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Home Range and Habitat Use of Feral Hogs (*Sus scrofa*) on Lowndes County WMA, Alabama

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HOME RANGE AND HABITAT USE OF FERAL PIGS (*Sus scrofa*) ON LOWNDES COUNTY WMA, ALABAMA

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ABSTRACT: This study was conducted on Lowndes County Wildlife Management Area (WMA), Alabama to assess the survival, home ranges, and habitat preferences of feral pigs during high and low hunting pressure seasons. For the study, two six-month seasons were defined (high pressure hunting or low pressure hunting) based on the number of hunters that entered the woods on the WMA. We collared twenty-four pigs to determine home range and habitat use from 1 February 2005-31 January 2006 on Lowndes County WMA. Seventeen collared pigs had an average home range of 403.6 $\pm$ 65.6 ha in the low pressure season, and 11 pigs had an average home range of 278.6 $\pm$ 64.5 ha during the high pressure season. Season had a significant effect on home range size ($P = 0.039$) and core range size ($P = 0.018$). The test for group effect randomization indicated that the pigs did not choose their habitats (home range or core range) randomly ($P < 0.0001$). The type of season had a significant effect on habitat use ($P = 0.027$). Sex ($P = 0.062$) and age ($P = 0.84$) did not have any significant effects on pig habitat preference. During the low pressure season, the collared pigs preferred wetland and shrub/scrub habitats; whereas, they preferred pine forests and shrub/scrub habitats during the high pressure season.

KEY WORDS: feral pig, home range, habitat use, humans, hunting pressure

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INTRODUCTION

Feral pigs (*Sus scrofa*) are a controversial wildlife species, and their numbers and ranges are increasing due to their high fecundity and translocation by humans. While they remain a popular game species, they have the potential to root up and ruin crop fields and native vegetation, which raises concern amongst farmers, landowners, and land managers (Wood and Barrett 1979, Dickson et al. 2001). The popularity of feral pigs is on the rise with legends of "Hogzilla" and "Monster Pig" sparking hunters' interest in this species (Caudell 2007). Feral pigs offer hunters extra opportunities to hunt when

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other game species seasons are closed. Wildlife biologists are faced with the dilemma of trying to provide hunting opportunities while, at the same time, minimizing the deleterious impacts on the environment such as erosion, spreading exotic plants, food plot and crop damage.

A home range is defined as the area an individual normally traverses during its activities of food gathering, mating, and caring for young (Truve 2004). In the case of feral pigs, home ranges are usually influenced by food availability, weather, breeding, and hunting pressure (Matschke and Hardister 1966). In free-ranging feral hogs, the females will travel in family groups called sounders. These groups are made up of several sows along with their young. Upon maturing, females can settle into their home ranges relatively quickly because of the lack of competition. On the other hand, competition and territoriality may cause boars to travel great distances to establish their home ranges (Morini et al. 1995). Adult boars are often solitary and join other pigs only when breeding opportunities arise (Boitani et al. 1994, Nakatani and Ono 1995, Kammermeyer et al. 2003).

Human presence can alter the movements of wild pigs (Singer et al. 1981), and hunting and control efforts often increase the area traveled by pursued hogs. This pressure may cause dispersal into new areas and alter home ranges (Sodeikat and Pohlmeyer 2003). In Europe, home ranges of Eurasian boars increase due to the animals migrating in search of available food during harsh weather (Maillard and Fournier 1995). Continuous pressure may cause pigs to disperse and leave their normal home range (Maillard and Fournier 1995). This will expand the pig population into new areas, which will increase damage.

Wild boars in Europe were reported to have home ranges of 40-150 km^2. Pure wild boars often have larger home ranges than the feral pigs in North America (Boitani et al. 1994). This is due to the Eurasian boars migrating to warmer areas that contain more food sources. Home ranges for feral pigs in North America range from an average of 1.1-5.32 km^2 (Kurz and Marchinton 1972, Singer et al. 1981, Baber and Coblentz 1986, Boitani et al. 1994). The smaller home ranges of feral pigs in North America are due to the milder climates and plentiful food sources year round in the environments they inhabit. While knowledge of feral pig home ranges is beneficial, feral pig habitat preference will help managers and biologists develop more effective control regimens.

