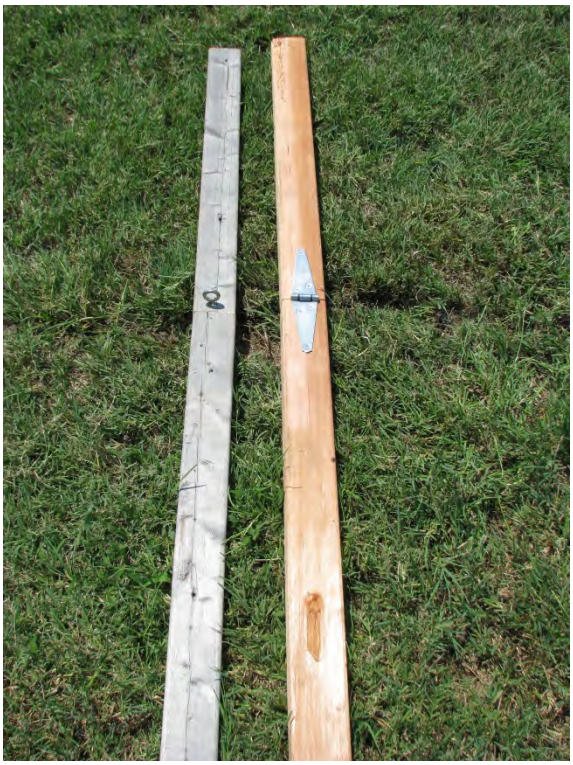
*(Once the first gate is tripped by pigs rooting the trigger, the second gate trips and falls automatically)

Upper left- View from one gate to the other inside the trap. Upper right-Trap set with both gates set to catch. Lower left-Tripwire (plastic-coated clothesline) shown attached to the trigger located on the inside of one gate which runs/attaches to the far end of the trap and also has a dropwire attaching it to the tire --Note second wire (lower center) pulled tight when the gate falls—this action trips the opposite gate trigger. Lower right-Chain and hex bolts are used to secure the gate frame to a t-post set on each side of the gate.

Top Left-Gate Frame (note cross brace 4’ above the ground faces inside of trap

Top Right-Closeup of channel bolted to bottom cross braces. A shallow trench should be dug to “bury” these cross braces flush to ground level

Left-Closeup of cross braces with one 4’ off the ground that faces inside of trap and one at top 6’ above the ground facing out and away from trap. Channels are formed by sandwiching a 2” x 3” x 6’ board between 2 decking boards measuring 1” x 6” x 6’ and securing all 3 boards together with wood screws from both sides.



Top Left-Inside of gate door. Note block to hold gate up with trigger resting against it. Top Right-Outside of gate door. Note handle at bottom to raise the gate. Lower Left-4' triggers (front side (L) shows eyebolt and back side (R) shows hinge). Lower Right-Tripwire secured to trigger and to the far end of the trap near gate. A dropwire secures the tire to the main wire. Bait is placed inside of tire and gates tripped by pigs rooting/moving the tire to access bait.

Modified Gate Design – 8’ Wide Door for Single Door Trap

This version simply turns a full sheet of ¾” plywood sideways to make an even wider doorway. The cost for this gate vs. the 4’ wide guillotine gate detailed previously is slightly higher because of additional lengths of boards in the frame and the need to place a panel piece 2’ tall x 16’ long above the door to prevent escape over the doorway once the door is tripped and pigs are caught inside. See accompanying photos.

Training Wild Pigs to Bait

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I often refer to adopting "best management practices" to be successful at reducing wild pig populations in order to reduce the damage these invasive exotics inflict upon the landscape. When it comes to baiting wild pigs for shooting or trapping, training the pigs to bait is critical.

Watch for signs of wild pig presence including wallows and mud on trees and poles.

Pasture damage by wild pig rooting is a common problem for Texas landowners.

The steps for training pigs to bait are the same regardless of whether the landowner plans to shoot or trap the pigs. Step 1 is to identify that pigs are present—hopefully based on their sign left behind and before damage begins. Damage is fairly obvious and on rare occasions landowners may even lay their eyes on a pig or sounder of pigs providing confirmation of their presence. Remember, there are but two kinds of landowners in Texas—those that have wild pigs and those that are about to have wild pigs. In addition, there are but two kinds of wild pigs—those causing damage and those about to cause damage!

Once you have documented the pigs' presence, back-track them to as near their daytime cover as you can. That often ends at the property line for many landowners but still, get as close as you can. Offer bait at that site or if you are unsure of where they spend their daylight hours establish multiple bait sites. Place the bait so the prevailing wind direction can carry the scent of the bait toward the pigs. Hang a trail camera on the bait site or simply rake the ground smooth and observe for pig tracks (hooves will be more rounded and often larger than those of a deer). I much prefer using a camera over a rake since it also records the number of pigs as well as times and dates that pigs are present.

A trail camera records the times and dates as well as the number of pigs visiting a bait site.

Bait should be distributed and monitored by trail camera.

Pigs responding to a camera – monitored bait site. Monitoring is critical in pig removal.

Baits can differ and pigs often respond to different baits seasonally. The most difficult time to get pigs on bait is when native food items (e.g., acorns) or cultivated crops (e.g., peanuts, corn) are abundant. While shelled corn is the "gold standard" of pig baits, practically every species of critter out there also eats corn. Be creative—sour some grain for one bait site, use shelled corn at another or perhaps even try a dry dog food or cheese-based catfish bait in combination with corn or milo. Also, if you live outside Texas, check state laws and wildlife agency regulations regarding baiting before you proceed.

Once the pigs are on bait, the control method to be utilized dictates the best management practices to follow. Should you shoot or trap? That depends on the location and number of pigs.

Shooting

Once the pigs are verified to be on bait consistently, either by sign identification or camera, the shooter(s) can plan their approach to the site—always from downwind. If a camera has been used, the shooter can narrow down the time window and be much more efficient timewise, especially if several sounders of pigs have been trained onto multiple bait sites. Pop-up blinds are often set-up to serve as shooting stations downwind from bait sites. While some shooters opt for night vision equipment, simple solar powered landscape flood lights available for $10 to $20 at any hardware store can be placed toward the bait but facing in the opposite direction from where the shooter will approach. Garden t-posts or stakes can be employed to support the lights as needed. The lights cast soft illumination that does not spook the pigs yet is bright enough for the shooter to identify the target(s) through a typical rifle scope. Some landowners have successfully employed archery and crossbow equipment to reduce noise causing the pigs to spook from the bait site. Although they often leave upon the first arrow or bolt fired, they return to feed much sooner as compared to firearms that create more noise.

Solar-powered lights can be used to illuminate a bait site for night-time shooting.

A blind can be setup downwind from a baited site. Note pigs feeding at the site.

This technique is particularly efficient on large solitary boars that have proven difficult to trap. In fact, it is a method often used adjacent to a trap site where a sounder of pigs has already been removed by trapping and where the boars are consistently photo-captured but remained reluctant to enter the trap itself.

These two large boars would feed on bait but would not enter the adjacent trap. Note time and date.

Approximately 24 hours after the two boars were patterned, a shooter returned and successfully removed the 317 pound boar.

If a large sounder of pigs is documented at the bait site, the landowner may be better served to erect a trap rather than shoot into the sounder removing only one or a few pigs at a time. The hard part is over—the pigs are on bait and trapping can remove larger numbers as compared to shooting.

Trapping

Never, ever erect a corral trap until you have wild pigs consistently on bait! The bait site selection protocol is the same for trapping as previously described for shooting. This is where the use of a trail camera really pays off. Once the pigs are on bait, the sounder size dictates the corral trap size. Research has clearly shown that corral traps are more efficient at capturing wild pigs as compared to the smaller box traps.

Once the camera documents that pigs are consistently (meaning nightly) patterned on the bait, trap construction can begin. The minimum corral trap size that I recommend consists of four 20’ by 5’ tall panels (or equivalent) using 4” by 4” mesh with t-posts driven every 4’ to 5’ around the perimeter. If a large sounder (30 +) of pigs is identified on camera, a trap with as

many as 6 or even 8 panels may be necessary. The t-posts should be secured to the panels with smooth wire tied at the top, middle and bottom of the panels. Make sure there are no gaps between the bottom of the panels and the ground and always overlap the panels one mesh width at a t-post. I like to leave the opening for the gate at least 10’ to 15’ feet wide early in the baiting process. However, if a wide (8’ +) gate is used, it can be set in place immediately, secured to the trap panels and locked open. While corral traps may take a few hours to erect, almost all of the components can be reused for other purposes around the farm or ranch once pig trapping has concluded.

At this stage, most bait is placed outside the opening or the gate but some can be placed in the throat of the trap where the gate will be or is located.

Note the large opening in this trap to encourage pigs to enter and consume bait that will be placed inside.

Note the line of bait extending from well outside to deep inside this trap as part of the pre-baiting process.

It may take several days for the pigs to accept the presence of the new trap. Once the pigs are back on bait, continue to progressively offer less bait on the outside and more inside the trap. As the pigs enter the trap consistently, you may want to move the camera to the back of the trap and record the pig activity as they enter through the gate opening.

A completed corral trap. Note panel placed over the top adjacent to the gate opening.

Pigs will initially feed up to the open gate but it may take several days for them to enter trap.

As the pigs begin to feed inside the trap, more bait is offered inside and less outside.

Pigs can be trained to accept the presence of a trap and begin to feed more inside over time.

As the pigs venture deeper into the trap, continue to reduce feeding outside and concentrate increasing amounts of bait toward the back of the trap where the trigger is routinely located. If a tire trigger is to be employed, go ahead and place the tire inside the trap so the pigs can become accustomed to its presence, eventually placing corn under and inside the tire itself so the pigs will equate it with food. If the throat of the trap was left splayed open, you can now set the gate in place with the door(s) locked open in order to train the pigs through the narrower opening. This may require placing bait both immediately outside and inside the gate threshold to encourage the pigs to enter the narrower opening.

Over time, concentrate baiting deeper inside the trap with a minimum of bait placed on the outside. The wider gate opening generally reduces the training time required.

Once the pigs are entering through the gate consistently, continue to concentrate most of the bait deep inside the trap. When the pigs are consistently entering the trap through the locked open gate, you get to pick the day that you can set the trap to catch.

Baiting a Trap to Catch

There should be no guesswork involved as to whether you are successful at catching pigs once the trap is set. If you have trained the pigs to bait and then to the bait inside the trap properly (all documented by camera), you should be virtually guaranteed to be successful!

Continue feeding in and around the trigger while monitoring by camera.

Placing bait inside the trap.

Late on the afternoon that you set the trap to catch, place bait in a horseshoe pattern around the inside of the trap, maybe two or three feet inside of the panels. If smaller pigs are in the sounder, they will go to this bait first. Place sufficient bait around the trigger used. This is where the tire used as a trigger really shines. (Small pigs are the first to go in a trap followed by the sows and younger boars with the larger boars in last—if they are even running with the sounder at all). Often mature boars show up at a bait site on a different time schedule than a sounder- unless a sow is in estrous. Bait is placed under, around and even inside the old tire that is tied to the tripwire trigger. Smaller pigs cannot easily move the tire, so tripping the trap is delayed until larger pigs are present. The idea is for the last pig to be inside the trap before the first pig trips the trigger releasing the gate. The larger the sounder of pigs, the greater distance needed between the gate and the trigger and therefore the more bait placed between the gate and trigger--which means employing a larger trap. The idea is for the sounder to feed their way methodically back to the trigger—not rush the trigger immediately upon entering the trap. The delay in tripping the gate works in your favor by allowing more time for the entire sounder to enter the trap before the gate is tripped.

Rooter stick trigger using a post hole that will be filled with bait. Smaller pigs root less than adults.

A tire trigger usually requires a larger pig to flip the tire in order to trip and close the gate.

A trip wire trigger is commonly used in corral traps but is more easily tripped by smaller pigs as compared to the tire and rooter stick trigger styles.

On the afternoon before setting the gate to catch, bait heavily around the trigger (left) and also place bait in a line around the inside of the trap to encourage all pigs to feed simultaneously (right).

The smaller pigs will eat the easily accessible corn first, while the adults will generally work their way to the bait at the trigger. As more bait is consumed by the sounder, more competition is created for the decreasing supply of bait. Eventually, the pigs are forced to start nosing the tire trigger to access more bait or digging into a posthole if a rooter trigger has been employed. Both of these triggers delay trap trip simply because the pigs have to “work harder” to get at the remaining bait. The tripwire is least sensitive of these three trigger types-- but can be adjusted height-wise to some degree in order to avoid begin tripped by the smaller pigs in the sounder. As stated, feed placed between the gate and tripwire delays the pigs tripping the gate.

Plan to check the trap the next morning shortly after daylight. The longer you leave pigs in a trap, the more time they have to escape. If you have followed your protocol to this point, you should have pigs in the trap. So how long does this process take? In areas where the pigs have not been pressured and the correct bait sites are selected, we have gotten the pigs on bait as early as the first night, entering the trap within 5 days of initial baiting and captured in as little as a 7 to 10 days from start to finish. Be prepared for it to take much longer—a month is not unusual.

After pre-baiting and using best management practices, this sounder of 21 pigs was captured in less than two weeks. However, if additional pigs are photo-captured but not trapped, wire the gate open and start feeding outside the trap again with camera monitoring.

For absentee landowners that may visit their properties only occasionally or on weekends, employ a deer feeder (where legal) with a camera. However, the use of a feeder does restrict the bait choices that can be offered to shelled corn and perhaps a few other baits that funnel thru the feeder without stopping it up. I prefer to set the feeder to go off shortly after dusk and then again after midnight—in other words when pigs are likely to be the most active. One word of caution—be sure and stake the feeder legs in place, otherwise pigs can and will overturn the feeder and damage the mechanism. Once the camera confirms pigs on bait, erect the trap as described but position the feeder so it initially feeds both inside and outside the gate and then progressively only inside toward the back of the trap. These two devices used in tandem can take much of the guesswork out of the process but still allow the absentee landowner to effectively reduce pig numbers at their convenience.

If your camera data suggest that another sounder is present or not all the pigs in the sounder were actually captured, immediately lock the gate open and start the baiting process again. Sometimes AWOL pigs return immediately and sometimes it may take a week for them to re-appear after their comrades have been removed. In addition, pregnant sows that are regulars at the bait site often leave the sounder for a few weeks immediately before and after farrowing but should eventually return with their litters. Only careful monitoring of camera images/video and identification of pigs by color or coat pattern and numerical counts can reveal if all pigs were captured in one fell swoop or if follow-up trapping will be required.

Remember, we are not going to eradicate wild pigs in Texas with our current legal methods of control. However, we can effectively reduce the damage they cause by working smarter instead of harder!!

Selecting a Manual Gate Trigger for Wild Pig Trapping

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Lots of information is out there on trap designs and gates that can be used in the **War on Wild Pigs**. But when it comes to triggers—notsomuch! There are triggers that simply close the door and there are triggers that can be a bit more selective. Although not the focus of this article on manual triggers, there are at least five companies that offer "remote trigger" technology that allows for the trap to be tripped remotely by phone or by sending a text message or email! Talk about selective! I am all for someone availing themselves to this technology if they desire to do so. However, in my mind and based on over 30 years of experience—"the only practice that matters is the one that is adopted" –Therefore, for many landowners the cost associated with these modern marvels may be a prohibitive factor.

Everything you read here has been tested by me personally—I just don't recommend anything associated with pig trapping unless I know that it works! Furthermore, I love to look at everyone's home-made pig traps! Every trap seems to be a little different but I always learn something from the new design or trigger/gate mechanism that I can pass on to landowners to give them an additional edge when it comes to trapping, which to me is the method that is the first line of defense against marauding wild pigs.

First and foremost, some words about scent control, traps, pre-baiting, trail cameras and trigger locations. **You cannot beat a pig's nose**-take precautions when you are at an active bait or trap site and minimize the scent you leave behind. As for traps, I prefer tear-drop shaped corral traps (to allow pigs to be more easily loaded into a trailer for transport to a buying station) over box traps and will not construct a corral trap with less than about 80' of perimeter. Five foot high panels using 4" x 4" mesh and 16' or 20' long supported by 6 ½' t-posts placed every 4'-5' around the perimeter are standard. Anywhere from two to five additional panels are added if the sounder is large—say 25 to 30 pigs or more. The idea is: <u>As the number of pigs photo-captured at the bait/trap site increases, the distance from the gate opening to the trigger should also increase-which means building larger traps.</u>

You simply cannot trap what you cannot bait, so always get the pigs on bait before erecting a trap. In addition, a camera will aid in determining when pigs are on bait and is essential to me in determining how large your trap should be based on pig sounder size. **I simply would not attempt to trap pigs without a camera!** You must pre-bait pigs and then allow them to gain confidence in entering a trap long before you are ready to set the trap gate to catch. I also prefer for the manual triggering mechanism to be located toward the back of the trap. I want as many pigs as possible inside the trap before the trigger is tripped allowing the gate to close.

Whenever you are dealing with wild pigs, regardless of sounder size, baiting strategy (both pre-baiting and during the capture phase) is awfully important. So, in order to achieve your objective, you might want to also read the "Baiting" article that accompanies this one.

There are basically six types of manual wild pig trap triggers, seven if you count the no-trigger- at-all version! Of course, there may be some additional triggers in use out there that I am unaware of, given that pig trappers are such an ingenious lot! But for our purposes here, let's go through those I have used and I will give you my take on each one:

1) **No Trigger**-This design features a throat where two panels come together and relies on the "memory" of the metal in the panels to close or spring back or at least narrow once a pig pushes through –only after being trained to enter the wired-open throat during the pre-baiting process. There are several variations of this trap design including the Wexford, Figure 6 or Figure 9 trap. While this trap design cuts cost by eliminating a formal gate and employs no trigger, I think there are a couple of drawbacks. I have captured many pigs up to about 100 pounds in this design, which may make up most of the population out there. This of course requires a pre-baiting period with the throat of the trap wired open to ease the training process. However, I have great difficulty training large adults-- be they sows or boars to "push in" this design once it is set to capture. I know this because I have employed multiple cameras at many trap sites: One camera facing into the throat to record what goes in and a second camera to capture what is showing up to eat bait on the outside but refuses to go inside. I also have video of large boars eating bait up to the "push in point" but refusing to enter the trap itself. I even have video of small pigs opening the panels and exiting the trap, although this could be due to a design flaw on my part. The bottom line is big pigs just don't like tight spots and the necessity to push two panels apart to enter the trap results in capturing a percentage of the pigs showing up, but in my experience not all of them! If you are unsure, hang an extra camera to monitor who may be showing up for the party but doesn't have a ticket to get inside!

The "Wexford" (left) and "Figure 6 or 9" trap (right) designs feature no gate or trigger and have accounted for many pigs removed from the landscape.

Pre-baiting a wired open Figure 6 or 9 trap.

2) **<u>Pressure Plate Trigger</u>**- This trigger trips when the pigs step on a "pan" or plate much like a steel trap. Some of these plates are designed so the pressure can be adjusted somewhat to prevent the weight of smaller pigs from tripping the trigger and closing the gate. However, I found that pigs don't really like stepping on these various shapes and sizes of pans because of their solid surfaces, therefore I stopped using them years ago. Sorry, no photo available.

3) **<u>Trough Trigger</u>**-This trigger was originally deployed in the smaller box traps that began appearing in the early 1980's on the front end of the population explosion of wild pigs in Texas. It is deployed by moving or pushing up or down on a trough filled with bait. It is effective but can often be deployed by smaller pigs—the ones most likely to enter the trap first. The adults are often still outside when the gate is tripped making it the least discriminant of the triggers discussed here.

Movement of the trough triggers the gate to close via a tripwire connecting the two together.

4) **<u>Tripwire Trigger</u>**-The tripwire trigger simply is a length or wire, cable or other line that the pigs encounter while foraging for the bait and cause the gate to trip and close. I often use plastic-coated clothesline as the main tripwire but make a "leader" (think fishing) out of <u>braided</u> saltwater fishing line of at least 60 pounds test in the critical area where pigs will encounter the tripwire. The braid does not stretch like monofilament line and its small diameter and dark color make it difficult for pigs to detect. Educated pigs can often avoid tripwires if they are made exclusively out of heavier material such as the aforementioned plastic-coated clothesline. Do I sound like I'm paranoid? You bet I am—the boar in the photo below crossed the heavy tripwire 8 times in a 20 minute span before he finally tripped it-he simply knew it was there! The tripwire should be run above hog height from the gate along a series of t-posts to about ¾ of the way to the back of the trap where it is then angled down and run 12" high and parallel to the ground over about a 5' to 10' distance where it is then attached to the back of the trap. If baiting is done properly, the sounder of pigs should "feed their way" to the back of the trap to ensure more of the pigs are inside when the bait placed along the tripwire is consumed and the trap tripped. Smaller pigs can be prevented from tripping the gate to some degree by raising the tripwire higher above

Note the "short trigger" rig in use. Since the camera confirmed only one boar entering the trap, there was no need to bait him all the way to the back of the trap where the tripwire is normally set.

the ground—if camera data confirms that one or more sows in the sounder have small pigs. This tripwire approach has accounted for thousands and thousands of wild pigs trapped but it is not as selective as the next three trigger types.

Note this adult pig touching a heavy tripwire but avoiding triggering the gate to close.

The tripwire is run parallel to the ground for 5' to 10' and attached to the back of the trap.

Saltwater braid fishing line doesn't stretch and its small diameter makes it more difficult for pigs to detect as compared to heavier tripwires.

5) **<u>Rooter Stick Trigger</u>**-The rooter stick is a novel approach that relies on the pig's rooting behavior to cause the gate to close. Since sub-adults don't root nearly as much as the adults, this technique can serve to delay gate closure until adult pigs enter the trap and all of the other bait placed inside the trap has been consumed.

A post hole is filled with bait and rooter stick placed over the top. Rooting behavior to access bait moves the stick and triggers the gate to close.

6. **Bucket Trigger**-The bucket trigger works on the same principle as the hangman's platform used in the Old West-most assuredly on cowboys guilty of trapping, transporting and re-releasing wild pigs to another area! Its selectivity comes from the fact that the bucket contains both "bait and weight" (e.g., a couple of bricks or scrap iron added as ballast). The bucket should have large enough holes drilled in the sides near the bottom so bait can dribble out. The smaller pigs typically cannot knock the bucket off its perch of a cinder block or similar structure. The trigger can be made even more "adult pig specific" by increasing its height out of the easy reach of smaller pigs. It is important to have the bucket present (with some bait inside) during the pre-baiting phase to acclimate the pigs to its presence. Like other trigger designs, sufficient bait is placed inside the trap and around the trigger when camera data confirms the pig's acceptance of the trap during training. If a soured bait such as corn or milo is used, a lid can be placed on the bucket to help maintain moisture content and to dissuade non-target species.