Knowledge of habitat use by a species of animal is necessary for understanding land-cover preference and helps biologists to draw inferences about which habitat is occupied with regards to availability (Bond et al. 2002). These inferences then lead to wildlife management decisions regarding that species of animal. Feral pigs use a wide variety of habitat conditions (Hanson and Karstad 1959, Dickson et al. 2001). Wild pigs choice of habitat use depends on type of cover and cover density (Barrett 1978). Thick cover provides protection from humans and other predators, while providing the pigs with preferred bedding sites. In the Southeast, pigs typically use riparian forests associated with a steady water source, but they will inhabit areas from bottomland swamps to mountainous forests (Kurz and Marchinton 1972, Wood and Brenneman 1980, Dickson et al. 2001)).

Hunting pressure can influence the movements and habitat preference of pressured animals (Root et al. 1988). Home range sizes and the types of habitat used may be altered depending on the amount of pressure applied to feral hogs; however, few studies deal with home range and habitat use along different hunting pressures. Home range and habitat use data from this study will allow state officials to better implement feral pig control plans by having a more in depth knowledge of a pig's range and habitat preference along different hunting pressure situations. Our objectives for this study were to understand feral pig movements and habitat use under varying harvest pressures by ascertaining cumulative and seasonal home ranges and habitat preferences of feral pigs on Lowndes County WMA, Alabama.

METHODS

Study Area

We conducted this study from February 2005 through March 2006 in and around Lowndes County Wildlife Management Area (WMA), in Lowndes County, Alabama. The 4,218 ha WMA is located near the town of White Hall between Montgomery and Selma, Alabama and is managed by the Division of Wildlife and Freshwater Fisheries of the Alabama Department of Conservation and Natural Resources. The Lowndes County WMA and the surrounding land consist of planted hardwoods (red oak, *Quercus rubra*; white oaks, *Quercus alba*; water oak, *Quercus nigra*; willow oak, *Quercus prinus*; swamp chestnut oak, *Quercus michauxii*; red hickory, *Carya ovalis*) agricultural fields, pine stands, clearcuts, swamps, and bottomland hardwoods; which are habitats conducive to fostering the population of feral pigs. Lands adjacent to the Lowndes County WMA are managed for farming, beef cattle, gravel mining, and game hunting. Feral hogs may be harvested on the WMA with appropriate weapons during the big and small game seasons, along with a specified three-week hog hunt during the months of August and September. The Lowndes County WMA biologists and surrounding landowners use opportunistic feral pig hunting throughout the year to help manage the population. Signs explaining my project were posted at Lowndes County WMA entrances and parking lots and gas stations in the area. Adjacent landowners were notified about the project. The study was conducted under permit number 2003-0608 of the Institutional Animal Care and Use Committee of Auburn University.

Capture and Monitoring

The study was conducted from February 2005 through March 2006; however, data were analyzed from February 2005 through January 2006. This allowed for one complete year of data where the hunting seasons could be equally divided.

Beginning in February 2005, we captured feral pigs via cage traps baited with shelled corn, corn mash, and molasses, wrangling, and a drop net on Lowndes County WMA and adjacent land. Since pigs do not contain sweat glands and are susceptible to overheating when exposed to extreme sunlight (Baber and Coblentz 1986, Dickson et al. 2001), traps were placed in well shaded areas to ensure the pigs' safety. Traps were set before dusk and checked every morning. Pre-baiting was carried out for a week or two to maximize trapping efforts.

Upon capture, pigs were injected intramuscularly with Telazol (Tiletamine HCL and Zolazepam HCL) via a three foot pole syringe at a rate of 1.5cc/45.4 kg (Jolley and Hanson 2005 pers. commun.). Once immobilized, ophthalmic ointment was administered to the animals' eyes to prevent them from drying out. A blindfold was placed around the head to cover the eyes and to keep the animal from being startled by movements. Pigs were sexed and a livestock ear tag was attached for identification purposes. Morphological measurements were taken to the nearest centimeter. These measurements included chest and neck girth, total length, back of head to snout, top of shoulder blade to toe, and tusk length. Alertness, respiration rate, and heart rate were monitored throughout anesthetization. Cool water was available in case a pig started to overheat. All animals were monitored until fully alert and then released at the trap site.

Since pigs are considered to be in the "growing" stage up until they reach 45.4 kg (Callis et al. 1971), the captured pigs were divided into two groups, adults ($\geq$ 45.4 kg) and juveniles ($\leq$ 44.9 kg). This differentiation was done to prevent animals from becoming too large for the transmitter harness over the course of the study.

The use of telemetry provided continuous information regarding the movement of animals and made it easier to decipher the home ranges of animals and whether or not they had dispersed from an area (Truve 2004). Gathering this movement data provided basic information regarding a species and is valuable to control programs and wildlife managers (Sanderson 1966).

Adults were fitted with transmitter harnesses that contained mortality-sensor VHF transmitters (Advanced Telemetry Systems, Inc., Isanti, MN, USA). Harnesses were secured to allow for future growth during the study period. Mortality-sensor VHF ear tag transmitters (Advanced Telemetry Systems, Inc., Isanti, MN, USA) were attached to the ears of juvenile pigs. The choice to use ear tag transmitters instead of receiver harnesses on juveniles was based on the rapid growth rate of young pigs.

Feral pigs deployed with transmitters were not tracked for a period of 48 hours following capture and transmitter attachment. This allowed them time to adjust to wearing the harnesses and ear tags. I located feral pigs using ATS VHF receivers and three-element, hand-held Yagi antennas. Locations gathered from each pig had at least 2 hours between them to prevent bias. Locations were taken 2-5 times per week with an attempt to obtain > 30 locations per season: low hunting pressure and high hunting pressure. We divided the study into 2 seasons (low pressure: February-July; high pressure: August-January) based on the hunting data presented by the 2005-2006 State of Alabama Wildlife Management Area Harvest Report (McCutcheon 2006) (Table 2.1). Man-days hunted and the number of animals harvested from Lowndes County WMA were analyzed to assess the amount of human pressure applied to wildlife during certain times of the year. The time period of February-July (2005; low pressure) contained 260 man-days hunted, while the time period of August 2005-January 2006 (high pressure) had 4985 man-days hunted. In the low pressure season, fewer people hunted turkeys and small game, and the gates were closed to the public for several months during this time frame. In the high pressure season, a higher number of hunters entered the woods in pursuit of deer and hogs, and there was a special 3-week early hog season during this time period.

Telemetry sessions were carried out throughout the day and night to account for all movement periods. Locations of pigs were established by taking $\geq$ 2 bearings $\leq$ 15 minutes of each other from preset stations to reduce movement error. The bearings were between 20^0 and 160^0 of each other to ensure that appropriate bearing angles were obtained (Gese et al. 1988). Stations were established throughout the study area based on land terrain and accessibility. Locations with an error of 0.1 km^2 or more were discarded and not used in the home range calculations.

Test collars were utilized to quantify user error associated with telemetry in the study area. Approximately 100 locations were used from two VHF test collars (four stations) to calculate error. This error (SD = 4.24) was then incorporated into the computer program LOCATE (Pacer, Truro, Nova Scotia) to estimate locations.

<u>Home Range and Habitat Use</u>

Seasonal and cumulative home ranges were estimated using the adaptive kernel method (Worton 1989) in the computer program CALHOME. Home ranges were areas defined as 95% of the maximum probability of the study area, while core areas were defined as 62% of the maximum probability of the home range (Shivik et al. 1996). A three-way ANOVA was carried out to test whether or not sex, age, type of season, and their interactions significantly impacted home range size.

Habitat analysis was carried out in ArcView GIS 3.2 (ESRI) and ArcGIS 8.3. The source data set (National Land Cover Database 2001 data set) was reclassified to provide more statistical power (Vogelmann et al. 2001). Aebischer's method of compositional analysis was carried out to calculate use versus availability based on the type of season (high or low pressure), sex, and age of the collared pigs (Aebischer et al. 1993). Habitat proportions were measured as the proportion of each land-cover type located within the defined study area. The study area, or available habitat types, was calculated by drawing a 100 % MCP around all pig home ranges buffered by the radius (3543 meters) of the largest pig home range. Habitat availability was measured to encompass the potential habitats that a collared pig could traverse. We defined home range use based on the proportion of each land-cover type within the home ranges compared to study area availability (Johnson's second order selection 1980). Habitat use at the core area was compared to availability within the pigs' home ranges (Johnson's third order selection 1980). Ranking matrices were calculated by t-tests for the low and high pressure seasons to determine which habitats were preferred by order.