The weight of the bucket triggers the gate to close when the pigs push it off of its stand.

7. **Tire Trigger**-The tire trigger is absolutely the most specific toward adult wild pigs of all the manual triggers I have used. I must give full credit for this idea to Rob Denhaus at the Ft. Worth Nature Center, who was kind enough to sketch it out on a napkin for me one day at lunch. Once the pigs are on bait, go ahead and place the tire at the bait site so the pigs can grow accustomed to its presence. Once they are eating around the tire, begin to place more bait under and inside the tire to encourage rooting behavior so they gain better access to the bait. As the pigs enter the trap and feed on bait the night the gate/trap is set to catch, enough bait should be concentrated under and inside the tire to attract the attention and focus of the adult pigs. The smaller pigs seem to be drawn more to bait poured around the inside perimeter of the trap walls. Only by pushing or flipping the tire can the gate be tripped to close-- which usually only occurs once all other bait has been consumed-- and "competition" for the remaining "tire bait" stiffens. It is not unusual for one old "boss sow" to try and dominate or defend the tire's food source from other adult pigs in the sounder. I prefer a rather small automobile tire (think compact car size) in the 13" size range over 16" or larger—I know that Goodyear brand tires work but I would bet that Goodrich, Michelin, Bridgestone, Cooper, Hankook and others will work just as well! I have to admit that the tire trigger works great on a single door trap, but it is absolutely custom-made for a double door trap (think of a football shaped trap with the nose of the ball lopped off of each end for a two guillotine

Tire trigger used in a corral trap with a double door design.

Baiting a tire trigger for pig capture.

gate installation—another Denkhaus suggestion!). When the tire is flipped or pushed, the wire leading from the tire that is attached to the main tripwire causes the first door to trip and the weight of that door falling causes the opposite gate door to trip and fall-almost simultaneously with the first door. It is a true marvel of and tribute to redneck technology!

In closing, I have used each and every one of these gate triggers. Choose the one that works best for you based on the sizes and numbers of pigs encountered. The right trigger in the appropriate trap makes for a great combination but also rely on pre-baiting and camera monitoring. One picture can indeed be worth a thousand words when it comes to determining if you trigger choice leads to the successful trapping of wild pigs!

V. EXCLUDING WILD PIGS FROM DEER FEEDING STATIONS

Exclusion Fencing for Feral Hogs at White-tailed Deer Feeders

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ABSTRACT

Management programs aimed at white-tailed deer (*Odocoileus virginianus*) production often include the use of feeders, either to deliver supplemental feed or bait. However, much of the feed placed into deer feeders is consumed by non-target species, such as feral hogs (*Sus scrofa*). Our objectives were to compare three exclusion fence designs at deer feeders for their ability to restrict feral hog visitation and enable white-tailed deer visitation. Our high fence design consisted of 86 cm high graduated paneling. Our medium fence design consisted of 76 cm high, 10×10 cm paneling. Our low height design consisted of 51 cm high, 10×10 cm paneling. We placed deer feeders >1.5 km apart and monitored feeders with motion-sensing digital photography during the summer and winter. We compared the percent change in visitation index by fence design and season. We found feral hog percent change in visitation index varied by treatment, with our low fence design restricting feral hog visitation less than the medium and high fence designs. Given the cost of materials and the effectiveness of the exclusion fences, we recommend using an 86 cm high exclusion fence for feral hogs around deer feeders. However, we caution that our data and recommendations are from short-term seasonal trials.

KEY WORDS: boar, exclusion fencing, feeder, feral hog, *Sus scrofa*, white-tailed deer

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We thank the Welder Wildlife Refuge for providing access to conduct research. We are grateful to A. Barajas, C. Brown, B. Campion, D. Campion, C. Nedbalek, S. Rabe, and R. Sinclair for field assistance. Financial support was provided by the Renewable Resources Extension Act. We appreciate logistical support provided by the Caesar Kleberg Wildlife Research Institute at Texas A&M University-Kingsville. Our mention of commercial products herein is for identification purposes and does not constitute endorsement or censure by the United States Department of Agriculture.

INTRODUCTION

White-tailed deer (*Odocoileus virginianus*) and invasive feral hogs (*Sus scrofa*) coexist on millions of hectares throughout Texas (Adams et al., 2005). Management programs aimed at white-tailed deer production often include the use of feeders, either to deliver supplemental feed or bait (Webb et al., 2008). In fact, Texas landowners feed approximately 136 million kg of corn annually (R.N. Wilkins, Texas AgriLife Extension Service, unpublished data). However, much of the feed placed into deer feeders is consumed by non-target species (Lambert and Demarais 2001). Feral hogs and raccoons (*Procyon lotor*) are the primary non-target species causing damage through feed loss at deer feeders (Cooper and Ginnett 2000).

Biologists and land managers are seeking solutions to reduce damage at deer feeders by feral hogs (e.g., consuming feed, turning feeders over, and creating wallows at feeders). For example, biologists have determined that feral hog activity at deer feeders may be reduced by using feed types that are unpalatable to feral hogs as deer feed (Cooper 2006). Additionally, land managers often use fencing to exclude feral hogs from deer feeders (e.g., see Webb et al., 2008). However, little data exist regarding the effectiveness of different fence designs for feral hog exclusion at deer feeders. For example, both woven-wire (Hone and Atkinson 1983, Doupé et al., 2009) and electric (Reidy et al., 2008, Vidrih and Trdan 2008, Honda et al., 2009) fence designs have been found effective at reducing feral hog movements in various field applications, but have not been evaluated at a focal resource, such as deer feeders. Furthermore, the optimum height of exclusion fencing for deer feeders has not been determined.

Our objectives were to compare three exclusion fence designs at deer feeders for their ability to restrict feral hog visitation and enable white-tailed deer visitation during the summer and winter. Given previous reports that woven-wire fencing ≥80 cm restricted feral hog movement in captivity (Hone and Atkinson 1983), we hypothesized that our treatment 86 cm in height would restrict feral hog visitation to deer feeders. Furthermore, we hypothesized that white-tailed deer visitation to deer feeders would not be inhibited by our treatment fence designs because they were ≤86 cm in height (VerCauteren et al., 2006).

MATERIALS AND METHODS

We conducted our study during 2009 on the 3,157-ha Rob and Bessie Welder Wildlife Refuge (28°06'N, 97°22'W) in San Patricio County, which received an average of 79 cm of rainfall annually. The property was dominated by live oak (*Quercus virginiana*), honey mesquite (*Prosopis glandulosa*), and huisache (*Acacia farnesiana*). Primary non-target species at deer feeders were feral hogs, raccoons, and collared peccaries (*Pecari tajacu*). Feeding of deer and other wildlife did not occur on the property prior to our study. All animal use procedures were approved by the National Wildlife Research Center's Animal Care and Use Committee (Number QA-1702).

We evaluated three exclusion fence designs at deer feeders from 29 June–28 July (summer) and from 5 November–3 December (winter). Our fence designs used six 4.9-m livestock panels constructed into a 9.4 m diameter perimeter circle around deer feeders with the aid of 12 t-posts (Figure 1). Our high fence design consisted of 86 cm

Figure 1. Exclusion fencing using 6 1.9-m livestock panels constructed into 9.4 m diameter perimeter circle around deer feeders with the aid of 12 t-posts in San Patricio County, Texas during the summer (29 June–28 July) and winter (5 November–3 December) of 2009.

high graduated paneling (Feedlot Panel, Hog; Tractor Supply Company, Brentwood, Tennessee). Our medium fence design consisted of 152 cm high 10×10 cm paneling (Utility Panel, 5 ft × 16 ft; Tractor Supply Company, Brentwood, Tennessee) cut in half, yielding a 76 cm high exclusion fence. Our low height design consisted of the same 152 cm high 10×10 cm paneling cut into thirds, yielding a 51 cm high exclusion fence. We used 2.4 m high tripod deer feeders with a 102 kg capacity (R225 Pro VB Tripod Feeder Kit; American Hunter Outdoor Products, Grand Prairie, Texas) during our trials. Throughout our seasonal trials, we programmed deer feeders to release corn for 10 seconds daily at 0600 and 1700 hours.

At the beginning of our summer and winter trials we identified locations with fresh signs of white-tailed deer and feral hog activity and from these we selected locations to place deer feeders (n = 6 per trial and n = 2 per treatment). For each trial we placed deer feeders >1.5 km apart and monitored feeders with motion-sensing digital photography (Silent Image Professional; Reconyx, LaCrosse, Wisconsin). We placed camera systems 5 m from deer feeders and programmed systems to "high sensitivity" to capture 5 digital images every 5 seconds at a 2-minute trip interval. We revisited deer feeders, checked camera systems, and downloaded digital images every 3 to 5 days. From day 1 to 14 of each trial we maintained and monitored deer feeders without construction of exclusion fencing, the before fence construction period. On day 15 of each trial, we used a random number generator to assign deer feeder locations to an

exclusion fencing treatment (n = 2 for high, medium, and low treatments) and constructed exclusion fencing treatment. From day 15 to 28 of each trial, we maintained and monitored deer feeders with exclusion fencing treatments, the after fence construction period.

We determined species-specific visitation rates through examination of digital images. As an index to visitation, we recorded the maximum number of individuals consuming corn by species captured on any one image within any hour on a daily basis. We report these data as the maximum number of visits by species per hour. We calculated the percent change in visitation index before and after fence construction for each location by dividing the after index by the before index and multiplying by 100. Percent values were square root transformed prior to analysis (Steel and Torrie 1980). For each species, we used PROC ANOVA (SAS Institute, Inc., Cary, North Carolina) to compare the percent change in visitation index by fence design (high, medium, and low) and season (summer and winter) in a 2 × 3 factorial design (Littell et al., 2006). We reported means ± SE.

RESULTS AND DISCUSSION

We examined and recorded data from 111,769 digital images during our summer trial and 75,630 digital images during our winter trial. For feral hog percent change in visitation index, we found no interaction between fence design and season ($F_{2,11}$ = 0.54, P = 0.61) and no season effect ($F_{1,11}$ = 0.54, P = 0.49). However, feral hog percent change in visitation index varied by treatment ($F_{2,11}$ = 3.92, P = 0.08), with our low fence design (51 cm) restricting feral hog visitation to deer feeders less than the medium (76 cm) and high (86 cm) fence designs. In fact, after construction of the medium and high exclusion fencing treatments, no feral hogs gained access to the deer feeders (Figure 2). This was consistent with our hypothesis that our high exclusion fence would restrict feral hog visitation to deer feeders. For white-tailed deer percent change in visitation index, we found no interaction between fence design and season ($F_{2,11}$ = 0.08, P = 0.92) and no treatment effect ($F_{2,11}$ = 0.44, P = 0.66). This was consistent with our hypothesis that visitation by deer would not be inhibited by our exclusion fencing. After construction of the high, medium, and low exclusion fencing treatments, deer continued to gain access to the feeders (Figure 3). However, deer percent change in visitation index varied by season ($F_{1,11}$ = 6.89, P = 0.04), with a greater percent change in visitation index occurring during the summer (4 ± 23%) than winter (–74 ± 9%).

Our observation of greater deer visitation during the summer compared to the winter trial may be due to severe drought conditions observed during the summer. For example, from January–July 2009 our study site received only 28% of its average normal precipitation for the period (NOAA 2009) and available deer forage was reduced, which may have prompted deer to visit feeders at a greater rate. Near average normal monthly precipitation occurred from September–December 2009 on our study site, which increased available forage during our winter trial. Another explanation for this observation is that deer in our winter trial may have been more interested in breeding activities than foraging activities and visited feeders at a lesser rate. A final explanation is that during our winter trial heavy rainfall occurred after exclusion fence construction. This may have further reduced deer activity and visitation to feeders.

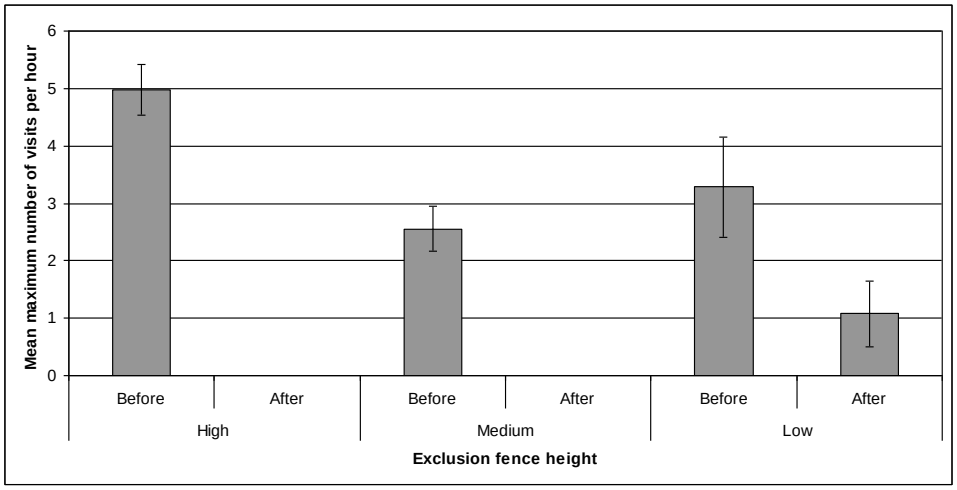

Figure 2. Mean (±SE) maximum number of visits by feral swine per hour 14 days before and 14 days after construction of exclusion fencing at high (86 cm, $n = 4$), medium (76 cm, $n = 4$), and low (51 cm, $n = 4$) heights around deer feeders in San Patricio County, Texas during the summer (29 June–28 July) and winter (5 November–3 December) of 2009.

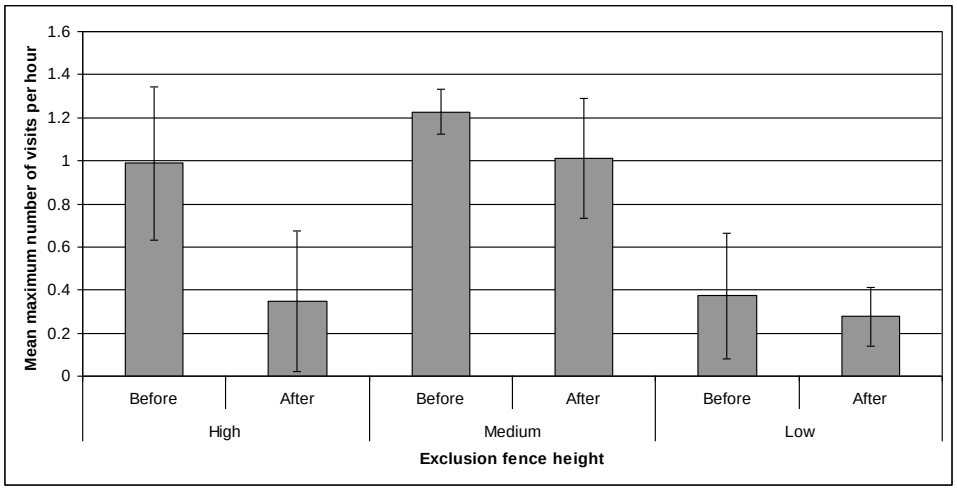

Figure 3. Mean (±SE) maximum number of visits by white-tailed deer per hour 14 days before and 14 days after construction of exclusion fencing at high (86 cm, $n = 4$), medium (76 cm, $n = 4$), and low (51 cm, $n = 4$) heights around deer feeders in San Patricio County, Texas during the summer (29 June–28 July) and winter (5 November–3 December) seasons of 2009.

Researchers from southern Texas have noted few fawns using deer feeders with feral hog exclusion fencing (VanBogelen et al., 2009). Our digital image data support this observation. During our summer trial we observed fawns with does, but on no occasion did they consume corn at feeders either before or after fence construction.

During our winter trial fewer fawns were observed, perhaps due to mortality caused by the abovementioned drought conditions. Again, we did not observe these animals consuming corn at feeders before or after fence construction, even at our low exclusion fence locations. In addition to exclusion fencing restricting access of fawns to deer feeders, VanBogelen et al., (2009) suggest that social interactions with adult deer may also restrict fawns from visiting feeders. This explanation appears plausible given our observations.

Our data suggest that feral hog exclusion fencing at deer feeders should be >51 cm and that fencing 76 cm and 86 cm were equally effective at excluding feral hogs. Including t-posts and t-post clips, our high, medium, and low exclusion fence material costs were $190, $187, $142 per deer feeder, respectively. If managers cut t-posts in half, then these costs would be reduced. Additionally, our 3-person fence construction crews were able to build one exclusion fence in approximately 45 minutes and this was consistent among fence designs. Furthermore, preparation time was needed to cut the medium fence in half. As such, our medium fence cost slightly less than our high fence to construct, but this may depend on local supplies available, vendors, and markets. Given the cost of materials that we encountered and the effectiveness of the exclusion fences, we recommend using an 86 cm high exclusion fence for feral hogs around deer feeders. However, we caution that our data and recommendations are from short-term seasonal trials and may not apply to situations in which year round supplemental feeding is practiced. With time, over longer durations, and depending upon other available forages, feral hogs will likely challenge even the 86 cm high exclusion fencing. Additional study is needed to formulate management appropriate recommendations in these situations.

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AgriLIFE EXTENSION
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L-5533
10-11

Using Fences to Exclude Feral Hogs from Wildlife Feeding Stations

Jared Timmons[1], Justin Rattan[2], Tyler Campbell[3], David Long[4], Billy Higginbotham[5], Duane Campion[6], Mark McFarland[7], Nikki Dictson[8], and James C. Cathey[9]

Research conducted in the South Texas Brush country has found that exclosure fences are an effective way to keep feral hogs from eating corn and supplemental feeds that are intended for other animals. These fences protect corn and protein pellets from feral hogs and though labor intensive, they will pay for themselves in feed savings. (Fig. 1A)

Wildlife managers and hunters manage many properties for white-tailed deer. They use corn as feed and as bait to attract them into hunting areas. They also provide supplemental feed such as protein pellets in order to increase antler scores, body weights, survival and fawn production.

Hunters and land managers put out thousands of tons of corn each year and though most of this corn is intended for deer, feral hogs consume a substantial portion of it (Fig. 1B). Hogs also are detrimental to other game species such as ground-nesting birds like quail and wild turkey.

Figure 1A
An exclusion fence can be constructed around a broadcast corn feeder.

Figure 1B
When there are no fences, feral hogs routinely eat the corn that is meant to attract deer.

Keeping hogs out of the corn

To determine whether fencing could exclude feral hogs while still allowing deer to enter the feeding area, researchers with the U.S. Department of Agriculture and AgriLife Extension Service erected various heights of welded-panel fences and studied their effectiveness.

1-Extension Wildlife Assistant; 2-Research Technician, Caesar Kleberg Wildlife Research Institute; 3-Research Wildlife Biologist, USDA APHIS Wildlife Services; 4-Wildlife Biologist, USDA APHIS Wildlife Services; 5-Professor and Extension Wildlife and Fisheries Specialist; 6-San Patricio County Extension Agent; 7-Professor and Extension Soil Fertility Specialist; 8-Extension Program Specialist; and 9-Associate Professor and Extension Wildlife Specialist.
1,2,5,6,7,8,9, The Texas A&M University System

Figure 2

Feral hogs were partially excluded from the bait station using 20-inch fences; 28-inch and 34-inch hog panels excluded them completely.

Figure 3

White-tailed deer can access feed protected by 20- and 28-inch utility panels and 34-inch hog panels.

The fences tested were 20, 28, and 34 inches tall. The 20- and 28-inch fences used six 16-foot-long utility panels with 4-inch squares. The 34-inch fence was constructed using graduated hog panel, with the smaller openings closest to the ground. Where the panels overlapped, they were tied to steel T posts with bailing wire. T-posts were also placed halfway between each overlap. Each exclosure measured 28 feet in diameter and was placed around a broadcast corn feeder.

The study was conducted in two phases, one during the summer of 2010 and the other in the fall. Researchers used remote-sensing infrared cameras to monitor the feeders for 2 weeks before and 2 weeks after setting the fences. They found that the 20-inch fence reduced feral hog access while the 28- and 34-inch-tall fences kept them out completely (Fig. 2).

Adult deer visits to the feeders did not decline significantly after the fences were erected. The 2009 drought severely limited the fawn crop and may be the reason that no fawns visited the feeders before or after the fences were built. Also, fawns have a lower social status and may have been kept away by more dominant deer. As fawns grow larger, their access to feeding stations should increase.

Another study was conducted by the Caesar Kleberg Wildlife Research Institute and Texas A&M University–Kingsville. This study found that fences taller than 33 inches limited fawn access to feeding stations. This group also conducted a study on exclosures around protein feeders and suggested that fences be 80 by 80 feet or larger to prevent deer from crowding while feeding.

The materials for the 20-, 28-, and 34-inch fences cost $170, $187, and $190 respectively. The 28-inch fence required more labor because 5-foot-tall utility panels were cut in half to create the six panels needed for the circular fence.

Choosing the right height

Remote-sensing infrared cameras can confirm if feral hogs are visiting your bait or feed stations. You can also inspect the area for hog tracks, rooting, rubs, and wallows. If hogs are a problem around your feeders, 28- or 34-inch-tall fences will keep them from reaching your corn. These two fence heights will keep out feral hogs but still allow adult deer to enter and feed (Fig. 3).

However, fencing that is 34 inches high may be too tall for fawns. When fawns are present, the 20- and 28-inch fences are a better choice. If you do build a fence that is 34 inches tall, you can improve accessibility for fawns by cutting at least two slots that are 6 inches deep by 3 feet wide into the top of the fence. Also, place the smaller openings of the graduated panel closest to the ground.

Building the fence

A 28-inch-tall fence requires the following:

- Three 60-inch by 16-foot utility panels
- Twelve 5-foot T-posts
- Wire clips
- T-post driver
- Fencing pliers
- Bolt cutters

1. Use the bolt cutters to cut each panel length-wise exactly in half.
2. Place the utility panels end to end to form an approximately 28-foot-diameter circle

around the feeder. Overlap the ends by one 4-inch square and push the cut end into the ground.

3. Fasten the ends together with wire clips.
4. Position the fence so the feeder is in the middle of the circle.
5. Drive steel T-posts on the outside of the circle in the middle of each panel and where they overlap.
6. Fasten the T-posts to the panels with wire clips. Make sure the panels are flush to the ground and leave no gaps that hogs might dig under.

Deterring feral hogs has many benefits

In many parts of Texas, feral hogs damage landscapes, pollute the water, and hinder farming, ranching and wildlife management. They cause an estimated $52 million in damage to the state's agriculture industry each year.

Because feral hogs are non-native and damage water quality and wildlife management, fencing them from supplemental feed should be part of every ranch management plan.

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

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

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Acknowledgments and Disclaimer

Justin Foster, Research Coordinator with Texas Parks and Wildlife Department, and Daniel Kunz, Technical Guidance Biologist with Texas Parks and Wildlife Department, reviewed and provided editorial comments for this publication.

This result demonstration was funded by the United States Department of Agriculture through the Renewable Natural Resources Extension Act. This publication was developed as part of the Plum Creek Watershed Feral Hog Project, with funding support for publication costs from the U.S. Environmental Protection Agency through a Clean Water Act §319(h) Nonpoint Source grant administered by the Texas State Soil and Water Conservation Board and from the Cooperative State Research, Education, and Extension Service, USDA, National Integrated Water Quality Program.

Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the USDA.

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Issued in furtherance of Cooperative Extension Work in Agriculture and Home Economics, Acts of Congress of May 8, 1914, as amended, and June 30, 1914, in cooperation with the United States Department of Agriculture. Edward G. Smith, Director, Texas AgriLife Extension Service, The Texas A&M University System.

12M, New

VI. WILD PIG TELEMETRY STUDY

Wild Pig Telemetry Study

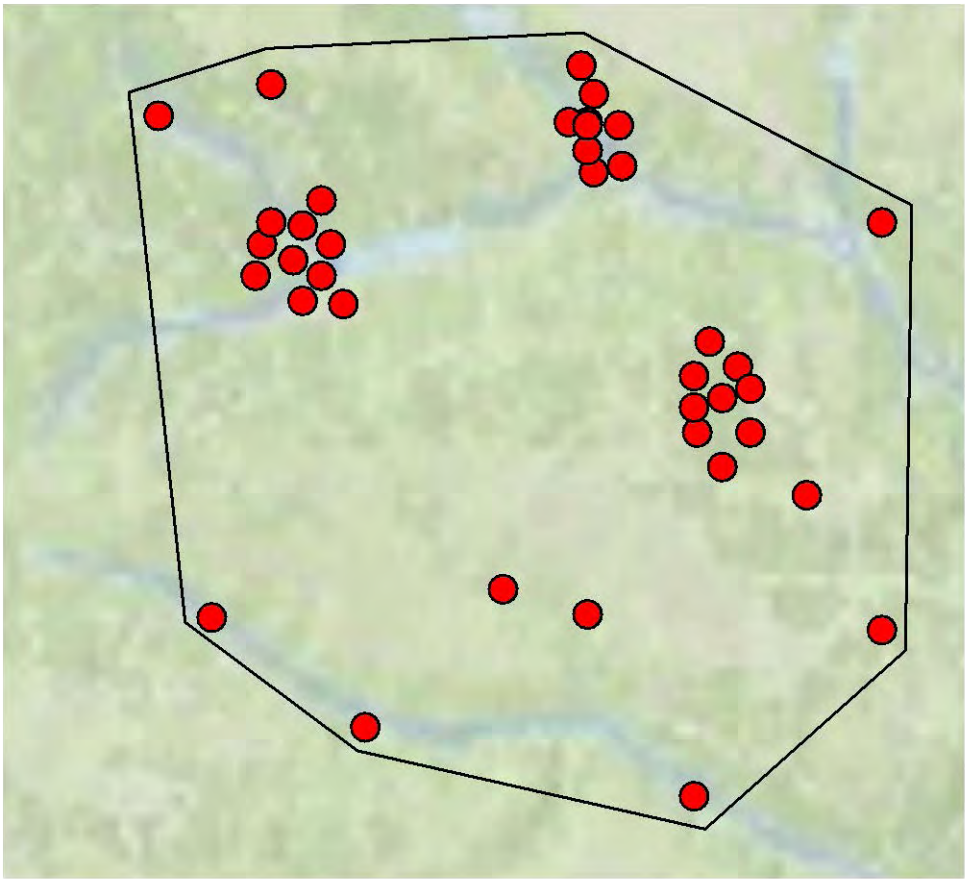
Wild pigs exhibit a home range behavior that consists of a core area and a network of paths. The size and shape of the home range will vary depending on availability of food, water, shade and escape cover.

Our wild pig telemetry study was conducted as a joint project between Texas A&M AgriLife Research, the Noble Foundation (Ardmore, OK) and the Texas A&M AgriLife Extension Service.

The study site was on and adjacent to the Texas A&M AgriLife Research and Extension Center at Overton. From July 2011 through May of 2012, a total of 14 adult female wild pigs were fitted with telemetry collars and monitored on a weekly basis.

While data analyses is on-going, the average home range for sows that were monitored at least 60 days was 1,071 acres. On two occasions, sows fitted with radio telemetry collars re-entered the traps where they were initially captured within four days.

Additional data analyses will include average daily distance moved, movement patterns pre- and post-farrowing and maximum distance moved.



VII. WILD PIG TAKE SURVEY

Texas Wild Pig Take Survey

Billy Higginbotham
Professor and Extension Wildlife and
Fisheries Specialist
Texas AgriLife Extension Service

Need:

There have been no data available to truly characterize landowner-initiated removal of wild pigs in Texas. These data would be useful to frame harvest methods employed in order to estimate the number of wild pigs removed from the statewide population of approximately 2.6 million animals. This information could then be used to refine the mortality estimate in a population model. Lastly, this should also help guide AgriLife Extension's educational efforts to abate wild pig damage through landowner-initiated control.

Methodology:

In 2011, county Extension agents were asked to survey landowners regarding 1) whether or not they removed wild pigs from their properties during calendar year 2010, 2) if pigs were removed, how many and by what method(s) and 3) property acreage and location (county) controlled by the survey respondents. Surveys were collected from March 1 through May 31, 2011. CEAs used direct mailouts and in-person distribution at various Extension educational events to survey landowners. All surveys were returned to Billy Higginbotham-Extension Wildlife and Fisheries Specialist for analyses.

Results:

A total of 697 landowner surveys were returned. The surveys represented data from 139 counties from properties totaling approximately 1.8 million acres. During 2010, 80% of survey respondents removed wild pigs from their properties. A total of 36,646 wild pigs were harvested during the year by survey respondents.

All trapping represented 57% of the wild pig take with "trap and sell" representing 27% of the total number removed followed by "trap and destroy" (21%) and "trap and use" (9%). The increase in the number of buying stations plus a greater awareness by landowners of the opportunity to sell live pigs has probably increased the supply in recent years.

All shooting represented 35% of all pigs removed with "landowner/employee shooting" representing 16%. "Recreational hunting" accounted for 11% of the total take while "aerial shooting" (not by Wildlife Services) represented 8% of the pigs removed in 2010. Removal by "dogs" (6%) and "snares" (2%) constituted the remainder of the pig removal reported.

Although we are continually asked by many hunters as to where they can hunt in order to "help" landowners control pigs—you are simply not going to impact a wild pig population through recreational hunting alone—not when the models suggest that an annual harvest of from 50% to 70% (our model suggested 66%) of the population is necessary just to hold it stable. Nevertheless, an increasing number of landowners are relying on the revenue stream generated by marketing hunting opportunities for wild pigs to offset damage and generate income, especially during the off seasons.

These harvest data were employed to refine our mortality estimate for use in our population model. Trapped and sold harvest estimates from the surveys were also compared to the number of pigs slaughtered at processors where USDA inspectors were on hand (approximately 640,000 wild pigs inspected and processed from 2004-2009 alone). This allowed us to calculate an estimated annual harvest of 753,646 wild pigs. It is important to remember that this is only an estimate—but it suggests that in 2010 we removed approximately 29% of the estimated 2.6 million pigs in Texas.

Based on our annual estimated population increase of 21% from the model, it would take about 5 years for a Texas wild pig population to double in size. However, it is important to remember that several factors (including drought) can have an impact on population growth rates.

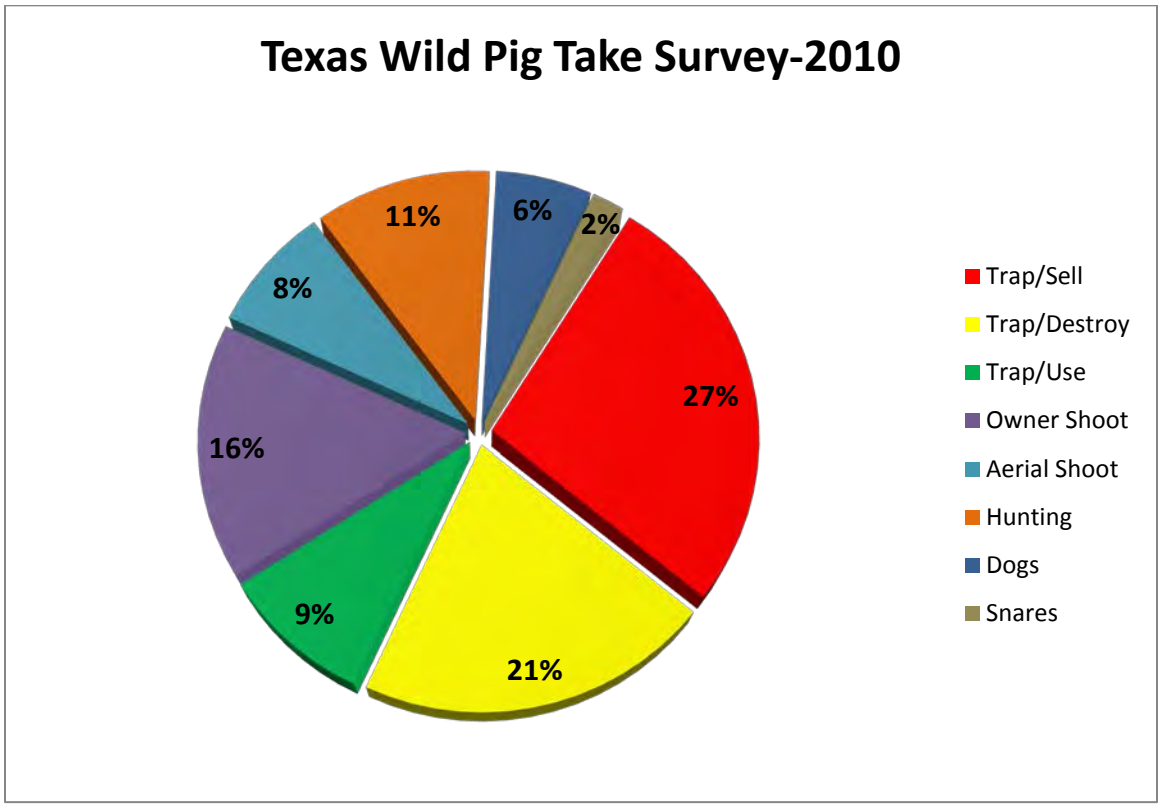


Figure 1. Methods of take for a total of 36,646 wild pigs based on surveys from 697 Texas landowners in CY 2010.

Some Additional Recent Research Findings on Wild Pigs

*Catch rates are 4x higher in corral traps than box traps. Mature boars in particular have an aversion to box traps. **Georgia**

*Following pig euthanasia inside of traps, 10 of 12 (83%) traps caught additional pigs within one week (Suggests that it does not reduce future catch when pigs are killed in traps). **Alabama**

*Boars spent 32 minutes on average at trap locations while sounders spent an average of 70 minutes. Sounders also made twice as many trips to trap locations as compared to boars. **Alabama**

*73% of pigs trapped and released were recaptured later (We have confirmed this trend with our telemetry work at the Overton Center). **Alabama**

*Continuous catch doors (saloon, rooter and swinging door) don't catch additional pigs once they trip and close. We have also confirmed this at Overton. This means that the drop or guillotine gate (once closed cannot be opened) can be used with equal success compared to continuous catch doors. **Alabama**

*Baiting with soured corn and shelled corn caught pigs at the same rate. (However, experience tells us that there will be more non-target species (e.g., raccoons, deer) use on shelled corn compared to soured corn). **Alabama**

*Drop Nets vs. Corral Traps. Drop nets captured 86% of marked pigs while corral traps captured only 46%. The catch rate (in hours spent per pig captured) was also better (1.9) for drop nets than corral traps (2.6). These researchers (Noble Foundation) are currently evaluating a hybrid between the drop net and corral trap called the "Boar Buster". **Oklahoma**

*Pig response to aerial gunning. Wild pigs displayed one of two behavior patterns in response to harassment by helicopters: 1) Leave home range by no more than a mile and then return within 24 to 48 hours or 2) simply hunker down in security cover and stay put. Regardless, they stayed close to home. **Texas**

*Sodium nitrite as a pig toxicant. Research trials continue and at this point it appears a delivery system that only pigs can access appears to be more likely than finding a pig-specific bait. Sodium nitrite is already approved as a preservative for certain meats destined for human consumption. It is also humane (works within about 90 minutes) and has no secondary impact on other animals scavenging a carcass (e.g., vultures, coyotes). At this time, landowners cannot use this or any other compound for the expressed intent to poison wild pigs in the United States. The research trials are part of the EPA registration process and will likely continue for a few more years. **Texas**

*****Lastly, we (AgriLife Extension) are currently conducting demonstration trials investigating the impact of gate width on trapping success. Camera data indicate that many pigs have an aversion to entering narrow gate openings, especially mature pigs--boars and sows. **Texas**

2010 Feral Hog Take Survey

Your responses to this short anonymous survey will help Texas AgriLife Extension estimate the number of feral hogs removed from the Texas landscape in 2010.

1. Did you remove (or kill) feral hogs from your properties anytime during 2010? ____yes no____

2. If you answered yes to question 1, **please estimate the number of hogs removed** from all of your properties by each method during 2010:

_____ Trapped and destroyed on site	_____ Trapped and Sold
_____Trapped and given way/personal use	_____Aerial Shooting (not by Wildlife Services)
_____ Owner/Employee shooting	_____ Recreational hunting (guests, leasees)
_____Snares	_____ Catch dogs

3. What is the total acreage of the properties where hogs were removed? _____

4. List all counties where these answers were derived from: _____

_____

CEA/Specialist: Please return these surveys to Billy Higginbotham, Texas AgriLife Extension Service, PO Box 38, Overton, TX 75684. Email: b-higginbotham@tamu.edu

VIII. POPULATION MODELING STUDY

FERAL HOG STATEWIDE POPULATION GROWTH AND DENSITY

THE ISSUE

Feral hog (*Sus scrofa*) management in Texas and throughout the southeastern United States is increasing due to the prolific breeding potential and environmental impacts caused by the species. This free ranging, non-native, invasive species exhibits one of the highest reported reproduction rates of any ungulate. When hogs were introduced into the United States in the 1500's, they were beneficial to early settlers because of their importance as a meat source and adaptability to the environment. Release or escape of then domestic hogs has led to their current expansion. In Texas, feral hogs are reported to cause nearly $52 million in annual agriculture damage with higher reported damage in farming areas. This is equivalent to approximately $7,500/landowner in damage since feral hogs occupy largely private lands. As the population of feral hogs continue to grow, so will the conflict with agriculture and wildlife requiring more attention from natural resource managers.

SCOPE OF WORK

Population dynamics (i.e., survival, reproduction, density, etc.) of feral hogs is poorly understood throughout their range to include Texas. The estimated number of feral hogs, for example, in Texas ranges from a reported 1 million to as high as 4 million, and not really based on scientific studies or data. Conversely, the rate of growth for feral hogs also has been cited as doubling each year and again not based on empirical data further complicating efforts to estimate hog densities. The objective of this project was to (1) evaluate population growth rates, and (2) obtain crude density estimates for feral hogs state-wide. For Objective 1 (estimate population growth rate), we constructed a state-wide feral hog model using a sex- and age-structured population model (see Figure 1). From a comprehensive literature review of 21 scientific studies conducted throughout the southeastern United States, we estimated demographic parameters (i.e., survival, litters/year, average litter size, etc.), which included mean, low, and high estimates for each demographic parameter. Variance estimates for model parameters allowed demographic stochasticity to be incorporated with each simulation. Multiple model simulations (>100) were conducted and population trajectories averaged for further comparisons.

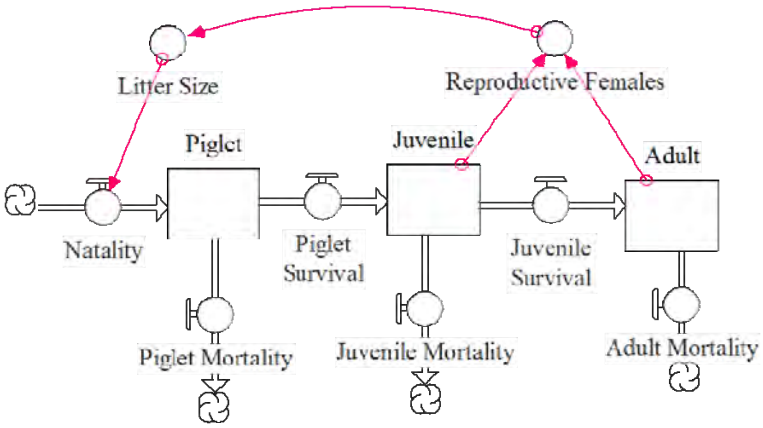


Figure 1. Conceptual feral hog model.

Three independent, state-wide data sources were used to estimate population growth rates for feral hogs, and compared to average model population trajectories: (1) reported harvest numbers from Texas Parks and Wildlife Department (TPWD) aerial permit holders, (2) feral hogs sold to processing plants for consumption (i.e., slaughter house data), and (3) USDA APHIS-Wildlife Service agency harvest estimates.

For Objective 2 (i.e., state-wide density estimate), we conducted a comprehensive literature review that resulted in the identification of 8 feral hog studies reporting hog densities from various Texas ecoregions. From this review, we determined an overall state-wide density estimate with a 95% confidence interval. We then determined potential feral hog habitat through the use of a Geographical Information System (GIS) based on National Land Cover (i.e., vegetation types) and average rainfall. With the vegetation cover layer, we omitted areas unlikely to support high densities of feral hogs (e.g., water, barren ground, low-high development). We also omitted areas receiving <20 inches of annual rainfall as suitable feral hog habitat with the exclusion of riparian areas (these were classified as suitable based on water availability needed by hogs). From this analysis, we estimated approximately 134 million acres of suitable feral hog habitat (Figure 2) or 79% of the entire state.

Figure 2. Feral hog suitable habitat (green).

RESEARCH HIGHLIGHTS

Population Growth Rate (Objective 1) – We estimated approximately 18-21% annual population growth based on demographic estimates used in our state-wide feral hog model. Annual intrinsic growth from all data sources varied between 19 -25%, with an average of 21% (Figure 3).

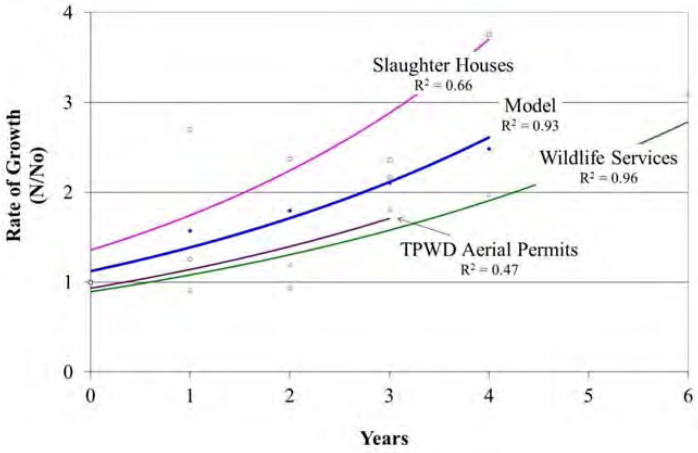
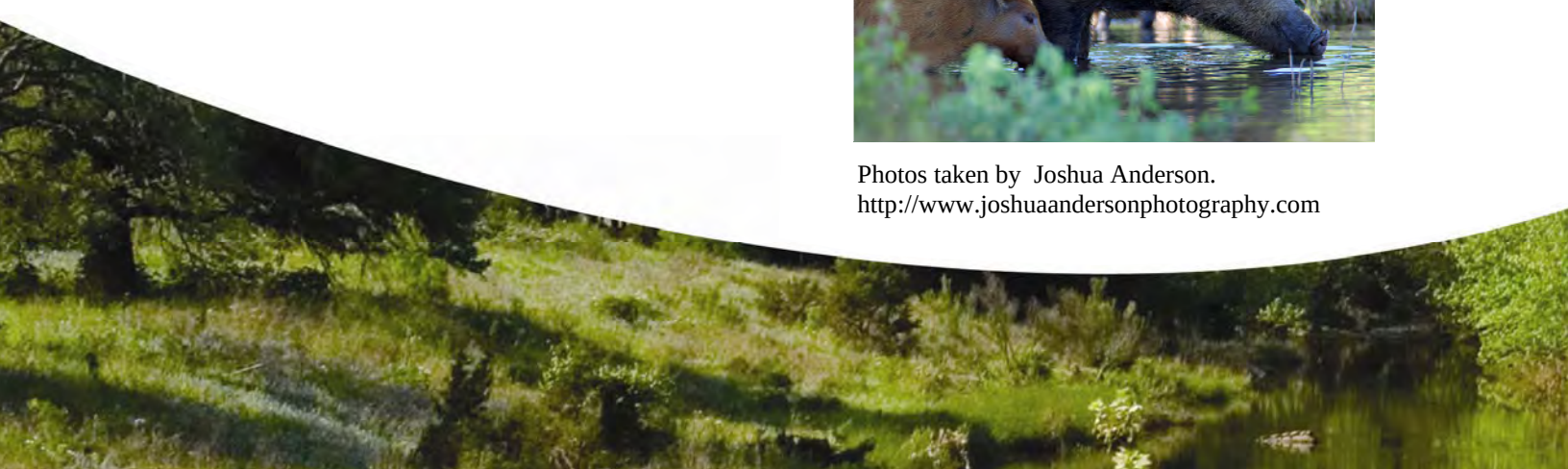


Figure 3. Model population trajectory compared to hog trend datasets.