We collected blood samples during trapping and shooting efforts from pigs that were not used in the study to test for disease prevalence within the study population. Also, we drew blood from the pigs with transmitters after the study was finished. The serum was tested for the presence of swine brucellosis, pseudorabies, and classical swine fever.

RESULTS

Forty-seven pigs were captured during the study period at Lowndes County WMA and adjacent lands. Thirty-one pigs were fitted with transmitters, and livestock ear tags only were attached to 16 pigs with no transmitters. One of the transmittered pigs wedged himself underneath a vehicle, and subsequently died. Of the thirty-one pigs fitted with transmitters, 24 (13 adults, 11 juveniles; 14 boars, 10 sows) were used in the home range and habitat analyses.

We drew blood from 25 pigs throughout the study. Their serum was sent to the state diagnostic lab in Auburn, Alabama to be tested for swine brucellosis, pseudorabies, and classical swine fever. All results came back negative. These 25 samples were made up from the pigs that were trapped and not used for the study, and also from ones that were used in the study.

Neither the harnesses nor ear tag transmitters worked as well in the field as anticipated. This was due to the pigs' wallowing and rooting which led to the malfunction of several transmitters. Six pigs with transmitters disappeared during the course of the study. Despite numerous attempts to locate them (including telemetry flights), they were never found.

Three pigs had their transmitters fall off. One harness broke and slipped off the pig's body, while the other two pigs just slipped out of their harnesses. We inadvertently fitted the harnesses too loosely around the animals' body upon capture, and their data were censored based on the day the harness fell off.

A boar severely damaged his ear tag transmitter and disappeared for several weeks. He was subsequently captured again, and we were able to replace the ear tag transmitter with a harness transmitter due to his growth since the first capture. Another pig ripped his ear tag transmitter out, but was later killed by an adjacent landowner. Several transmitters were damaged and emitted the mortality sensor instead of the normal pulse. The pigs were thought to be dead, but when we walked in to retrieve the carcasses and transmitters, we frightened the pigs from their bedding areas. Because this occurred on several occasions, we waited several days after obtaining an initial mortality signal from the transmitters to ensure that the pigs did not move before retrieval efforts.

Home Range

Eleven males (5 juveniles and 6 adults) and 6 females (3 juveniles and 3 adults) were monitored during the low pressure season (Table 2.2 and Table 2.3). A total of 432 radio locations were obtained on 11 boars, and 240 locations were obtained from 6 sows during the low pressure season. A total of 334 radio locations were collected from 8 juveniles, and 338 locations were obtained from 9 adults during the low pressure season. Six boars (2 juveniles and 4 adults) and 5 sows (2 juveniles and 3 adults) were monitored during the high pressure season. A total of 311 radio locations were collected from the boars, and 298 locations were obtained from the sows during the high pressure season. We collected 188 radio locations for juveniles and 421 locations for adults during the high pressure season. Hunting mortality and transmitter malfunction curtailed our efforts for a larger amount of radio locations. More locations were collected for each collared pig, but were not used due to their error of 0.1 or greater in LOCATE.

The type of season significantly affected the home range size of collared pigs (P = 0.039). Sex (P = 0.69) and age (P = 0.35) did not significantly impact home range size. The type of season significantly impacted the core range of the pigs (P = 0.01), while sex (P = 0.26) and age (P = 0.28) did not significantly influence the size of the pigs' core range. The average sizes of the core ranges decreased from low pressure to high pressure seasons.

The mean home range of the 17 pigs monitored during the low pressure season was 403.6 ± 65.6 ha with a core range of 90.1 ± 13.7 ha. Boars had an average home range of 403.1 ± 68.7 ha and sows had an average home range of 404.4 ± 147.4 ha during the low pressure season. During the high pressure season, boars had an average home range size of 283.8 ± 75.2 ha, while sows had an average home range size of 272.5 ± 119.9 ha. The pigs tightened up or decreased their home range size during the time when human pressure was the highest.