Observed increases in state-wide hog trend data were very similar to model population trajectories, suggesting model results are reasonable and support parameter estimates used in model construction.

Feral Hog Density (Objective 2) – We found the average hog density in Texas from reported studies ranged from 1.33 hogs/ square mile to 2.45 hogs/square mile. This range (1.33-2.45 hogs/sq. mile) represented a 95% confidence interval. By multiplying the density estimate to the total potential suitable feral hog habitat, we estimate the number of feral hogs state-wide to be between 1.8 and 3.4 million hogs (mean 2.6 million hogs).

Photos taken by Joshua Anderson.
http://www.joshuaandersonphotography.com



SP-472
AUGUST 2012

TEXAS A&M UNIVERSITY

Feral Hog Population Growth, Density and Harvest in Texas

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Photo courtesy Jared Timmons, Texas AgriLife Extension Service

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

Cover photo courtesy Texas AgriLife Extension Service

Figure 1. Feral hogs are known for their rooting behavior, as they forage for food. The destructive nature of this act can be devastating to pastures, row crops, and wildlife habitat. (Photo courtesy Jared Timmons, Texas AgriLife Extension Service)

Feral Hog Population Growth, Density and Harvest in Texas

The Issue

Domestic pigs were introduced to North America into what is now the United States in the 1500s. They were beneficial to early explorers and settlers because of their importance as a reliable meat source and their hardiness in adverse environments. Domestic pigs were either held in pens or allowed to free-range to forage. Pigs escaping from these practices lead to the initial establishment of wild populations and more recent translocations for hunting purposes led to further establishment of wild populations, which today threaten agricultural production, native wildlife, and water quality. As feral hog populations continue to spread, agricultural and environmental damage has increased (Figure 1). Feral hogs cause at least $52 million in agriculture losses each year in Texas. This free-ranging, non-native, invasive species exhibits the highest reproductive capability of any hoofed animal, which makes population reduction difficult.

Population Growth and Density

Population dynamics (i.e., survival, reproduction, density, etc.) of feral hogs is poorly understood. Often, the number of feral hogs are reported from 1 to 4 million in Texas. These estimates are not based on scientific studies. However, the number of feral hog observations and increased damage reported throughout Texas suggests the state-wide population is growing and expanding its range. Here, we assess population attributes and suitable habitat to better understand the extent of the feral hog epidemic and action required to reduce their impact to agriculture and wildlife management.

Population Factor	Range	Average
Reproductive maturity age	5-14 months	8 months
Number of litters per year	0.84 – 2.0	1.5
Piglets per litter	3.3 – 8.0	5.64
Juvenile to adult ratio	0.52 – 0.75	0.68
Male to female sex ratio	0.38 – 0.64	0.5

Table 1. Demographic estimates used in developing the feral hog population model were derived from 21 scientific studies.

Evaluating Feral Hog Population Growth Rates

A review of 21 scientific studies conducted throughout the southeastern United States provided reasonable estimates of characteristics like survival, litters/year, low, average, and high litter size estimates (Table 1). A state-wide, mathematical model of feral hog populations was developed using averages of these sex, age and reproductive characteristics. Results generated by this model were compared to three independent, state-wide data sources that provided population trend information for feral hogs. Sources included: (1) reported harvest numbers from Texas Parks and Wildlife Department (TPWD) aerial permit holders, (2) feral hogs sold to processing plants for consumption, and (3) United States Department of Agriculture-Animal and Plant Health Inspection Service Wildlife Services agency harvest estimates.

Crude Density Estimates for Feral Hogs State-wide

A comprehensive literature review resulted in eight feral hog studies reporting hog densities from various regions in Texas. From this review, an overall state-wide density estimate was determined. However, the relative density of feral hogs will be different in various areas throughout the state, mainly due to variable habitat conditions. Therefore, we further refined this estimate based on the amount of potential/available feral hog habitat throughout the state. Potential feral hog habitat was identified through the use of a Geographical Information System (GIS) mapping system, based on National Land Cover (i.e., vegetation types) and average rainfall. Within the vegetation cover layer, areas unlikely to support high densities of feral hogs were omitted. For example, water, barren ground, and locations with high human development were excluded. Areas receiving less than 20 inches of annual rainfall were also omitted as suitable feral hog habitat; with the exception of riparian areas (creeks). From this analysis we estimated approximately 134 million acres of suitable feral hog habitat, or 79% of the state (Figure 2).

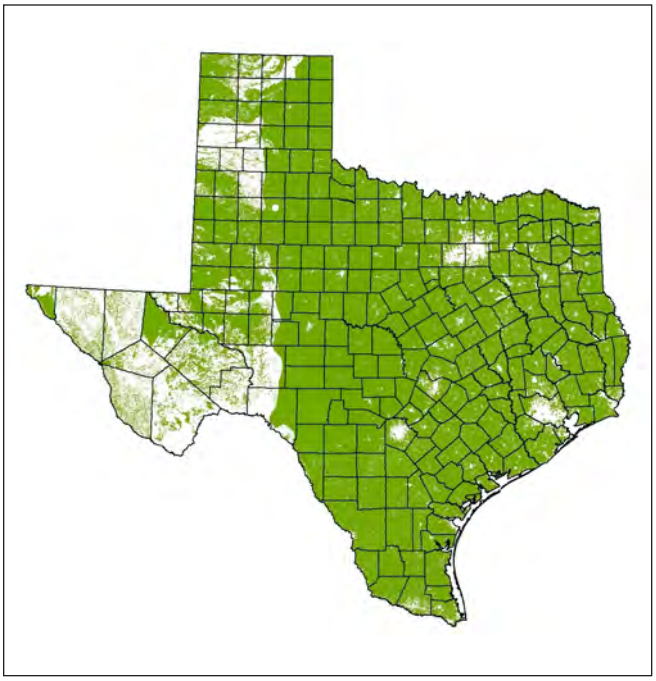

Figure 2. Areas shown in green indicate suitable habitat for feral hogs, comprising 79% of the land mass in Texas.

Research Findings

The population model estimated 18-21% annual population growth, whereas all data sources varied between 19-25%, with an average of 21% (Figure 3). Observed increases in state-wide feral hog trend data were similar to the other model population trajectories, suggesting model results were reasonable and supported characteristics used in model construction.

The average feral hog density in Texas ranged from 1.3-2.5 hogs/square mile from reported studies. By multiplying the density estimate to the total potential suitable feral hog habitat, we estimated the number of feral hogs statewide to be between 1.8 and 3.4 million, with the average being 2.6 million.

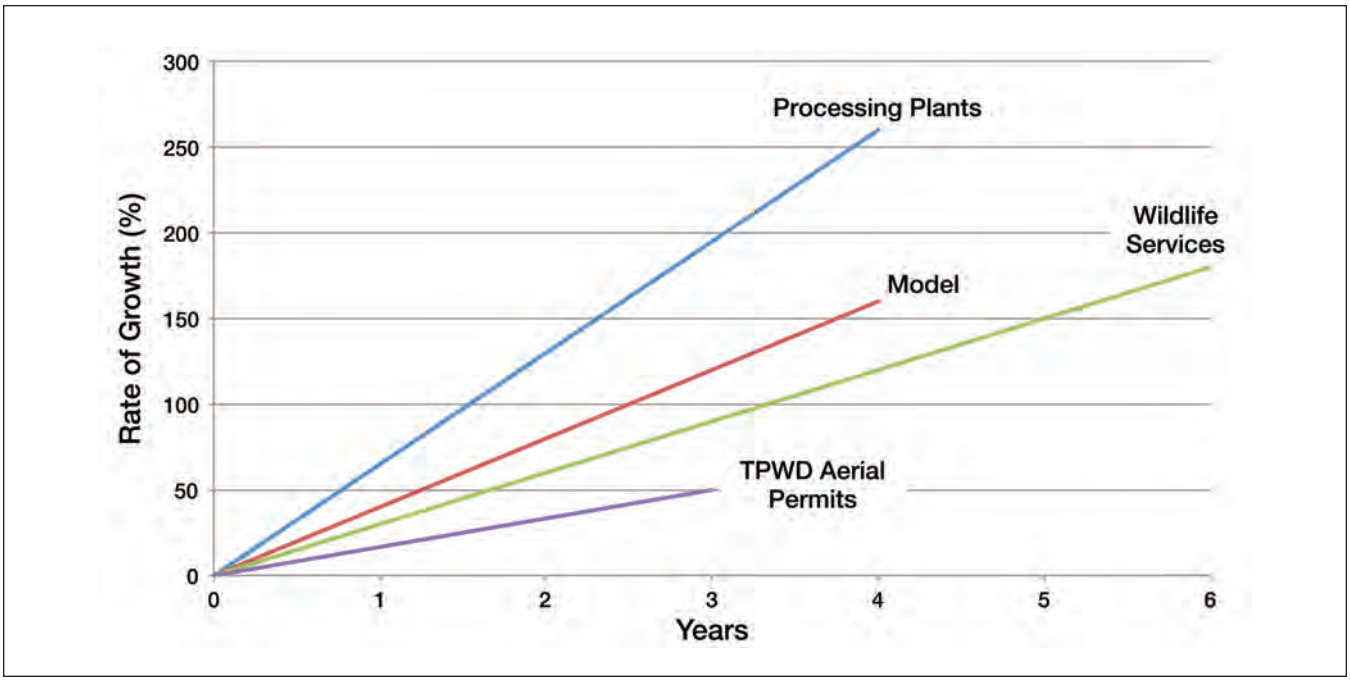

Figure 3. Feral hog growth rates over time as predicted by processing plant, population model, Wildlife Services, and reports from TPWD.

Feral Hog Harvest Survey

Between March 1 and May 31 2011, Texas AgriLife Extension Service county extension agents queried landowners using mail surveys and at extension educational programs. They posed the following questions: (1) whether or not feral hogs were removed from their properties during 2010, (2) if feral hogs were removed, how many were removed and by what methods, and (3) what is the property acreage and location?

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

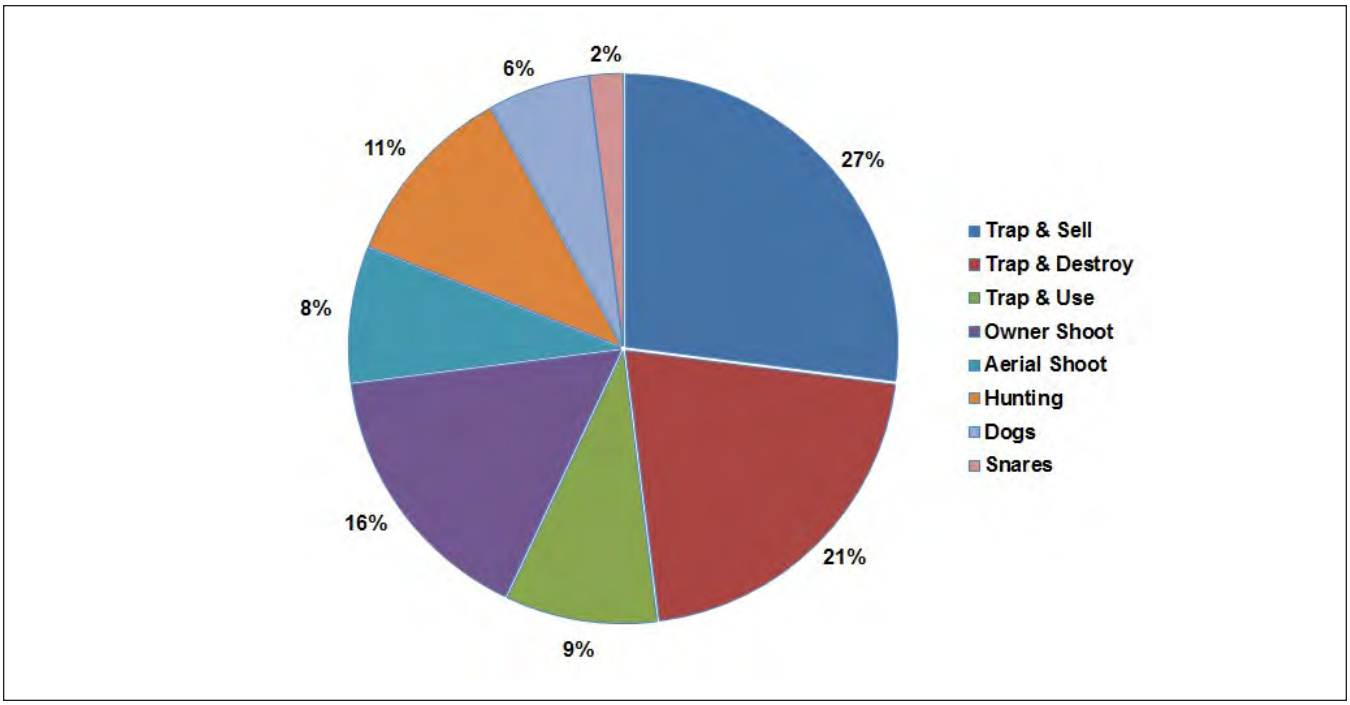

Figure 4. In 2010, 679 survey respondents reported they removed and/or used 36,646 feral hogs by trapping, shooting, and use of dogs and snares.

Six hundred ninety-seven landowner surveys were returned providing data from 139 of 254 counties from properties totaling approximately 1.8 million acres in Texas. Eighty percent of the respondents removed feral hogs from their properties during 2010. Cumulatively, they removed 36,646 feral hogs. Among this group, trap and sell accounted for the most harvested feral hogs (27%), followed by trap and destroy (21%), owner shooting (16%), hunting (11%), trap and use (9%), aerial shooting (not by Wildlife Services) accounted for 8%, dogs (6%), and snares 2% (Figure 4).

Data from the Texas Department of Agriculture on the number of hogs sold to processing plants from 2004-2008 was used to adjust all other estimates. An estimate for the harvest in 2010 was 753,646 or 29% of the estimated feral hog population in Texas. The population model indicated that without harvest the feral hog population was expected to triple within five years (3.33 times initial population), with a 28% annual growth rate. With low harvest (15% of the population) the model indicated that the feral hog population was expected to increase 2.51 times within five years, with an annual growth rate of 22%. Further, with an average harvest of 28% of the population, the feral hog population was expected to double every five years (2.02 times initial population), with a 16% annual growth rate. The population model indicated that with a high harvest of 41% of the population the feral hog population was expected to increase 1.63 times within five years, with a 12% annual growth rate. The model suggested an annual harvest of 66% was required to hold the population stable (Table 2).

Management Implications

With these improved feral hog population estimates, natural resource agencies and landowners can better understand the scope of the feral hog problem in Texas. The population model was beneficial in measuring population growth and evaluating the potential effect of various levels of feral hog removal. Currently, management and control efforts are focused on reducing damage (e.g., economic impacts), not on eradication. Population reduction measures need to increase dramatically, as the estimated harvest rate is only 29% but up to 66% of the population will need to be removed annually on a long-term basis (i.e., five years or more) to reach a stable population. Obviously, feral hog harvest needs to increase substantially, and control methods need additional evaluation to increase harvest thereby reducing economic and ecological damage.

Initial Population of Feral Hogs	Annual Population Growth Rate	Annual Population Harvest Rate	Five Year Population Increase	Five Year Outcome
2,600,000	28%	0%	8,658,000	Population increases 3.33 times
2,600,000	22%	15%	6,526,000	Population increases 2.51 times
2,600,000	16%	28%	5,252,000	Population increases 2.02 times
2,600,000	12%	41%	4,238,000	Population increases 1.63 times
2,600,000	0%	66%	0	No population growth

Table 2. Given an average population of 2,600,000 feral hogs, an even sex ratio, levels of annual population growth and harvest, the model indicates growth or no growth over five years. As annual population harvest increases annual population growth decreases.

Although the model was meant for broad scale, state-level assessments, those worried about feral hogs at finer scales can evaluate what they face. For instance, many people recognize a need to reduce feral hogs particularly near watersheds, as feral hogs can contribute fecal coliforms, including *Escherichia coli*, to waterways. This could harm aquatic life and restrict outdoor recreation associated with impaired streams. For example, the Plum Creek Watershed located in Caldwell, Hays, and Travis counties was listed on the State of Texas 2004 303(d) List of Impaired Waters due to elevated bacteria levels. To alleviate problems associated with bacterial impairments a watershed protection plan was created by Plum Creek Watershed Partnership stakeholders. The plan called for feral hog removal along with other reduction methods. By using the population model created in this investigation, conservation planners like those in the Plum Creek area can better recognize the required number of hogs harvested to limit the population and hopefully have a positive influence on improved stream health.

See other feral hog resources at http://agrilifebookstore.org.

- L-5523 Recognizing Feral Hog Sign
- L-5524 Corral Traps for Capturing Feral Hogs
- L-5525 Box Traps for Capturing Feral Hogs
- L-5526 Placing and Baiting Feral Hog Traps
- L-5527 Door Modifications for Feral Hog Traps
- L-5528 Snaring Feral Hog
- L-5529 Making a Feral Hog Snare
- ESP-419 Feral Hogs Impact Ground-nesting Birds
- ESP-420 Feral Hog Laws and Regulations
- ESP-421 Feral Hogs and Disease Concerns
- ESP-422 Feral Hogs and Water Quality in Plum Creek
- ESP-423 Feral Hog Transportation Regulations
- L-5533 Using Fences to Exclude Feral Hogs from Wildlife Feeding Stations
- SP-467 Feral Hogs Negatively Affect Native Plant Communities

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Photo courtesy Texas AgriLife Extension Service

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Acknowledgements and disclaimer

We would like to thank Dr. Mark Smith, Auburn University, and Dr. Bronson Strickland, Mississippi State University, for their insightful review of this publication.

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

Soil Water TSSWCB

A Primer of Texas Feral Hog Model

Roel Lopez – Institute of Renewable Natural Resources
Billy Higginbotham, Texas AgriLife Extension Service

Model Overview

We developed a stage-based population model for feral hogs in Texas (entire state). Demographic changes were modeled using a stage-structured, stochastic matrix model that allowed for annual changes in vital rates (model 6 was the only stochastic model). Only females were modeled using the program RAMAS Metapop (Applied Biomathematics, Version 4.0, Akçakaya and Root, 2002).

Model Development

Model Parameters

Initial abundances.—Initial abundances for model simulations were varied between 1 million and 2 million feral hogs state-wide. Actual model abundances reflect the female component of the total feral hog population. Model estimates should be doubled to include males.

Survival.—Annual survival and variances were estimated from rates reported in the literature. For the stochastic model, means and variances were estimated from the most probable models (models 2-4). See spreadsheet for actual rates used.

Fecundity.—We assumed an average birth rate/litter size of 6 piglets annually. From these data, fecundity estimates for juveniles (F_j) and adults (F_a) were determined by the function

$F_j = R * M * S_y$

$F_a = R * M * S_a$

where R is equal to the female fetal sex ratio, M is maternity, and S_j and S_a are yearling and adult survival rates, respectively.

Stage matrix.—The Texas feral hog population was represented with a Leslie transition matrix that contained survival and fecundities by age-class (juveniles and adult) (Caswell 2000). In developing the hog model, we assumed (1) all reproduction occurred in a relatively short breeding season ("birth-pulse" population), (2) the population was surveyed after each breeding season (post-reproductive survey), and (3) only adults breed (proportion of breeders determined by survival rate for adults). With these assumptions, the stage matrix for the feral hog model was

$$\begin{bmatrix} Fj & F_a \\ Sj & S_a \end{bmatrix},$$

where S_j and S_a are juvenile and adult survival, respectively, and F_j and F_a are juvenile and adult maternity (piglets/sow), respectively.

Density dependence.—*We assumed no density dependence in the model to provide the most conservative estimates in our model results.*

Literature Cited

Akçakaya, H. R., and W. Root. 2002. RAMAS Metapop: viability analysis for stage-structured metapopulations (Version 4.0). Applied Biomathematics, Setauket, New York, USA.

Caswell, H. 2000. Matrix population models: construction, analysis, and interpretation. Sinauer Press, Sunderland, Massachusetts, USA.

Model 6 (Stochastic)

Females only
Litter size - 6 / year
Sex ratio – 1:1
Abundance – 500,000 (1 million total when males included)
Survival

	Juveniles	Adults	Model
	25	50	2
	30	60	3
	35	65	4
mean	**30**	**58**	6
SD	**5**	**8**	

Fecundity = sex ratio X average birth rate X maternal survival = 1.75

1000 simulations, 5 year period

Eigenanalysis for population 1 ('Pop 1')

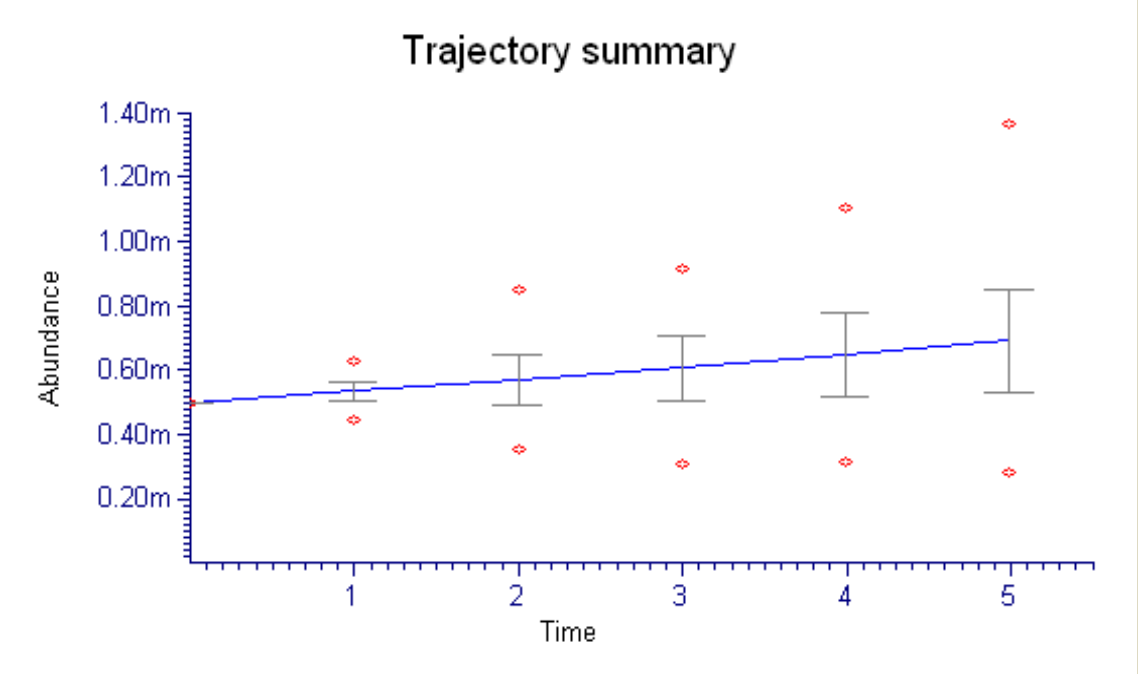
Stage matrix (default):

	1	2
1:	0.0000	1.7500
2:	0.3000	0.5800

Growth rate (lambda)= 1.0704 (approximate)

Stage	Init. distr.	Stable distr.	Reprod. Value	Avg. residence
1	0.620	0.620	1.000	1.00
2	0.380	0.380	3.568	2.38

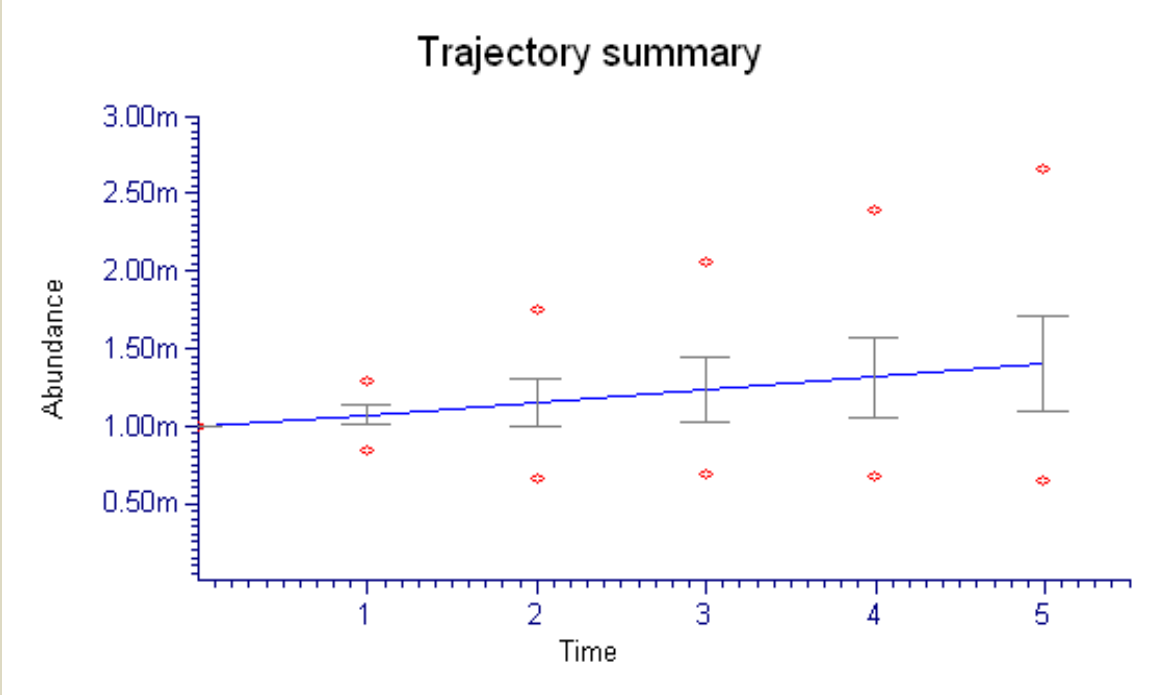
Assumes 1 million total (graphs and table are half, modeling only the female component)



Trajectory summary

Time	Abundance				
	Minimum	-1 S.D.	Average	+1 S.D.	Maximum
0	500000	500000	500000	500000	500000
1	443593	503164	533794	564423	629697
2	353015	489258	568434	647611	849046
3	305623	504304	606532	708760	915645
4	311245	516874	647408	777943	1104533
5	282067	532182	691654	851126	1368912

Assumes 2 million total (graphs and table are half, modeling only the female component)



Trajectory summary

Time	Abundance				
	Minimum	-1 S.D.	Average	+1 S.D.	Maximum
0	1000000	1000000	1000000	1000000	1000000
1	844539	1008665.94	1070500.25	1132334.63	1295780
2	654763	989440.94	1147918.38	1306395.88	1753907
3	691630	1027258.5	1233100.75	1438943	2056057
4	676896	1056387.25	1316681.5	1576975.75	2390495
5	646561	1095665.25	1404280.25	1712895.25	2661189

IX. EXAMPLES

Educational Outreach via the Media

WILD PIG
Media Contact Summary (2006-Present)

Year(s)	TV	Newspaper	Magazine Authored	Articles Interviewed	Radio	News Releases	Pod Casts/ UTube
2006-07	7	20	1	0	3	2	1
2008-09	5	17	2	5	7	1	0
2010-11	10	24	1	10	8	2	0
2012	7	16	0	4	9	3	5
2013 (thru May	2	3	0	2	3	0	1
Sub-Totals	29	80	4	21	30	8	7
Total Media Contacts:	**179**						

Busting feral hog myths | AgriLife Today

AgriLife TODAY
Sharing Stories of Everyday Solutions

According to a recent study, about 134 million acres, or 79 percent of the state total of 170 million acres, is feral hog habitat. (Texas AgriLife Extension Service graphic courtesy of the Texas A&M University Institute for Renewable Natural Resources)

OVERTON — Until recently, if anyone tried to tell you how many feral hogs there are in Texas, they were just blowing smoke, according to a Texas AgriLife Extension Service wildlife biologist.

“When it comes to feral hogs in Texas, separating fact from fiction is becoming a little easier as research reveals more about the pesky porcines,” said Dr. Billy Higginbotham, AgriLife Extension wildlife specialist. “There remains much we don’t know about this exotic that has inhabited our state for the past 450 years.”

Highest ranking among the myths are estimates of the actual number of feral hogs in Texas, Higginbotham said. A common number that has been bantered about for years is 1 to 4 million. But there was just no data to support this estimate.

That is, there wasn’t until Dr. Roel Lopez, associate director of the Texas A&M University Institute for Renewable Natural Resources, recently used geographic information system procedures to turn the guesstimates into reliable estimates, said Higginbotham, who collaborated with Lopez on the study.

The term “geographic information systems,” usually simply called GIS, refers to a procedure that involves diverse data gathering means, from on-the-ground GPS referenced data to satellite to historical records, and organizes it geographically.

“A simpler way to put it is that it’s just a electronic map,” Lopez said.

Using GIS techniques, Lopez was able to quantify first the extent of the feral hog habitat in Texas. He estimates that “approximately 134 million acres, or 79 percent of the state’s 170 million acres, represents feral hog habitat,” said Higginbotham.

By knowing the range of feral hog habitat and the species population density in various types of Texas environments, Lopez also came up with a population estimate that has some meat to it, Higginbotham said. Lopez estimates that the actual number could range from a low of 1.9 million to a high of 3.4 million.

Exaggerated claims of feral hog population-growth rates are a related myth. Many of the population guesstimates are based on a purely arbitrary number of hogs in Texas being set at 1 million in the 1970s. This number, which also had no research basis, is then often extrapolated on using another bit of misinformation: That because of feral hogs’ high birth rates, their population is doubling every year.

So what are the facts?

A 2011 consolidation of past studies done by his graduate student, Janell Mellish, the average litter size in Texas and the Southeast is 5.6 pigs, Lopez said.

It is also known, that on average, a sow is about 13 months old when she has her first litter, and that also on average, mature sows have 1.5 litters per year. This means there is a significant population growth rate, but a far cry from the doubling-yearly myth, Lopez said.

“We estimated the population growth of feral hogs in Texas averages between 18 percent to 20 percent annually,” Lopez said. “This means that it would take almost five years for a population to double in size if left unchecked.”

The study, which was conducted by Lopez and Mellish, used three methods to estimate feral pig population growth in Texas: the statewide number of aerial permits issued for shooting feral hogs; the number of pigs processed in commercial processing facilities; and feral hog control data made available from U.S. Department of Agriculture-Wildlife Services.

A common myth is that it's possible to identify the breed of a given feral hog by its color and markings. "Hogwash," said a Texas AgriLife Extension Service wildlife specialist. (Texas AgriLife Extension Service photo by Dr. Billy Higginbotham)

Another common myth is that recreational hunting alone can control feral hog populations, Higginbotham said.

“Of the dozen studies conducted across the nation, hunting removes between 8 percent and 50 percent of a population, with an average of 24 percent across all studies,” he said. “In order to hold a population stable with no growth, 60 to 70 percent of a feral hog population would have to be removed annually.”

Another myth is that it’s possible to identify the breed of a given feral hog by its color markings.

“Today’s feral hogs are descended from domestic breeds, Eurasian wild boars and, of course, hybrids of the two,” Higginbotham said. “But despite claims to the contrary, simply observing the color patterns, hair characteristics and size cannot let you definitively identify which of the three types and individual hog falls into.”

One thing about feral hogs is definitely not a myth — the huge amount of damage they do to crops, wildlife habitat and landscapes, Higginbotham said. And from all indications, the damage they do is expanding in scope and range.

“Feral hogs were once largely a rural or agricultural issue in Texas, inflicting over $52 million in damage annually,” he said. “But the porkers have literally moved to town and are now causing significant damage in urban and suburban communities. This damage includes the rooting of landscapes, parks, lawns, golf courses, sports fields and even cemeteries, as they search for food. It has been estimated that a single hog can cause over $200 damage annually.”

The $200-per-hog estimate doesn’t include the damage feral hogs do as they compete with other wildlife species, such as whitetail deer, for food and habitat, he noted. And some of the species challenged by feral hog invasions are endangered species.

It’s important to keep in perspective that the bottom line is not an actual hog-head count, but the damage they do and how to develop ways to reduce it.

“For those landowners actively engaged in deer management, their tolerance of feral hogs should be very, very low,” Higginbotham said. “Can we (significantly) reduce the damage feral hogs do through control efforts? The answer is ‘absolutely yes.’

“Texas AgriLife Extension Service has demonstrated that through education and outreach and Wildlife Services-led control efforts, damage can be significantly reduced by control efforts,” he said. “In a 2006-07 study funded by the Texas Department of Agriculture, agricultural damage was reduced by 66 percent via control efforts in just two years.”

Since 2007, subsequent studies done by AgriLife Extension and again funded by the state’s department of agriculture confirmed that control measures such as trapping and shooting “prevented millions of dollars in damage by reducing feral hog populations,” he said.

“Landowners remain the first line of defense since Texas is 95 percent privately owned land,” Higginbotham said. “This means arming the public with Best Management Practices and using various legal control methods to abate the damage by reducing feral hog populations.”

For more information on feral hogs, visit the AgriLife Extension website, “Coping with Feral Hogs,” at http://feralhogs.tamu.edu .

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Environment Land Regional Top Story Wildlife

Statewide News Release

Texas AgriLife Research and Extension Center at Overton Deep Into Wild Pig Issues

In the great state of Texas, what could a deer hunter, hay producer, row crop farmer, suburban homeowner and motorist driving our rural roadways at night possibly have in common? The answer is that there is a good chance that all of them have already been or could be negatively impacted by the presence of wild pigs.

Pigs first landed on the shores of our country in 1539 at Tampa Bay, Florida. A brief three years later, Hernando de Soto's exploration party left the banks of the Mississippi River in Arkansas and headed straight for Texas, with 800 pigs in tow!

Since their introduction more than 450 years ago, pigs have prospered in Texas. However, it was not until the 1980's that the population literally exploded and the damage escalated.

There are several factors that led to the population boom resulting in an estimate of some 2.6 million pigs in Texas today, according to a study by the Texas AgriLife Extension Service and the Institute for Renewable Natural Resources at Texas A&M University.

These include clandestine and illegal releases of wild pigs--presumably for hunting purposes into previously unoccupied habitats across the state and access to increased nutritional supplementation meant for native wildlife species such as white-tailed deer. Couple these factors with the highest reproductive rate of any large mammal found worldwide and you have the recipe for a perfect storm.

Contrary to some claims, wild pigs are not born pregnant—but with the capability of producing an average of 1 ½ litters a year with between 5 and 6 pigs per litter, the Texas population grows at an annual rate of about 20% according to a recent Texas AgriLife Extension Service population modeling study.

In order to hold a wild pig population stable, studies suggest that between 50% and 70% of the animals must be removed annually. A 2011 study conducted by AgiLife Extension estimated that approximately 29% of the statewide population or roughly 750,000 wild pigs are being removed annually with trapping (57% of all pigs) and shooting (35% of all pigs) accounting for the bulk of the removal.

Fortunately, it is possible for landowners to literally make a silk purse out of a sow's ear by selling live wild pigs to one of approximately 90 buying stations scattered across the state. From 2004-2009 there were some 460,000 wild pigs purchased thru buying stations, USDA inspected and processed with cuts entering the human food chain here in the U.S. as well as abroad. The income Texas landowners receive from this marketing opportunity can be used to offset trapping expenses and damage pigs cause.

Before well-intentioned hunters and landowners realized the impacts of wild pigs, releases were common during the 1970's and 1980's. Although it was never actually legal to move and release pigs, the Texas Animal Health Commission has recently ramped up the penalties for illegal releases in Texas.

The supplementation factor largely comes in the form of shelled corn fed at the rate of some 300 million pounds annually. Targeted at non-migratory species such as white-tailed deer and to a lesser degree turkeys and quail, wild pigs have shown no compunction regarding getting their fair share—hogs at the trough (or deer feeder) as the saying goes.

However, it is not just the loss of corn that is at issue here. Behaviorally, deer and other native wildlife species show little tolerance for wild pigs and when they show up, the deer typically leave the immediate area. Additionally, the access to supplement may be putting the sows in better physiological condition resulting in more eggs produced, larger litters and higher piglet survival which could ultimately results in more pigs on the ground.

But this is Texas, and we are not going to stop the legal practice of supplementing white-tailed deer. However, to address the issue, a study was conducted to determine if pigs could be successfully excluded from feeder areas without decreasing deer access. Indeed, excluder pens made from panels 28" to 34" in height excluded pigs without decreasing der visits. As a result, we strongly recommend that all deer feeders are fenced using standard swine panels in habitats shared by wild pigs and white-tails, which is roughly 83 million acres in Texas alone.

The Texas AgriLife Research and Extension Center at Overton has also spent a considerable amount of time developing what we call "Best Management Practices" for reducing damage via pig removal. We focus on using supplies and equipment that are readily available in any Texas community that give the landowner, manager and hunter the best opportunity to be successful at abating the damage caused reducing pig populations.

While we avoid using the "e word"-**eradication** in Texas, AgriLife Extension efforts have clearly shown that the landowner is the first line of defense in the war on wild pigs, and detailed economic analyses have shown that agricultural damage alone (estimated conservatively at $52 million annually) can be reduced by as much as two-thirds by adopting BMPs.

Examples of BMPs include recognition of pig sign before damage begins, training the wild pigs to a bait source prior to initiating control efforts by shooting or trapping, using a remote-sensing (game) camera to pattern the pigs and to determine the number of pigs in the sounder.

I think the greatest tool we have in the War on Wild Pigs is the remote-sensing camera. It helps the landowner determine when you have the pigs trained to bait and the number of pigs in the sounder, which is instrumental in determining the size of trap necessary to capture the pigs.

Personally, I would not even attempt to trap pigs without the use of a camera and I certainly would not drive a single t-post to erect a trap until that camera confirmed that the wild pigs were on bait.

Speaking of traps, the Overton Center has investigated the efficiency of some interesting trap designs including the tear drop, Figure 6, the Figure 8 and the Double Door Trap that was modified from a design borrowed from the Fort Worth Nature Center.

Additional research includes a telemetry study designed to identify wild pig habitat selection and movements to better target control efforts and a trap gate width study to increase trapping efficiency.

The goal for landowners interested in abating damage caused by wild pigs is to remove the greatest number of pigs possible with the least amount of effort and cost. If we can do that, we can help those interested in reducing the negative impacts pigs pose whether you are a hunter, homeowner, row crop farmer, cattle/hay producer or a motorist driving along Texas roadways at night when wild pigs are most active.

Ringling Brothers ★ The Cruelest Show on Earth

Mother Jones

SMART, FEARLESS JOURNALISM

November + December 2011

JOB KILLERS

What happens when you shrink government until you can "drown it in the bathtub"?

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This Little Piggy Is Toast

In which I try (and fail) to eradicate an invasive species with a Remington 700 rifle BY KIERA BUTLER

It's pouring rain, and I'm shivering in a metal hunting stand 15 feet off the ground, deep in the Georgia woods, waiting for a feral hog to wander out of the brush so I can kill it. Next to me sits Jackson Landers, an expert hunter who has graciously spent his morning drilling me on gun safety. Before today, I have fired a gun exactly once—at a paper picture of an evil clown on a rifle range near the San Francisco airport. I come from a staunchly vegetarian family that loves animals like other families love football. Some of my earliest memories are of my dad hustling me outside to hear geese flying overhead.

But Landers thinks his approach to hunting could help save the critters my family adores: He targets invasive species that make their way into local ecosystems and help themselves to food and real estate, often at the expense of native fauna. The key, Landers says, is to convince people that these interlopers are fun to hunt—and delicious. "Once you create a market, the problem will basically take care of itself," he told me earlier. "You're sort of killing two birds with one stone. Invasives are free-range; they're a lot more ethical than meat from a factory farm."

To test his model, I accompanied Landers and his father-in-law, Bob, to a 1,000-acre former horse farm—a tangle of dirt roads, wetlands, and thickets of live oaks and loblolly pines near Savannah. That's how I ended up atop the hunting stand, wondering whether my hippie parents would disown me.

Landers was not the first to have this idea—there's a whole "invasivore" community online, sharing tips on where to find invasive plants and animals and posting recipes for kudzu, Chinese mystery snails, and Asian carp—but as far as I know, he's the first person trying to make a living from it. Since quitting his job as an insurance broker last year, he's shot iguanas in Florida, snatched armadillos with his bare hands in Georgia, and speared lionfish in the Bahamas.

At 33, Landers resembles a Boy Scout: khakis, boots, a knife on his belt. He has a blog called *The Locavore Hunter*, teaches hunting classes in Charlottesville, Virginia, and works with wholesalers, restaurateurs, and chefs to promote invasives as menu items. At first, it was a tough sell—even adventurous chefs tend to draw the line at grilled armadillo—but the idea is catching on. A sushi restaurant in New Haven, Connecticut, now serves several species of invasive fish, and one Louisiana chef is running a bold compaign encouraging restaurants to add nutria to their menus.

Getting rid of feral pigs would be a major coup, says Billy Higginbotham, a wildlife specialist at Texas A&M University. Introduced to the Southeast by Spanish settlers in the 1500s, these pigs have thrived in the wild. In coastal areas, they gobble the eggs of endangered sea turtles; farther inland, they root up native plants, destroy crops, and dig wallows big enough to topple tractors. And they're survivors: prolific, smart, and omnivorous. "They can live off any food item out there," Higginbotham says.

Halfway through the first morning, we hear four shots. Investigating, we find Bob driving down the road, beaming, a dead pig in the back of his ATV. We head back to the barn to celebrate with a mason jar of moonshine. Landers lays the pig on a platform and cuts it open, one long slice down its middle. He expertly removes its guts, and we hang the carcass on a hook for skinning. We pass the moonshine again. I'm beginning to think I could get into this.

But what if it's too much fun? Julie Robbins, a biologist with Georgia's Department of Natural Resources, believes pig hunting helped cause [*continued on page 71*]

Eat Your Weedies

CHEF SEAN BAKER of Gather, a restaurant in Berkeley, California, provided this recipe for purslane, an invasive succulent that grows wild throughout most of the United States. If you can't find any in your yard, check out specialty-food stores and Latino markets. —K.B.

Purslane Salad With Roasted Root Vegetables (serves four)

Start with **3 cups of celery root** and **3 cups of peeled sunchokes**, chopped into ¾" pieces. Toss with **salt** and **olive oil** and roast in a 325-degree oven for 30 to 45 minutes until soft, rotating as needed. Cool to room temperature and dump into a big bowl with **3 cups of washed, chopped purslane**. Toss in **3 tablespoons of toasted pine nuts, 1 tablespoon of chopped fresh thyme,** and **1½ tablespoons of chopped fresh parsley**. Flavor with a mix of **3 tablespoons of lemon juice** and **6 tablespoons of olive oil**. Add **salt** and **fresh ground pepper** to taste, grate **pecorino cheese** on top, and serve.

More invasive-species recipes at motherjones.com/invasive-recipes

LEFT: ROB DOBI; RIGHT: DIRK RICHTER/ISTOCKPHOTO

this little piggy is toast

[*continued from page 72*] the population to explode in the first place. A couple of decades ago, property owners trying to eliminate the ferals found that it made for great recreation. "People began to trap pigs and illegally transport them to their own properties, then charge an arm and a leg for people to come and hunt them," Robbins says. In some parts of the South, pig hunts fetch up to $500 a night.

That's one problem with invasive animals: They're often exotic and interesting and sort of thrilling to have around. On Gasparilla Island, off Florida's Gulf Coast, black spiny-tailed iguanas wreak havoc on tortoises and birds, while attracting another key species—tourists. Gasparilla wildlife specialist and iguana hunter George Cera says locals are aware of the problem but bristle at the idea of eliminating a species that has become the local mascot. "I had beer bottles thrown at me while I was hunting," he says. "One time I swore a guy was going to start a fistfight with me."

And the invasives don't always cooperate. After three days of shivering in the woods, I have nothing to show. Bob graciously offers me a shoulder from his kill. That night, I bring it to the South Carolina home of a friend's parents. The kitchen fills with a smoky smell as her mom roasts the shoulder with onions, thyme, beer, and a rich red barbecue sauce. When it's done, the meat slides easily off the bone. We pile the juicy pieces on hot rolls, slather on more barbecue sauce, and call it a pulled-pork sandwich. And it's delicious: tender, tangy, sweet.