Although insignificant, juvenile pigs had unexpected larger home ranges than adults. The average juvenile and adult home ranges during the low pressure season were 499.8 ± 111.7 and 318.1 ± 67.9 ha respectively; while the average juvenile and adult home ranges during the high pressure season were 354 ± 158.9 and 235.6 ± 53.2 ha.

Habitat Use

We focused on the second and third orders of habitat usage as defined by Johnson (1980). The second order of habitat use deals with the habitat use comprised of an animal's home range within the study area that was available. The third order of usage was used to describe the core areas or patches within an animal's home range (Johnson 1980). From these orders, we were able to decipher which habitat types feral pigs chose to use within our given study area along with the core areas within their home ranges.

Habitat proportions available for the study area in 2005-2006 were water: 4.9%, developed: 4.3%, deciduous/mixed: 11.9%, evergreen: 3.5%, shrub/scrub: 12.1%, grassland/pasture/cultivated crops: 30.1%, wetlands: 33.3%. The test for group effect randomization indicated that the pigs did not choose their habitats randomly (Wilks' Lambda=0.615, d.f 6, P < 0.001), but rather chose the habitats that specifically met their needs. The type of season had a significant impact on which habitat types the pigs preferred (P = 0.02). The sex of the pigs proved to impact habitat preference but was not statistically significant (P = 0.06); whereas, the age of the pigs did not affect habitat use (P = 0.84). The low pressure ranking matrix ordered the habitats in sequence as wetlands > shrub/scrub > developed > deciduous/mixed > evergreen > grassland/pasture/cultivated crops > H_2O (Table 2.4). The high pressure ranking matrix ordered the habitat types as evergreen > shrub/scrub > wetlands > H_2O > deciduous/mixed > grassland/pasture/cultivated crops = developed (Table 2.5).

The type of season (P = 0.25), sex of the pigs (P = 0.96), and age (P = 0.82) did not significantly impact which habitats the pigs used for their core areas. The test for group effect proved that the pigs chose specific habitats to use for their core ranges (P = 0.002). The core range vs. home range availability ranking matrix ordered the habitats from most preferred to least preferred: deciduous/mixed > shrub/scrub = wetlands > grassland/pasture/cultivated crops > developed > evergreen > water.

DISCUSSION

Home ranges should be smaller if the pig's living requirements are provided in a smaller area (Sanderson 1966), and when food was scarce during the winter, home range size increased (Kurz and Marchinton 1972, Singer et al. 1981). Maillard and Fournier (1995) showed that with pig home ranges and movements increased with the onset of hunting pressure in the winter, then decreased when hunting pressure subsided. Our high pressure season (fall and winter) showed the opposite results. The average home range size decreased by 125 hectares when food supply was shorter in the high pressure season than compared to the low pressure season in our study. This could be attributed to high hunter pressure causing the pigs to decrease their home range in an attempt to avoid the hunters. The pigs would stay in impenetrable thickets to avoid detection by hunters during the day and would venture out to nearby food plots at night to feed before returning to the thickets.

The amount of pressure in each season proved to be a significant influence on the sizes of the feral pigs' home ranges. Their home ranges were larger during the low pressure season when compared to the high pressure season. The pigs seemed to tighten up their movements and seek out areas of refuge away from human presence; however, human-induced mortality was the highest source of pig mortality. While most of the hunters probably focused their efforts around wetlands or swamps during the high pressure season, the pigs changed from using wetlands (most preferred in low pressure) to using evergreen forests where there might be less human traffic.

Although males are mostly solitary, they seemed to be somewhat tolerant of each other; in that, their home ranges often overlapped with each other. Visually, the home ranges of boars and sows overlapped each other regardless of sex or age (Figure 2.1 and 2.2). Boars and sows had roughly the same home range size regardless of the type of season which coincides with findings in coastal South Carolina (Wood and Brenneman 1980). The boars probably did not have to travel great distances to find food or a receptive sow based on the types of favorable habitats and the large number of pigs on Lowndes WMA.

Juveniles had larger average home ranges than adult pigs. Several pigs were collared as juveniles but survived to adulthood during the study. The larger juvenile home range could be due to their exploration of new areas to establish their own territory as they grew into adulthood. A juvenile female had the largest home range (1085 hectares) in the low pressure season. This same pig also had the largest home range (734.6 hectares) during the high pressure season and likely influenced the average juvenile home ranges. Several juveniles dispersed to completely new areas and established new home ranges.