So can invasive pulled-pork sandwiches save the world? Most scientists I spoke to agreed that ecology is messy, unpredictable, and poorly suited for the restaurant supply chain. But Texas A&M's Higginbotham says people like Landers at least do their part to turn people on to conservation: "Silk purse out of a sow's ear, so to speak." ■

VOLUME 36, NUMBER 6. Address all editorial, business, and production correspondence to Mother Jones, 222 Sutter Street, Suite 600, San Francisco, CA 94108. Subscriptions: $24. Add US$10 for Canadian and other foreign subscriptions for postage.

POSTMASTER: Send change of address to Mother Jones, PO Box 3029, Langhorne, PA 19047. Subscription questions and orders can also be directed to (800) 438-6656 (Mon. to Fri., 7 a.m.-10 p.m., Sat. to Sun., 8 a.m.-4 p.m. Eastern Time) or subscribe @motherjones.com. *Mother Jones* subscribers are members of the Foundation for National Progress. Printed in the USA.

MOTHER JONES (ISSN 0362-884) is published bimonthly by the Foundation for National Progress. Preferred Periodicals Postage paid at San Francisco, CA, and additional mailing offices. Canada Post: Publications Mail Agreement #40612608. Canada returns to be sent to Pitney Bowes, PO Box 25542, London, ON N6C 6B2.

J.P. MORGAN'S DAGGER P. 6 • HANNIBAL'S APP P. 92

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Brian "Pig Man" Quaca began hunting at age 4. He and his father help run a game ranch for wild hogs. "They're just so smart, that's why I love them," he says.

Texans are battling a shockingly destructive invasive species

BY JOHN MORTHLAND PHOTOGRAPHS BY WYATT MCSPADDEN

A Plague of Pigs

ABOUT 50 MILES EAST OF WACO, TEXAS, a 70-acre field is cratered with holes up to five feet wide and three feet deep. The roots below a huge oak tree shading a creek have been dug out and exposed. Grass has been trampled into paths. Where the grass has been stripped, saplings crowd out the pecan trees that provide food for deer, opossums and other wildlife. A farmer wanting to cut his hay could barely run a tractor through here. There's no mistaking what has happened—this field has gone to the hogs.

"I've trapped 61 of 'em down here in the last month," says Tom Quaca, whose in-laws have owned this land for about a century. "But at least we got some hay out of here this year. First time in six years." Quaca hopes to flatten the earth and crush the saplings with a bulldozer. Then maybe—maybe—the hogs will move onto adjacent hunting grounds and he can once again use his family's land.

Wild hogs are among the most destructive invasive species in the United States today. Two million to six million of the animals are wreaking havoc in at least 39 states and four Canadian provinces; half are in Texas, where they

do some $400 million in damages annually. They tear up recreational areas, occasionally even terrorizing tourists in state and national parks, and squeeze out other wildlife.

Texas allows hunters to kill wild hogs year-round without limits or capture them alive to take to slaughterhouses to be processed and sold to restaurants as exotic meat. Thousands more are shot from helicopters. The goal is not eradication, which few believe possible, but control.

The wily hogs seem to thrive in almost any conditions, climate or ecosystem in the state—the Pineywoods of east Texas; the southern and western brush country; the lush, rolling central Hill Country. They are surprisingly intelligent mammals and evade the best efforts to trap or kill them (and those that have been unsuccessfully hunted are even smarter). They have no natural predators, and there are no legal poisons to use against them. Sows begin breeding at 6 to 8 months of age and have two litters of four to eight piglets—a dozen is not unheard of—every 12 to 15 months during a life span of 4 to 8 years. Even porcine populations reduced by 70 percent return to full strength within two or three years.

Wild hogs are "opportunistic omnivores," meaning they'll eat most anything. Using their extra-long snouts, flattened and strengthened on the end by a plate of cartilage, they can root as deep as three feet. They'll devour or destroy whole fields—of sorghum, rice, wheat, soybeans, potatoes, melons and other fruits, nuts, grass and hay. Farmers planting corn have discovered that the hogs go methodically down the rows during the night, extracting seeds one by one.

Hogs erode the soil and muddy streams and other water sources, possibly causing fish kills. They disrupt native vegetation and make it easier for invasive plants to take hold. The hogs claim any food set out for livestock, and occasionally eat the livestock as well, especially lambs, kids and calves. They also eat such wildlife as deer and quail and feast on the eggs of endangered sea turtles.

Because of their susceptibility to parasites and infections, wild hogs are potential carriers of disease. Swine brucellosis and pseudorabies are the most problematic because of the ease with which they can be transmitted to domestic pigs and the threat they pose to the pork industry.

And those are just the problems wild hogs cause in rural areas. In suburban and even urban parts of Texas, they're making themselves at home in parks, on golf courses and on athletic fields. They treat lawns and gardens like a salad bar and tangle with household pets.

Hogs, wild or otherwise, are not native to the United States. Christopher Columbus introduced them to the Caribbean, and Hernando De Soto brought them to Florida. Texas' early settlers let pigs roam free until needed; some were never recovered. During wars or economic downturns, many settlers abandoned their homesteads and the pigs were left to fend for themselves. In the 1930s, Eurasian wild boars were brought to Texas and released for hunting. They bred with free-ranging domestic animals and escapees that had adapted to the wild.

And yet wild hogs were barely more than a curiosity in the Lone Star State until the 1980s. It's only since then that the population has exploded, and not entirely because of the animals' intelligence, adaptability and fertility. Hunters found them challenging prey, so wild hog populations were nurtured on ranches that sold hunting leases; some captured hogs were released in other parts of the state. Game ranchers set out feed to attract deer, but wild hogs pilfered it, growing more fecund. Finally, improved animal husbandry reduced disease among domestic pigs, thereby reducing the incidence among wild hogs.

Few purebred Eurasian wild boars are left today, but they have hybridized with feral domestic hogs and continue to spread. All are interchangeably called wild or feral hogs, pigs or boars; in this context, "boar" can refer to a male or female. (Technically, "feral" refers to animals that can be

Hog Haven

As many as six million wild pigs are wreaking havoc in some 39 states (their range is in orange), a vast increase since 1982.

MAPS: GUILBERT GATES

LOWER RIGHT: RUSSELL GRAVES

Wild hogs tear up fields and forests by rooting as deep as three feet and eating almost anything (above: Tom Quaca examines porcine damage to a field of bexia grass; below left: bexia roots). Compared with domestic animals, wild pigs (below right) are bristlier and often darker; their tusks grow unimpeded; and their snouts are longer and tipped with tough cartilage for rooting.

traced back to escaped domestic pigs, while the more all-encompassing "wild" refers to any non-domestic animals.) Escaped domestic hogs adapt to the wild in just months, and within a couple of generations they transform into scary-looking beasts as mean as can be.

The difference between domestic and wild hogs is a matter of genetics, experience and environment. The animals are "plastic in their physical and behavioral makeup," says wild hog expert John Mayer of the Savannah River National Laboratory in South Carolina. Most domestic pigs have sparse coats, but descendants of escapees grow thick bristly hair in cold environments. Dark-skinned pigs are more likely than pale ones to survive in the wild and pass along their genes. Wild hogs develop curved "tusks" as long as seven inches that are actually teeth (which are cut from domestics when they're born). The two teeth on top are called whetters or grinders, and the two on the bottom are called cutters; continual grinding keeps the latter deadly sharp. Males that reach sexual maturity develop "shields" of dense tissue on their shoulders that grow harder and thicker (up to two inches) with age; these protect them during fights.

Wild hogs are rarely as big as pen-bound domestics; they average 150 to 200 pounds as adults, although a few reach more than 400 pounds. Well-fed pigs develop large, wide skulls; those with a limited diet, as in the wild, grow smaller, narrower skulls with longer snouts useful for rooting. Wild pigs have poor eyesight but good hearing and an acute sense of smell; they can detect odors up to seven miles away or 25 feet underground. They can run 30 miles an hour in bursts.

Adult males are solitary, keeping to themselves except when they breed or feed from a common source. Females

LOWER RIGHT: RUSSELL GRAVES

Hunters pay extra to pursue "trophy boars" with long tusks, says Lloyd Stewart (above). Some use dogs to track and capture hogs. (Below: Brad Porter outfitted his coon hound, Dan, with a radio transmitter to follow him in the brush.)

travel in groups, called sounders, usually of 2 to 20 but up to 50 individuals, including one or more sows, their piglets and maybe a few adoptees. Since the only thing (besides food) they cannot do without is water, they make their homes in bottomlands near rivers, creeks, lakes or ponds. They prefer areas of dense vegetation where they can hide and find shade. Because they have no sweat glands, they wallow in mudholes during the hot months; this not only cools them off but also coats them with mud that keeps insects and the worst of the sun's rays off their bodies. They are mostly nocturnal, one more reason they're difficult to hunt.

"LOOK UP THERE," EXCLAIMS BRAD PORTER, a natural resource specialist with the Texas Parks and Wildlife Department, as he points up a dirt road cutting across Cow Creek Ranch in south Texas. "That's hog-hunting 101 right there." As he speaks, his hunting partner's three dogs, who'd been trotting alongside Porter's pickup truck, streak through the twilight toward seven or eight wild hogs breaking for the brush. Porter stops to let his own two dogs out of their pens in the bed of the pickup and they, too, are off in a flash. When the truck reaches the area where the pigs had been, Porter, his partner Andy Garcia and I hear frantic barking and a low-pitched sighing sound. Running into the brush, we find the dogs have surrounded a red and black wild hog in a clearing. Two dogs have clamped onto its ears. Porter jabs his knife just behind the hog's shoulder, dispatching it instantly. The dogs back off and quiet down as he grabs its rear legs and drags it back to his truck.

"He's gonna make good eatin'," Garcia says of the dead animal, which weighs about 40 pounds.

The 3,000-acre ranch, in McMullen County, has been in the family of Lloyd Stewart's wife, Susan, since the mid-1900s. Stewart and his hunting and wildlife manager, Craig Oakes, began noticing wild hogs on the land in the 1980s, and the animals have become more of a problem every year. In 2002, Stewart began selling hog-hunting leases, charging $150 to $200 for a daylong hunt and $300 for weekends. But wild hogs have become so common around the state that it's getting hard to attract hunters. "Deer hunters tell us they have a lot of hogs at home," Oakes says, "so they don't want to pay to come shoot them here." The exception is trophy boars, defined as any wild pig with tusks longer than three inches. These bring around $700 for a weekend hunt.

"Most of the hogs that are killed here are killed by hunters, people who will eat them," Stewart says. He'll fly over the ranch to try to count the hogs, but unlike some landowners who are overrun, he has yet to shoot them from the air. "We're not that mad at 'em yet," Oakes chuckles. "I hate to kill something and not use it."

Many hunters prefer working with dogs. Two types of dogs are used in the hunt. Bay dogs—usually curs such as the Rhodesian Ridgeback, black-mouth cur or Catahoula or scent hounds such as the foxhound or Plott Hound—sniff out and pursue the animals. A hog will attempt to flee, but if

cornered or wounded will likely attack, battering the bay dogs with its snout or goring them with its tusks. (Some hunters outfit their dogs in Kevlar vests.) But if the dog gets right up in the hog's face while barking sharply, it can hold the hog "at bay." Once the bay dogs spring into action, catch dogs—typically bulldogs or pit bulls—are released. Catch dogs grab the bayed pig, usually at the base of the ear, and wrestle it to the ground, holding it until the hunter arrives to finish it off.

DOGS SHOW OFF THEIR WILD-HOG SKILLS at bayings, also known as bay trials, which are held most weekends in rural towns across Texas. A wild hog is released in a large pen and one or two dogs attempt to bay it, while spectators cheer. Trophies are awarded in numerous categories; gambling takes the form of paying to "sponsor" a particular dog and then splitting the pot with cosponsors if it wins. Occasionally bayings serve as fund-raisers for community members in need.

Ervin Callaway holds a baying on the third weekend of every month. His pen is down a rutted dirt road off U.S. Route 59 between the east Texas towns of Lufkin and Nacogdoches, and he's been doing this for 12 years. His son Mike is one of the judges.

THE ALIENS AMONG US

Americans are used to many alien species, including rats. Read about the world's 14 worst invasive mammals at smith.hy.pr/invasive, where you can also share this story.

"Here's how it works," Mike says as a redheaded preteenager preps a red dog. "The dog has two minutes in the pen with a hog and starts with a perfect score of 10. We count off any distractions, a tenth of a point for each. If a dog controls the hog completely with his herding instincts, and stares him down, it's a perfect bay. If a dog catches a pig, it's disqualified—we don't want any of our dogs or hogs tore up."

"Hog out," someone shouts, and a black and white hog (its tusks removed) emerges from a chute as two barking dogs are released to charge it. When it tries to move away, a young man uses a plywood shield to funnel it toward the dogs. They stop less than a foot away from the hog and make eye contact, barking until the animal shoots between them toward the other side of the pen. As the dogs close back in, the hog swerves hard into a fence, then bounces off. The smaller dog grabs its tail but is spun around until it lets go. The pig runs into a wallow and sits there. The yellow dog bays and barks, but from maybe three feet away, too far to be effective, and then it loses concentration and backs off. The pig exits through the chute. Neither dog scores well.

Several states, including Alabama, Mississippi, South Carolina and North Carolina, have outlawed bayings in response to protests from animal rights groups. Louisiana bars them except for Uncle Earl's Hog Dog Trials in Winnfield, the nation's largest. That five-day event began in 1995 and draws about 10,000 people annually. (The 2010 event was canceled because of disputes among the organizers.)

But bayings continue to take place on a smaller scale elsewhere, as do bloodier hog-catch trials in which dogs attack penned-in wild hogs and wrestle them to the ground. The legality of both events is in dispute, but local authorities tend not to prosecute. "The law in Texas is that it's illegal for a person to cause one animal to fight another previously wild animal that has been captured," says Stephan Otto, director of legislative affairs and staff attorney for the Animal Legal Defense Fund, a national group based in northern California. "But the legal definition of words like 'captured' and 'fight' has never been established. A local prosecutor would have to argue these things, and so far nobody has."

Many states have outlawed bay trials, in which dogs herd hogs, but the events are held regularly in Texas. Louisiana forbids all but one baying: Uncle Earl's Hog Dog Trials, the nation's largest (below: a dog named Jive competing in 2007).

ALEX BRANDON / AP IMAGES

BRIAN "PIG MAN" QUACA (Tom Quaca's son) paces the floor of his hunting lodge, waving his arms and free-associating about hogs he has known. There's the one that rammed his pickup truck; the bluish hog with record-length tusks that he bagged in New Zealand; and the "big 'un" he blew clean off its feet with a rifle only to see the beast get up and run away. "They're just so smart, that's why I love them," he says. "You can fool deer 50 percent of the time, but hogs'll win 90 percent of the time."

Quaca, 38, began rifle hunting when he was 4 years old but switched to bowhunting at age 11. He likes the silence after the shot. "It's just more primitive to use a bow, way more exciting," he says. As a teen, he eagerly helped neighbors clear out unwanted hogs. Now he guides hunts at Triple Q Outfitters, a fenced-in section of the property his wife's family owns. A customer dubbed him Pig Man, and it stuck. His reputation grew with the launch last year of "Pig Man, the Series," a Sportsman Channel TV program for which he travels the globe hunting wild hogs and other exotic animals.

About an hour before sunset, Quaca takes me to a blind near a feeding station in the woods. Just as he's getting his

JOHN MORTHLAND *writes about the food, music and regional culture of Texas and the South. He lives in Austin.*
Photographer **WYATT MCSPADDEN** *also lives in Austin.*

high-powered bow ready, a buck walks into the clearing and begins eating corn; two more are close behind. "The deer will come early to get as much food as they can before the pigs," he says. "It's getting close to prime time now."

A slight breeze eases through the blind. "That's gonna let those pigs smell us now. They probably won't come near." He rubs an odor-neutralizing cream into his skin and hands me the tube. The feeding station is at least 50 yards away, and it's hard to believe our scents can carry that far, let alone that there's a nose sharp enough to smell them. But as it gets darker, there are still no hogs.

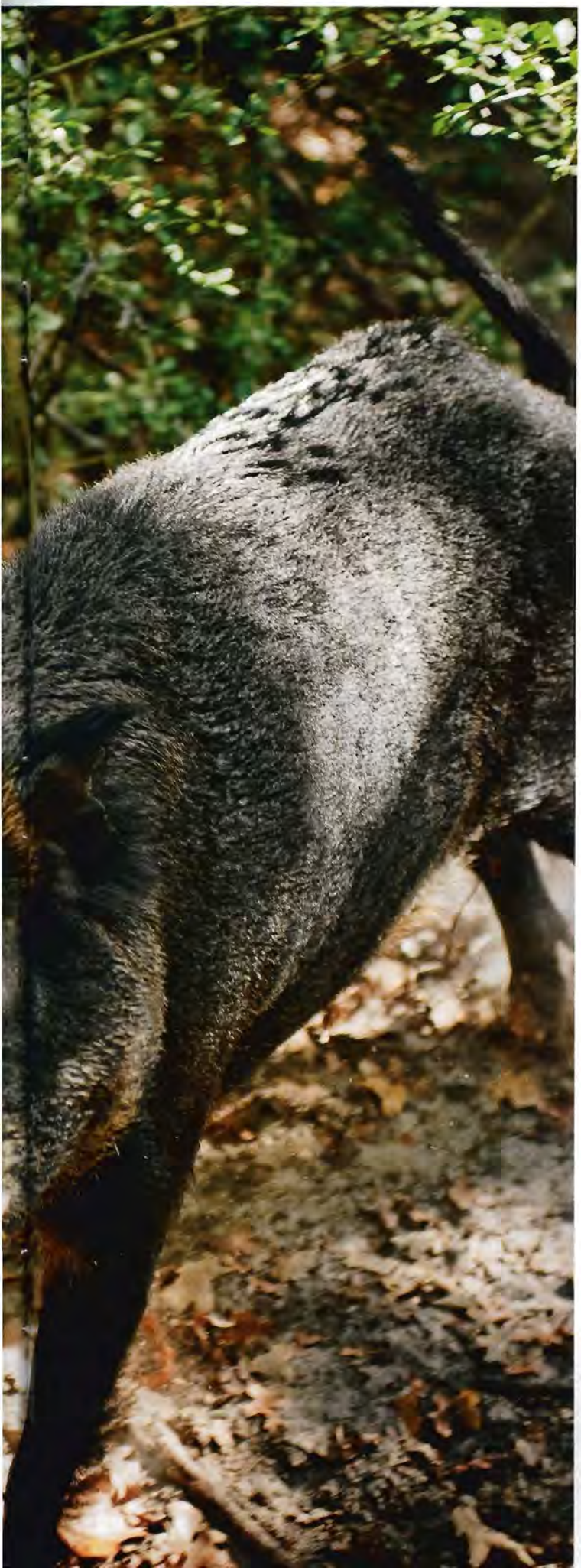
"It sounds like a hog might be over around those trees," Pig Man whispers, pointing to our left. "It sounded like he popped his teeth once or twice. I can promise you there's pigs close by, even if they don't show themselves. Those deer will stay however long they can and never notice us. But the pigs are *smart*."

The darkness grows, and Quaca starts packing to leave. "They won again," he says with a sigh. I tell him I still can't believe such a mild breeze carried our scents all the way to the feed. "That's why I like pigs so much," Quaca replies. "If the slightest thing is wrong—any tiny little thing—they'll get you every time. The sumbitches will get you every time."

The next morning, Tom shows me some flash photographs of the feeding station taken by a sensor camera about a half-hour after we left. In the pictures, a dozen feral pigs of all sizes are chowing down on corn.

TO BE SOLD COMMERCIALLY AS MEAT, wild hogs must be taken alive to one of nearly 100 statewide buying stations. One approved technique for capturing hogs is snaring them with a noose-like device hanging from a fence or tree; because other wildlife can get captured, the method has fewer advocates than trapping, the other approved technique. Trappers bait a cage with food meant to attract wild hogs but not other animals (fermented corn, for example). The trapdoor is left open for several days, until the hogs are comfortable with it. Then it's rigged to close on them. Trapped pigs are then taken to a buying station and from there to a processing plant overseen by U.S. Department of Agriculture inspectors. According to Billy Higginbotham, a wildlife and fisheries specialist with the Texas AgriLife Extension Service, 461,000 Texas wild hogs were processed between 2004 and 2009. Most of that meat ends up in Europe and Southeast Asia, where wild boar is considered a delicacy, but the American market is growing, too, though slowly.

Wild hog is neither gamy nor greasy, but it doesn't taste like domestic pork, either. It's a bit sweeter, with a hint of nuttiness, and is noticeably leaner and firmer. Boasting one-third less fat, it has fewer calories and less cholesterol than domestic pork. At the LaSalle County Fair and Wild Hog Cook-Off held each March in Cotulla, 60 miles northeast of the Mexican border, last year's winning entry in the exotic category was wild hog egg rolls—pulled pork and chopped bell peppers encased in a wonton. But there were far more entries in the barbecue division; this is Texas, after all.



"Being fairly intelligent, wild hogs quickly learn from their mistakes," says John Mayer. "Over time, these hogs can develop into as wild and stealthy an animal as exists anywhere."

"There's not much secret to it," insists Gary Hillje, whose team won the 2010 barbecue division. "Get a young female pig—males have too strong a flavor—50 or 60 pounds, before she's had a litter, before she's 6 months old. Check to make sure it's healthy; it should be shiny and you can't see the ribs. Then you put the hot coals under it and cook it low and slow."

The LaSalle County Fair also includes wild hog events in its rodeo. Five-man teams from eight local ranches compete in tests of cowboy skills, though cowboys are rarely required to rope and tie hogs in the wild. "But we might chase one down, rope it and put it in a cage to fatten it a couple months for a meal," says a grinning Jesse Avila, captain of the winning 2010 La Calia Cattle Company Ranch team.

As the wild hog population continues to grow, Texas' love-hate relationship with the beasts veers toward hate. Michael Bodenchuk, director of the Texas Wildlife Services Program, notes that in 2009 the state killed 24,648 wild hogs, nearly half of them from the air (a technique most effective in areas where trees and brush provide little cover). "But that doesn't really affect the total population much," he adds. "We go into specific areas where they've gotten out of control and try to bring that local population down to where the landowners can hopefully maintain it."

In the past five years Texas AgriLife Extension has sponsored some 100 programs teaching landowners and others how to identify and control wild hog infestations. "If you don't know how to outsmart these pigs, you're just further educating them," says Higginbotham, who points to a two-year program that reduced the economic impact of wild hogs in several regions by 66 percent. "Can we hope to eradicate feral hogs with the resources we have now? Absolutely not," he says. "But we're much further along than we were five years ago; we have some good research being done and we're moving in the right direction."

For example, Duane Kraemer, a professor of veterinary physiology and pharmacology at Texas A&M University, and his team have discovered a promising birth control compound. Now all they have to do is figure out a way to get wild hogs, and *only* wild hogs, to ingest it. "Nobody believes that can be done," he says. Tyler Campbell, a wildlife biologist with the USDA's National Wildlife Research Center at Texas A&M-Kingsville, and Justin Foster, a research coordinator for Texas Parks and Wildlife, are confident there must be a workable poison to kill wild hogs—though, once again, the delivery system is the more vexing issue. Campbell says the use of poison is at least five to ten years away.

Until then, there's a saying common to hunters and academics, landowners and government officials—just about anyone in the Southwest: "There's two kinds of people: those that have wild pigs and those that *will have* wild pigs." ○

Fish & Fishing

Chumming for Feral Hogs

article and photos by Dr. Billy Higginbotham (except where noted)
Professor and Extension Wildlife and Fisheries Specialist
Texas AgriLife Extension Service

Editor's Note: Much of Texas is so parched that Fish & Fishing columnist Dr. Billy Higginbotham is on dry land this month, telling us how to chum — not for fish — but for feral hogs.

photo by Wyman Meinzer

Hogs are headed your way. Texas' feral swine number some two million, found in at least 230 counties, from the Piney Woods to the Trans-Pecos.

In Texas, I maintain there are but two kinds of landowners: those with feral hogs and those about to get feral hogs! Populations have exploded in the Lone Star State over the past two decades. I was recently asked how many feral hogs call Texas home. My response was "too many!"

In reality, the best "guesstimates" puts the state's population at somewhere between 1.5 and two million of the critters. Populations occur in at least 230 of our 254 counties, as the hogs have spread rapidly to the west and north.

But Texas is not alone. Many other states have experienced increases in feral hog populations. Their range has also increased substantially — from 19 states in the late 1980s to 40 states today. Nationwide estimates fluctuate, but the total population probably falls somewhere between four and five million head.

I often tell landowners they can have a significant hog presence on their properties, yet never actually see one. However, if the landowner sees sounders of hogs moving about during daylight hours, they are truly in the feral hog business.

What's a landowner to do? Time is of the essence. Whenever feral hogs are seen, their sign is observed or their damage becomes apparent, it's time to take action.

We do know that with current technology feral hogs are not going to be eradicated for the long-term. Nevertheless, a 2006-07 Texas feral hog abatement study did show that we can significantly reduce the agricultural damage that feral hogs cause.

In most cases, the best course of action for landowners is to begin with a trapping effort. However, there are right and wrong ways to trap feral hogs. In fact, going about trapping the wrong way can not only lead to frustration but also give those hogs the equivalent of a Ph.D. in trap avoidance.

Were you ever lucky enough to stumble onto that magical fishing hole where the fish had never encountered a fish hook in their entire lives? Even a rank neophyte angler can look like Jimmy Houston under those conditions. Trapping hogs is no different.

For those areas where hogs have not had negative encounters with humans and/or little or no trapping has been done, you can get away with a lot. However, try those same techniques with hogs that have been hunted, dogged or even trapped and re-released, and you are dealing with a completely different species.

How can landowners stack the odds in their favor when dealing with this super intelligent animal? There are a number of different techniques that lead to trapping success, but one of the most important is pre-baiting — or what I like to call chumming for feral hogs. But remember, trapping feral hogs is a process, not an event.

It is important to begin the process of trapping as soon as hog damage is noted or when hogs are sighted on the property. Females become sexually mature at six to eight months of age and can have their first litter before their first birthday. Delays in control efforts will only lead to more hogs, which mean more problems.

If open pastures or crop fields are the sites of initial damage, I seldom start chumming right where that damage occurred. Rather, I like to back track the marauding hogs to their daytime cover and begin chumming with shelled corn at or near a location that is trap friendly. Part of that site selection process should include access for a vehicle and trailer, if hogs are to be loaded and moved from the capture site for slaughter or sale to a processor.

In some cases, the chum site is predetermined (i.e. deer feeder), but always check state game agency regulations to make sure baiting/chumming is allowed. Many trappers start the chumming process with shelled corn. However, if the bulk of this bait is being consumed by non-targets such as deer, crows, or raccoons, switch to another chum such as fermented corn, rice or milo — the smellier, the better!

Along with this initial chumming step, employing the use of a remote-sensing camera eases the task at hand. Although you can make on-site observations of corn consumption and check for other signs such as tracks, having a camera recording 24/7 to monitor hog response to chum is a big help.

The question that always comes up with cameras is whether models with infrared features are necessary to avoid spooking the hogs with a flash. In my experience, the flash is not a deterrent on the

larger traps that I employ. However, on a smaller trap, the camera should be positioned a comfortable distance away, yet close enough to reliably trigger and capture the action.

In addition to confirming hog response to chumming efforts, the camera will also reveal the approximate number of hogs in the sounder. That speaks volumes as to the size of trap that will be needed to do the job. Also, most cameras record both the dates and the times of events, so it is helpful to know just when those visits occur.

Once the hogs are responding to bait, you can then assemble or position a trap of the appropriate size in that area. Continue chumming, since it may take another week for the hogs to become accustomed to the trap itself.

Speaking of appropriate trap size — bigger is usually better. I want to maximize the distance from the gate opening to the trigger mechanism so as many of the porkers as possible are inside before the first one trips the trigger that closes the gate. That is best accomplished with a larger trap. If you catch two hogs and six are still standing around outside of the trap when you arrive to check it, your trap was too small.

I am not going to go into all the subtleties of trap design for the purposes of this article. Just remember that it is better to err on the big side and use panels with four-inch square mesh to retain all hogs caught.

Reinforce the trap well with T-posts, since trapped hogs act much differently when you are 150 yards away versus when you wheel up next to the trap. Include sides at least five feet tall and avoid 90-degree corners that are not covered. Hogs use corners like you and I use a ladder — they will go up and over and be gone forever once you approach inside their comfort zone.

Likewise, I am not going to dwell too much on gate design. Rooter gate or saloon door? How about those trap designs that use no gate at all? Pick one you have confidence in; your remote-sensing cameras will reveal much about gate efficiency. At this stage, the gate or opening should be wired open; it's still too soon to think about the actual act of trapping. Additional information on trap and gate designs can be found at the website http://feralhog.tamu.edu.

In addition to the week often needed for the hogs to become accustomed to the trap's presence, another week may elapse

Pre-baiting begins at a freshly damaged site.

Day five: Chumming and monitoring by remote-sensing camera reveals the number of hogs in the sounder. One hog has entered the trap.

before the hogs actually enter the trap itself. Corn or other chum should always be poured from outside with a trail leading to the inside and on towards the back of the trap where the gate trigger is located.

Once the first hogs enter the trap, it may take an additional week or more for the majority of the sounder to regularly begin going inside to feed. Continue to monitor your camera during pre-baiting, or rake areas smooth inside the trap, and watch for tracks if a camera is not being employed.

As you can see, it is not uncommon for at least a couple of weeks to elapse from initial pre-baiting until hogs are regularly entering the trap. Again, pressured hogs will be much slower to respond — and those that have experienced the inside of a trap before may not ever enter a second time.

One incident that comes to mind involved a large and previously trapped boar that was found guilty of gobbling peaches by breaking scaffold limbs off trees in a commercial orchard. It took three months of nightly visits before he entered the trap and earned his one-way ticket to hog heaven.

Once pre-baiting is successful and the hogs are routinely entering the trap, cap-

ture becomes a relatively simple matter. If you have prepared everything correctly up to this point, the actual trapping phase itself becomes a slam dunk. Set the gate to trip, and be prepared to wrangle hogs!

The camera should continue to record during the actual trapping phase. One picture is worth a thousand words when it comes to determining how many members of the sounder were actually inside the trap when it tripped. Were some hogs still outside when the gate was tripped, or were they AWOL that particular night? A quick count of the captured hogs reveals how many more you have to go.

Again, wire back the gate or trap opening, and begin the pre-baiting process if 100-percent capture was not achieved. If you were successful at catching the entire sounder, remain vigilant and scout for sign; sooner or later more hogs will drift in to cause more mayhem.

Enlist the help of your neighbors. Your hog problems will likely become their hog problems. Working cooperatively allows you to impact hog populations over a much larger area. But remember, with current technology, we are not going to totally and forever eradicate feral hogs.

Trapping hogs is a process that begins with chumming. If you have ever been disappointed when you set a hog trap one day and didn't catch hogs the next, now you know why. Chumming, the right equipment set in the right location, and patience on your part make for a successful hog trapping formula.

Day 11: All hogs in sounder now entering and feeding in the trap.

Day 14: Gotcha! The entire sounder has been trapped.

Tear-drop trap design eases the loading process.

TEXAS WILDLIFE

Magazine of the Texas Wildlife Association

November 2009 Volume 25 - Number 7

Working for tomorrow's wildlife ... TODAY!

X. Wild Pig FAQs

Frequently Asked Questions-Wild Pigs

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1- How many they average per litter and how often they can breed in a year?

The wild pig is the most prolific large mammal on the face of the Earth—but they are not "born pregnant"! The average is between 5 and 6 pigs per litter. Sows have approximately 1.5 litters per year. Are more litters per year and larger litter sizes possible? Absolutely yes! However, I am using long-term averages, not what can occur under ideal conditions –which usually unsustainable over the long haul. Young females do not typically have their first litter until they are 13+ months of age, even though they can be sexually mature at 6 to 8 months of age or even earlier in some cases.

2- What is the average lifespan of a wild pig?

Mortality rates vary greatly-impacting the very young and the very old primarily. Predation is not a big issue once they reach about 10 to 15 pounds. Hunting can be a significant mortality factor in some regions but generally is not enough to offset population growth. Depending on a variety of these factors, plus disease, vehicle collisions etc., average lifespan is probably between 4 and 8 years of age. The Texas A&M AgriLife Extension Service surveyed landowners in 2011 to determine an estimate of how many wild pigs are removed from the Texas landscape each year. We estimated 753,646 wild pigs were removed by landowner-initiated efforts in 2010. This will help refine rate of population growth and population estimate models even more.

3- How heavy can they grow to?

Weights depend on genetic background and food availability. Generally, males can reach larger weights than females but this is not a hard and fast rule. Average weights vary but run 200 pounds for adult males and 175 pounds for adult females. A 300 pound feral hog is a large pig. The unusually large weights of 500 pounds + occasionally reported in the media are very rare.

4- What is the power of their bite? What other animal can it be likened to in that regard?

They have extremely strong jaws to crack open hard-shelled nuts such as hickory nuts and pecans. As they predate upon or scavenge animal carcasses, they can easily break bones and often consume the entire carcass, often leaving little if any sign behind.

5- How strong is their sense of smell?

6-

The wild pig's sense of smell is well developed (much better than both their eyesight and hearing) and they rely strongly on it to detect danger and search out food. They are capable of sensing some odors 5-7 miles away and may be able to detect odors as much as 25 feet underground! Appealing to this tremendous sense of smell is often essentially as fermented or scented baits can provide additional attraction to make them more vulnerable to trapping.

7- What are their eating habits, and how much they eat in a day?

Wild pigs are opportunistic omnivores, meaning they feed on plant and animal matter in addition to being able to play the role of a scavenger. They are largely indiscriminant in their feeding habits and eat both vertebrate and invertebrate animals. Approximately 85% to 90% of their diet is believed to be composed of vegetation (including crops where available) and 10% animal matter. Small pigs may eat approximately 5% of their body weight daily; larger pigs an estimated 3 % of body weight.

8- Do you have any documented proof of their violent nature? (Newspaper clippings)

Ample documentation exists of wild pig-human encounters. However, the likelihood of a human being impacted by a hog/vehicle collision or disease risk—while still low is greater than an actual physical attack by a wild pig. Where the rare wild pig attack occurs, it is usually during a hunting scenario where dogs are used to bay or corner a pig in a spot and the pig "runs through" the associated hunters standing nearby. Occasionally, humans inadvertently walk between a sow and her litter and the sow reacts to protect her young. Totally unprovoked attacks outside of these two scenarios are rare. Given a choice, wild pigs usually flee rather than fight. However, U.S. newspapers report from 5 to 7 human fatalities each year.

9- If impaled by a wild pig's tusk, what disease could you get from one?

Most likely, a human would be subject to an infection just as you would from suffering any deep cut or abrasion from any unclean surface.

10- How fast can they run and high can they jump?

Wild pigs can run up to 30 mph. They can jump over fences less than 3 feet high and have "climbed" out of pig traps with walls 5 to 6 feet high.. Therefore, traps with 90 degree corners must be covered on top because the pigs tend to pile up in that corner and literally climb over each other-- and the corner gives enough leverage for them to go over the top. Either use a 5 foot high trap with no corners (circular or tear-drop shaped) or cover the corners/top of the trap.

11- How do they sleep? (habits…i.e. burrow a den? Standing up?)

Wild pig can simply lie down and sleep, usually on their sides. They will actually construct "nests" that they use for sleeping as well as farrowing. Some are very simple depressions and others can be quite elaborate. Oftentimes, they simply seek out thick underbrush for security or root into a brush pile or downed tree top for security. In the hot months, they will often lie in mud and/or seek deep shade.

12- How hard they are to kill?

How hard are they to kill with what? Very hard with a sling shoot or BB gun! Seriously, most archers shoot wild pigs in the heart /lung region immediately behind the shoulder from broadside or at a slightly quartering away angle. Hunters using firearms are advised to shoot the pigs in the neck or in the vitals (heart/lung region). Preferred rifles for pigs are 25 to 30 caliber. Regardless of the caliber/weapon, shot placement is essential for a clean and ethical kill. Archers typically limit their shots to 25-30 yards to help ensure a clean kill.

13- What other animal would you liken their intelligence level to, and ability to learn to avoid traps?

Wild pigs are one of the most intelligent species (exotic or native) found in the United States. They learn to avoid danger very quickly and "half-hearted" attempts to control them just make them less susceptible to future control efforts. They respond to human pressure via avoidance.

14- What is the average cost of property damage they inflict in Texas? Total cost of annual property damage?

A 2004 survey conducted by Texas A&M AgriLife Extension Service placed annual damage to agriculture in TX alone at $52 million with an additional $7 million spent by landowners to attempt to control the pigs and/or correct the damage. This is indeed a very conservative estimate. Other researchers suggest that damage per pig per year averages $200-- but the problem there is that the assumption is made that a 40 pound pig causes as much damage as a 300 pound pig, which is unlikely. The total pig population in Texas has been estimated recently (2011) at 2.6 million. However, estimates for the United States population as a whole are non-existent but "guesstimates" place that number between 4 million and 8 million animals. Some reports estimate total damage in the U.S. may be $1.5 billion annually— However, these damage estimates are in part based on population estimates—but again, a figure we don't have a good handle on nationwide.

15- Do they use the same trails to get from pace to place? If so, why?

Wild pigs are creatures of habit and will use the same bedding/resting areas and feeding areas as long as the food source remains available. However, they are capable of moving great distances to find food. Human disturbance/pressure will make them alter their patterns of movement. They do have some affinity to their "home range" which can vary from a few hundred acres to several thousand acres based on food availability and pressure. A 2011-12 telemetry study of adult female wild pigs in east Texas resulted in home range estimates of approximately 2 square miles, or 1,000 -1,200 acres.

16- What so they do to damage trees specifically?

The most sensitive environmental areas wild pigs damage are wetland areas and they can alter the vegetative community present. They compete with native wildlife for hard mast (e.g., acorns from oak trees). Their rooting can accelerate leaf litter decomposition causing the loss of nutrients which can impact seedling survival of trees. Their rooting behavior can damage seedling tree growth and survival. Longleaf pine seedlings seem to be especially vulnerable to wild pigs. Research suggests that the pigs may actually root up seedlings of various tree species and chew the root system to obtain nutrients. They rub against individual trees (pines) that are capable of producing a lot of rosin (presumably as they rub to remove ectoparasites on their skin). Rubbing of selected pine trees has resulted in girdling of some mature trees which can eventually kill the tree.

17- Are older boars loners? If so why do we think that?

If you see a large wild pig traveling alone, 101 times out of 100 it is a boar. The mature boars become more solitary, or sometimes travel with a small number of other large boars. They only join up with sounders when a sow comes into heat.

18- When does a sow abandon its litter and when do they separate?

Within a few days of giving birth, a pregnant sow will leave the group in order to farrow. They may remain apart for 2 to 4 weeks then rejoin the group. They really don't "abandon" their litter over time. A "sounder" is a family group of pigs made up of sows (typically related via about 3 generations) and their piglets. Pigs are completely weaned by about 3 months of age, although they have been observed eating solid food (e.g., corn) at as young as 2 weeks of age. About 80% of the yearling females remain with the sounder and the rest disperse. Young males disperse from the sounder at about 16 to 18 months of age. There is some research that supports the idea that sounders can become territorial--but not the individual pigs.

19- What kind of damage are they capable of on a wire fence?

Wild pigs do a great deal of damage to net wire fences which are generally used to confine sheep and goats. They tear them up or lift them up off the ground to gain access and therefore leave "holes" that sheep and goats can pass through.

20- What kind of foods are they most attracted to when trying to trap them?

One size does not fit all when it comes to baits. However, research by Dr. Tyler Campbell with USDA-APHIS/WS suggests that wild pigs are attracted to baits that have a sweet pungent odor, such as strawberry or berry flavorings. Hence, you will see several commercial "pig baits" that contain some type of strawberry flavoring based on this research. Many baits will and have worked and landowners are encouraged to vary baits among traps to find out what pigs find most attractive at a particular location or season. However, the more abundant the food supply, the more difficult it is to attract pigs to these baits. Shelled corn is often used, but landowners have also been successful by fermenting corn, milo, rice, oats, etc. to increase the odor attraction. Old fish grease, catfish "stink" baits and overripe fruit and vegetables have also been used successfully. Others have used maple syrup on corn. Some recent research in the southeast has indicated that while catch rates were no different between shelled corn and soured corn, although we do know from experience that non-target species (e.g., raccoons, deer, crows) use of shelled corn will be much higher than a soured grain product.

21- We seem to hear a lot of "things were fine until a year ago" remarks by people with wild pig issues. Why the seemingly sudden boom in population and fearless invasion of residential neighborhoods?

I once made the comment that "There are but 2 kinds of landowners in Texas: Those with wild pigs and those that are about to have wild pigs". They have steadily increased their range by moving northward and westward over the past 25 years. They have also gone from being a rural land/agriculture issue to an urban/suburban issue as well by moving into these more populated areas that are adjacent to adequate habitat that provides cover, security and food. Why the population explosion over this time? Several reasons converged to create the "perfect storm" resulting in the boom. 1) Indiscriminant stocking to new habitats by landowners and hunters facilitated rapid increase—pigs cannot fly but they can be trailered and released. This was done regularly (–DESPITE BEING ILLEGAL) in the 1970's thru the 1990's—and the stockings were very successful at re-establishing wild pig populations across the state. 2) Supplementing non-migratory wildlife (deer, turkeys quail etc.) is legal in the state of Texas. For example, an estimated 300 million pounds of shelled corn are fed to deer annually in Texas. However, non-target species (e.g., wild pigs, raccoons) get their fair share of this supplement. As a result, the sows that are on this higher nutritional plane because of their access to the unintended supplement allows sows to produce more eggs, have larger litters and have more pigs in their litters survive. 3) Wild pigs are the most prolific large mammal on the face of the earth. They are not "born pregnant", but their high intrinsic (built-in) rate of increase when environmental conditions are favorable can allow for rapid population increases. Population increases are not just a Texas phenomenon—for various reasons, populations have expanded in many states and now some 48 states have established wild pig populations.

22- Where do they originate from?

Pigs were domesticated some 8,000 to 10,000 years ago. There are believed to be multiple areas of origin in both Europe and Asia. Polynesians brought domesticated pigs into the Hawaiian Islands around 700 A.D. The first pigs were brought into what is now the continental U.S. into Florida in 1539 by Hernando de Soto. Explorers used these pigs as a traveling food source. After wandering around the southeastern United States in search of gold, his exploration party brought 700 pigs into what would become Texas in 1542.

23- What's the difference between a pig, hog and a boar, and are their different species?

All are descendants of a common ancestor-the Eurasion wild boar. The term Wild boar is typically used to describe Eurasian wild boar from Europe or Asia. Feral hogs are those that originated from domestic breeds but may be the result of a few or many, many generations in the wild. In the U.S., the best descriptor is probably to refer to them simply as wild pigs. Regardless, the Eurasians and domestics gone feral are largely the same species and therefore will interbreed with no problems resulting in all sorts of "hybrids" between the 2 groups. None of these should be confused with the javelina, a native pig-like mammal found in the American southwest that is not even closely related to wild boars/wild pigs/feral hogs.

24- Is there any use their bones, tusks or hair have in objects? (brushes, jewelry, leathers, etc.)

None that I know of. Their meat is consumed by humans. In fact, from 2004-2009, some 461,000 wild pigs captured in Texas were federally inspected and commercially processed for human consumption in the U.S., Europe and Asia.

25- Is it true that they use of mud as sun screen and to keep them cool? Does the mud help them with anything else?

Pigs have no functioning sweat glands and therefore they can be sensitive to high temperatures. During hot weather, they typically are associated more with cool shady places with water sources and tend to confine their movements at night when temperatures cool down. I don't agree that they are using mud as a sunscreen as much as they are using it to cool off in order to remain comfortable...

26- Do sows ever eat their young?

Never say never-- but I would not term it as "common or routine behavior". There are instances where they have been known to scavenge on pig carcasses.

27- How do they interact with other animals? Any they hang with or avoid?

Most other wildlife species don't associate with wild pigs. The less mobile (lizards, toads, snakes) may end up being their next meal, while others (e.g., white-tailed deer) typically vacate the immediate area when wild pigs show up. They can be competitors with native species for certain food supplies such as acorns and limit the availability of those food sources for less aggressive native species.

28- Are there methods of communication with each other and how loud is their squeal. Would squealing act as a warning to other pigs of danger?

Squeals can serve as a means of communicating (between sows and young, as a warning between wild pigs competing over a food source or as a danger warning to other pigs).

29- Is Swine Flu a legitimate danger from wild pigs, and how abundant is it? (i.e. 1 out of every 10 pigs can spread flu…?)

NO-Wild pigs do not cause swine flu.

30- What is the estimated population of wild pigs in all the United States?

We do not have estimates based on scientific data for the entire U.S, we have guesstimates. Most experts would agree that it is somewhere between 4 million and 8 million animals but this estimate is not based on good data. There is a real need to conduct surveys to establish baseline population data. In Texas at least, these data do exist from 8 studies and thru the use of Geographic Information Systems (GIS) an estimate has been made at 2.6 million head. We are also getting a handle on the Texas wild pig population rate of population growth. Based on recent studies, we estimate that annual population growth in Texas is approximately 18-21%. At that rate (if left unchecked), the population would take about 5 years to double in size. However, collectively we are doing everything in our power to make sure the population is not left unchecked.

31- What is the estimated world population of wild pigs?

Some countries in Europe and Asia feel they have a better handle on their total populations of pigs and some of these census techniques are just now being employed in the U.S.

32- What is the estimated annual dollar amount of destruction caused by wild pigs in the entire U.S.?

Some reports place the total damage figure as high as $1.5 billion in the U.S. annually. That is based on a damage estimate of approximately $200 damage per wild pig hog per year and the pig population of 6 million animals. However, if the population estimates (guesstimates) are wrong-- so is the total damage estimate. Again, that assumes that all pigs cause the same amount of damage, which is untrue based on their size as well as where they live (e.g., lower value rangeland vs. higher value cropland).

33- Is there some kind of census about the nation's wild pig population? What we're trying to find is how fast the population has grown, and at what rate they are continuing to grow.

No, there are guesstimates of from 4 to 8 million but researchers are working on finding better methods to estimate populations by state so we can gain a better handle on the total U.S. population. Anything you read in print right now on total U.S. populations is a pure guesstimate that is not based on scientific data. Our research work resulted in an estimated Texas population of about 2.6 million animals as of 2011.

34- When were wild pigs introduced to our soil?

1539-- In what is now Florida by Hernando de Soto. These 13 pigs were originally domestics released to be used as a future food source by the explorers. De Soto captured these particular pigs in Cuba and brought them into what is now Tampa Bay, Florida. Obviously there were some escapes during the exploration and these pigs became the seed stock for future wild pig/feral hog populations. The wild pig herd that accompanied De Soto's party increased to approximately 700 head by the time the exploration entered into what is now Texas in 1542.

34. Number of professional wild pig eradication companies in Texas?

We have no way to track these companies. A number of individuals do offer control services in the state and can be found via internet searches. Those that trap pigs usually retain the right to them market them to a buying station for processing or sell males (boars and barrows) to hunting preserves. Several helicopter services offering aerial hunting for wild pigs are also operating in Texas.

35. Where are the worst damage problems in Texas?

Anywhere we have wild pig populations we seem to have problems. From an agriculture standpoint, cropland damage results in higher economic impact than rangelands or pasturelands. More recently, damage to greenscapes in urban and suburban settings have resulted in considerable economic impacts as well.

36. How many pigs are caught each year?

The Texas A&M AgriLife Extension Service surveyed landowners in the Spring of 2011 to determine how many pigs they removed by all legal means from the Texas landscape in 2010. A total of 697 survey respondents controlling 1.8 million acres from 137 Texas counties removed 36,646 pigs in 2010. Trapping represented 57% of the total and shooting 35%. Dogs removed 6% of the total

and snares removed just 2%. Of the "shooting" category, only 11% of the total pigs removed were taken by hunters.

Based on this survey, we estimate 753,000 wild pigs are removed each year. We also know that from 2004- 2009, 461,000 hogs were federally inspected prior to slaughter at TX processing plants. These pigs were generally trapped then sold to buying stations. However, this is only a percentage of the pigs kept for home use or taken by hunters. Several studies suggest that annual hunter harvest averages 24% of the population--but these data are also lacking. It takes between 50% and 70% of a population to be controlled annually just to hold the numbers stable from one year to the next (Our population model suggested 66% had to be removed to hold the population stable). Therefore, recreational hunting alone cannot keep a population in check.

37. What diseases do they carry and are they harmful to other animals?

Approximately 15 diseases can be carried by wild pigs. However, swine brucellosis and pseudorabies are two examples of diseases of concern. Recently while testing wild pigs for brucellosis, researchers at Texas Tech documented the presence of tularemia in a large number of hogs tested. Tularemia can be transmitted to other animals and humans, Pseudo can be transmitted to other animals and swine brucellosis can be contracted by humans. Our recommendation is whenever you are field dressing hogs, use proper precautions (latex gloves and eyewear). Obviously, the biggest threat is disease transmission to domestic swine herds.

38. What are the different species of pigs typically found in Texas?

There is but one species (Sus scrofa) in the United States-- but many breeds are involved as most of our wild pigs today are originally from domestic stock. There are about 8 species of hogs in the genus Sus (think of them to 2nd cousins to our wild pigs) but about 18 subspecies of Sus Scrofa (1st cousins) found worldwide. All of our modern domestic breeds as well as our wild pigs originated from a common ancestor-the Eurasian wild boar that was first domesticated some 8,000 to 10,000 years ago in Europe and Asia.

39. Are inroads being made in the wild pig problem?

Our Texas AgriLife Extension Service 2006-07 study clearly showed that we can reduce the economic impact of wild pigs on agricultural enterprises by 66%. That does not mean we significantly reduced the total population— However, it does show that concerted control efforts can abate damage significantly. Excellent research is being conducted investigating the use of

both contraceptives and toxicants that could lead to additional tools for control in the future.

40. Do Texans understand the severity of the problem?

At one time, the wild pig issue was strictly considered to be an agriculture/rural issue in Texas. However, over the last decade, wild pigs have increasingly impacted urban/suburban areas of the state—including all the major cities, by damaging greenspaces (i.e., lawns, parks, sports fields) and by increases in vehicular collisions causing damage to vehicles and in some cases humans. More urban Texans are now aware of the issues relative to wild pigs.

41. Does the nation/Washington D.C . understand the severity of the problem?

At an Invasive Species Conference held in Washington D.C in 2010, several presentations were made regarding wild pigs and their impacts. So, efforts are being made to spotlight the issue in not only Texas but also in the other 46 or so states they now inhabit.

42. What are the wild pig's habitat preferences?

Typically, wild pigs will seek out the heaviest cover near water they can find where they are not harassed, then range out from there to feed. The habitats vary greatly across the range of the feral hog in the United States and even in Texas—from fairly arid regions in south Texas and the trans-Pecos of west Texas all the way to the heavily forested pineywoods and wetlands in eastern Texas. They must have sufficient food, water, cover and living space. If one or more of these requirements are not met, they can be extremely mobile and move to new areas that meet all of their habitat needs.

43. What impact do wild pigs have on our deer population in Texas?

Deer hunting in Texas is annually a $2.2 billion industry. Wild pigs impact white-tailed deer in 3 ways: 1) they compete (and often out-compete) deer for native mast (e.g., acorns) as a food supply in the Fall, 2) they compete for supplemental food sources (forages, corn fed as bait for hunting and protein supplements) that are meant for deer. We feed 300 million pounds of shelled corn annually in TX, with a good portion of that feed going to non-target species such as raccoons and wild pigs. Last Fall, shelled wildlife corn had a retail cost of $20 per 100 pounds. We are making our wild pig population larger by feeding white-tailed deer where they share habitats. Now, this is Texas and we are not going to stop feeding deer, so we need to exclude feral pigs from deer feeders. The Texas A&M AgriLife Extension Service and TAMU-Kingsville conducted a study in 2009 that showed that feeder pens at heights of 28" and 34" effectively denied wild pig access to supplement without significantly impacting deer access. Cost per circular feeder pen is about $170

for six 16' panels x 34" and 12 t-posts, and 3) deer don't tolerate pigs very well and typically vacate the immediate areas when pigs show up at feeder locations/stations.

44. Which trap doors work best?

Recent research in Alabama and confirmed in Texas has shown that continuous catch doors (saloon, rooter and swinging door gates) do not continue to catch additional wild pigs once the door is tripped. Therefore, the use of drop (guillotine) gates can be added to the list of effective trap doors or gates. Current research in Texas is also being conducted on the width of gate openings. Camera data previously suggested that many adult pigs have an aversion to entering narrower (<3 feet) gate openings. However, research findings have not confirmed this. Regardless, wider gates may reduce the training time necessary for adult wild pigs to enter traps.

45. Are all traps the same?

Recent research in Georgia has shown that the catch rate in corral traps is 4 times higher than in box traps. Also, boars have exhibited an aversion to entering the smaller box traps. Additional Alabama research found that boars spent an average of 32 minutes per visit to a bait/trap site while sounders spent 70 minutes per visit on average. Also, sounders made twice as many trips to the sites as compared to boars. In Oklahoma, researchers caught more pigs per unit of effort using drop nets as compared to corral traps. They are currently investigate the effectiveness of a "hybrid" trap that combines the attributes of a corral trap and drop net. Regardless, one study showed that 73% of pigs that were trapped and marked were recaptured at a later date. Lastly, one study found that 10 of 12 traps (83%) captured additional pigs within one week of pigs being euthanized in the traps. This suggests that blood left in a trap is not necessarily a deterrent to other pigs.

46. If I capture wild pigs in a trap, what can I do with them?

In Texas, landowners/trappers can hold live wild pigs for up to 7 days. If they plan to hold them longer than that, the Texas Animal Health Commission (TAHC)must inspect and approve the holding facilities being used. According to TAHC regulations, females can be sold to permitted buying stations (check the TAHC website for a complete listing of these facilities) found across the state, which is a good method of recouping part of one's trapping and damage repair costs. Male wild pigs can be sold to a permitted buying station or a permitted hunting preserve. Of course many landowners/hunters/trappers prefer to process the wild pig for home consumption.

47. What are some other sources of information on wild pigs?

Three websites that can provide additional information include:

Texas A&M AgriLife Extension's wild pig website:
http://feralhogs.tamu.edu

National Wild Pig Community of Practice website:
www.extension.org/feral_hogs

Texas A&M AgriLife Research and Extension Center-Overton
http://overton.tamu.edu

XI. WEBSITES

Coping With Feral Hogs
http://feralhogs.tamu.edu

Wild Pig Community of Practice
http://www.extension.org/feral_hogs

Texas A&M AgriLife Research & Extension Center-Overton
http://overton.tamu.edu

XII. APPENDICES

United States Department of Agriculture
Food Safety and Inspection Service
Washington, D.C. 20250

Mr Aaron Sumrall
AgriLife Extension/
Texas A&M System
11 Carrier Avenue
Post Office Box 1086
Shepherd, Texas 77371

DEC 29 2009

RE: FOIA-2010-00068
Slaughtered Swine Totals

Dear Mr. Sumrall:

This letter is in response to your Freedom of Information Act (FOIA) request dated November 17, 2009.

In responding to a FOIA request, the Department of Agriculture's Food Safety and Inspection Service (FSIS) search will include responsive records in its control on the date the search began.

You requested the number of processed/slaughtered feral swine at locations requiring federal permit in the state of Texas, over the past six to eight years Your request is granted in full Below are the totals for the respective years.

- 2004: 34,884
- 2005 94,113
- 2006. 82,624
- 2007 82,232
- 2008: 131,040
- 2009 36,018

Your FOIA request, including your identity and the information made available, is releasable to the public under subsequent FOIA requests. In responding to these requests, FSIS does not release personal privacy information, such as home addresses, telephone numbers, or social security numbers, all of which are protected from disclosure under FOIA Exemption 6.

Thank you for your interest in FSIS programs and policies

Sincerely,

Rene Cardwell
Deputy Director
Executive Correspondence
and Issues Management Staff

Texas Approved Feral Swine Holding Facilities

County	Region	Facility Name	Address	City	Zip	Telephone
Angelina	4	Hogs Gone Wild - Angelina County	652 Coach Redd Road	Lufkin	75901	
Atascosa	5	Mike Simmons Feral Swine	3030 County Road 303	Jourdanton	78026	830 570 0181
Baylor	3	Cody Dickson	Ogden Road/Tomanek Dr	Seymour	76380	940 631 5044
Baylor	3	David Scott	Hwy 277/FM 422	Seymour	76380	940 733 5335
Bee	5	Bee County Holding Facility	3782 County Road 313	Beeville	78104	512 554 1518
Bosque	6	Lampmans	109 County Road 1296	Morgan	76671	254 775 4274
Brazoria	2	Angela Danford	3028 County Road 244	Brazoria	77422	979 482 1851
Brazoria	2	Ray Moyle	4502 FM 1462	Rosharon	77583	281 451 6209
Callahan	6	Davey Crockett	4172 Hwy 36E	Baird	79504	325 669 0893
Callahan	6	Hamby Buying Station	3198 County Road 103 North	Abilene	79601	325 725 6813
Callahan	6	Reed Feral Swine	16201 County Road 421	Cross Plains	76443	325 660 9805
Cass	4	Hoggs Gone Wild - Cass County	3813 FM 96	Atlanta	75551	903 826 0162
Cass	4	Hogs Gone Wild, Cass Co South	Hwy 155 East	Avinger	75630	903 353 1104
Cherokee	4	Hogs Gone Wild - Cherokee County	691 County Road 3222	Jacksonville	75766	903 393 5977
Childress	1	Karl Tasko Wild Hog Buyer	16949 FM 268	Childress	79201	940 585 7475
Clay	3	Widgy Brown	#1 Feedlot Road	Petrolia	76377	940 733 1856
Coleman	6	Whon Buying Station	6400 FM 2633	Santa Anna	76878	325 642 4746
Comanche	6	Circle M Wild Hogs	1343 County Road 415	Comanche	76442	325 330 0904
Cooke	3	Gainsville Wild Boar Buying Station	3397 County Road 123	Gainesville	76240	940 665 6225
Coryell	6	PDQ Game Service	101 County Road 266	Gatesville	76528	254 248 4848
Cottle	1	Kenneth Finch	1989 N County Road 290	Paducah	79248	806 492 3130
Dimmit	5	El Ranchito	90 16th Street	Ashton	78827	830 854 0478
Ellis	3	Jeff Johnson	7446 FM 1181	Ennis	75119	214 532 7723
Fannin	4	Weddle-Ryser Wild Hog Buying Station	13508 E FM 1396	Windom	75492	903 378-7856
Fisher	1	Leon Helm	367 State Hwy 70 South	Roby	79543	325 776 2122
Fisher	1	Texas Wild Boar	203 East Second St	Rotan	79546	325 735 3479
Foard	3	Dale Henry	406 N Ave F	Crowell	79227	940 655 8106
Foard	3	R C Daniels	Hwy 6/Gaines Road	Crowell	79227	940 474 1020
Foard	3	Vance Brownlee	4021 N FM 98	Crowell	79227	940 655 8305
Fort Bend	2	Wilton Curry	3039 N Bar Lane	Rosenberg	77471	281 808 0597
Freestone	7	Brenda Tarver #3 - Streetman	1351 FM 80 N	Streetman	75859	903 599 2912
Freestone	7	Hog Pen Corner	350 F County Road 640	Teague	75860	903 388 0430
Frio	5	Southern Wild Game	2242 FM 3176	Devine	78016	830 663 2891
Garza	1	Justiceberg Hog Station	Hwy 84/County Road 386	Justiceburg	79330	325 207 8677
Goliad	5	Rudy De La Garza Holding Facility	2378 East Fannin	Goliad	77963	361 275 4466

Texas Approved Feral Swine Holding Facilities

County	Region	Facility Name	Address	City	Zip	Telephone
Gonzales	7	Candelaria Ranch	9491 Hwy 97E	Gonzales	78629	832 419 6151
Gonzales	7	Hanke Wild Hogs	808 West County Road 465	Gonzales	78629	830 857 0125
Gonzales	7	Robinsons Wild Hogs	26 County Road 121	Leesville	78122	830 491 1731
Grimes	7	Brenda Tarver Wild Hogs - Singleton	2408 County Road 176	Bedias	77831	936 395 0031
Grimes	7	Hog Busters Holding Facility	10088 FM 1227	Navasota	77868	979 204 5191
Guadalupe	7	Bubba Bacon Station	594 Frobeese	New Braunfels	78132	210 771 8541
Hardeman	3	Bob Gillespie	FM 2568/Spur 133	Quanah	79252	940 839 9773
Hardeman	3	John Holocker	Spur 135 & Loop 285	Quanah	79252	940 839 9417
Hardin	2	Steve Morris	5450 Millholland Rd	Sour Lake	77659	409 363 4579
Harris	2	Brandon Breaux	18606 Becker Road	Hockley	77447	979 906 0041
Harrison	4	Hogs Gone Wild - Harrison Co	11050 Hwy 80	Hallsville	75650	903 746 4801
Henderson	4	Hogs Gone Wild (Southside Feed)	9171 State Hwy 19 South	Athens	75751	903 677 2973
Hill	3	Ross Strauch	452 HCR 3175 W	Malone	76660	254 495 1721
Hopkins	4	Furguson Feral Holding Facility	3424 County Road 4725	Cumby	75433	903 994 2842
Hopkins	4	Hopkins Co Hogs Gone Wild	2342 County Road 2403	Winnsboro	75494	903 466 9608
Hunt	4	4B Ranch Feral Swine Pen	10603 FM 1565	Terrell	75160	972 345 3688
Hunt	4	Nathans Hog Buying Station	End of Hunt County Road 5075	Leonard	75452	903 815 9485
Jack	3	Live Wild Hogs	7448 Hwy 114 W	Jermyn	76459	940 550 4869
Jones	3	Brandi Richardson	2702 County Road 484	Anson	79501	325 370 4191
Jones	3	Eric Patterson	US Hwy 277 S/Hwy 277 Business West	Stamford	79553	325 725 6813
Jones	3	Melissa Olson	15160 County Road 208	Lueders	79533	325 725 9050
Jones	3	Sierra Wildhog Purchasing	13427 County Road 136	Hamlin	79520	
Kleberg	5	Gerad Merritt	1232 E FM 628	Riviera	78379	361 228 0192
Kleberg	5	Rick Martin	265 W County Road 2140 W	Kingsville	78363	361 227 2675
Knox	3	Payton Tankersley	Hwy 6/FM 1292	Knox City	79529	940 256 8288
Lamar	4	Carey Eatherly	211 County Road 13300	Paris	75462	903 227 0180
Lamar	4	Hogs Gone Wild - Lamar County	3280 County Road 11300	Paris	75462	903 517 3921
Lee	7	Steve Tumlinson	2908 County Road 430	Dime Box	77853	409 884 0277
Leon	7	Joe Langley Hog Buying Station	2294 County Road 121	Centerville	75833	903 536 2619
Limestone	7	Skipper Dodson	398 B LCR 398	Groesbeck	76642	254 747 0933
Mason	6	Donop Ranch	2246 Art Hedwigs Hill Rd	Mason	76856	325 347 6141
Mason	6	Lex Lehmberg Hogs Buying	HLM Ranch Road	Mason	76856	325 347 2200
Matagorda	2	Caney Creek Trapper	223 4th Street	Pledger	77468	979 578 6142
McLennan	7	Saulters Buying Station	730 West Old Axtell Road	Waco	76705	254 722 0769

Texas Approved Feral Swine Holding Facilities

County	Region	Facility Name	Address	City	Zip	Telephone
McLennon	7	Murdocks Grunter Hunters	235 Lucky B Ranch	Elm Mott	76640	254 733 3307
Medina	5	Maurice Chambers	11644 Hwy 90 West	DHanis	78850	830 591 8266
Milam	7	XL Wild Hogs	6261 County Road 358	Caldwell	77836	979 279 2448
Montgomery	2	Allen Wells	28488 Mays Road	Splendora	77372	832 492 3712
Montgomery	2	Wade Robinson	27733 FM 149	Montgomery	77356	832 326 6816
Morris	4	Wade Cobb	230 County Road 4303	Naples	75568	903 573 5145
Nacogdoches	4	Hogs Gone Wild - Nacogdoches	313 Cooper Road	Garrison	75946	936 547 3245
Nacogdoches	4	Mike Breaux	8570 FM 1087	Garrison	75946	936 554 8371
Navarro	3	Hogs Gone Wild - Navarro Co	4530 E State Highway 31	Corsicana	75109	903 654 9056
Parker	3	G & G Wildlife	900 McMillian Road	Mineral Wells	76067	940 328 4781
Polk	2	Hogs Gone Wild - Polk County	132 Herring Road	Corrigan	75939	936 215 0785
Polk	2	Texas Pig Hunters	350 S/Fillingim Road	Livingston	77351	936 327 1515
Rains	4	Middleton Wild Hog	6816 F M 514	Point	75472	903 473 7411
Red River	4	Johnsons Feral Hogs	8518 FM 1701	Avery	75554	903 244 3414
Refugio	5	Virginia Myers Holding Facility	701 Kelly Road	Refugio	78377	361 526 4084
Robertson	7	Brenda Tarver Wild Hogs - Wheelock	354 Hughes CutOff Road	Franklin	77852	979 828 3069
Rusk	4	Tennison Feral Hogs	1814 Aspin St	Henderson	75651	903 657 3627
Scurry	1	007 Outdoors	1156 County Road 241	Snyder	79549	325 725 2869
Shelby	4	Hogs Gone Wild - Shelby County	7037 U S Hwy 96 N	Tenaha	75974	936 554 6020
Smith	4	Hogs Gone Wild - Smith County	16331 County Road 358	Winona	75792	903 920 7867
Throckmorton	3	Texas Boars Unlimited	234 Lake Road	Woodson	76491	940 862 3885
Tyler	2	Feral Swine Holding Facility	3088 County Road 2565	Chester	75936	326 215 9855
Van Zandt	4	Hogs Gone Wild Van Zandt	9515 FM 1255	Grand Saline	75140	903 962 5630
Victoria	2	K Bar Ag Services	2083 Burroughsville Road	Victoria	77905	361 652 8222
Washington	7	Allen Wickel	5619 FM 1697	Carmine	78932	979 289 5012
Wharton	2	Daniel Wittig	County Road 100 - Boling	Wharton	77488	979 531 9132
Wichita	3	Tom Womack	FM 1180/Continental Rd	Kamay	76369	940 636 3917
Wilbarger	3	Lazy J Hog Buying	15667 F M 91	Chillicothe	79225	940 839 6120
Wise	3	Bill Hastings	278 PR 3501	Bridgeport	76426	940 626 9238
Young	3	Ronnie Hardin	152 Coal Mine Rd	New Castle	76372	940 521 2158