While the average number of radio locations per pig was relatively low, we feel that they are an adequate portrayal of the habitat traversed by the pigs. Each radio location is a depiction of a "picture" in a photo album. While not every pig movement was recorded, we were able to acquire an adequate representation of the pigs' home range by looking at their "photo album." The difference in spatial habitats appears to be the reason for differing home range sizes in the different studies (Wood and Brenneman 1980). This is why each study produces different results and is only specific to the animals located on the area that is being studied.

The low pressure season mainly consisted of the hot months (spring/summer) when rainfall was not as plentiful as during the winter months. This season covered the time during the low pressure turkey season and the summer months when the gates were closed to the public. There were a few turkey hunters in the area and very little pressure when the gates were closed. With less human pressure in the woods, the pigs explored more and increased their home range size.

The pigs preferred wetlands over all the other habitat types during the low hunting pressure season. They used the wetlands for thermoregulation, drinking, and for the array of edible aquatic plants (Dickson et al. 2001). The pigs utilized these habitats for bedding, farrowing, and food resources. During the early spring, we noticed numerous farrowing beds along with an increase of piglet sightings in close proximity of wetlands and shrub/scrub habitats. Surprisingly, developed areas were the third most preferred habitat. Developed areas included those areas that were around houses, other structures, and roads/roadsides. This could be due to pigs occasionally rooting up road sides in search of tubers or grubs. During low pressure situations, they may become more adventurous or curious of these developed areas. They have often been known to raid gardens near houses.

The high pressure season consisted of the early pig season and deer season (fall/winter). Human pressure was high during this season with more hunters present than during the low pressure season. Most of the hunters probably focused on the wetland areas during this time when searching for pigs. Many of the hunter's vehicles were parked near wetland areas. Thus, with more pressure applied to the wetlands, the pigs chose to utilize pine forests more than the other habitat types because of the lack of human presence. The second choice (shrub/scrub) was probably chosen for its thick cover providing refuge and nesting areas.

CONCLUSIONS AND MANAGEMENT IMPLICATIONS

Feral pig movements and habitat use were different than expected. Juveniles had larger home ranges than adults, and instead of the hunting pressure dispersing the pigs, the pressure seemed to make the pigs decrease their home ranges. The pigs did not use the wetlands habitat predominately for both seasons as previously thought. This project provided more insight into the ecology of pigs in different pressure settings.

Future pig researchers should take into careful consideration the mode of transmitter attachment. This study used ear tags and harnesses to attach transmitters to specimens. The ear tag transmitters were minimally invasive and were simple to attach; however, their signal had a limited distance due to the small antennae that pointed at the ground. Because of the pigs' rooting characteristics, the 289-day lifespan transmitter did not last the entirety of the battery life.

The harness transmitters had a 372-day lifespan. Their signal had excellent range (almost 3.22 km) under ideal circumstances, but the harnesses did not work as well as anticipated. Harnesses were difficult to properly fit on the specimen. Some of the harnesses broke and several slipped off of the animals. Several pigs that were tracked down after the study to retrieve the transmitter showed signs of the harness cutting into their bodies. Future studies should consider using a different mode of attachment than the harnesses.

The low pressure ranking matrix ordered the habitats in sequence as wetlands > shrub/scrub > developed > deciduous/mixed > evergreen > grassland/pasture/cultivated crops > H_2O. For better control efforts by managers, traps should be placed near wetlands and shrub/scrub habitats when the pigs have been minimally disturbed. These wetland and thick areas will attract pigs during the hot times of the year. While stalking or hunting the pigs, these areas should be traversed by hunters to increase their chances of harvesting pigs.

The high pressure ranking matrix ordered the habitat types as evergreen > shrub/scrub>wetlands>H_2O> deciduous /mixed>grassland/pasture/cultivated crops=developed. Since the high pressure consisted of the cooler parts of the year, the pigs did not focus on thermoregulation from the wetlands. During high hunting pressure, managers should focus on the pine forests and shrub/scrub habitats to better their chances of harvesting pigs. If hunters choose to hunt habitats that are not as heavily hunted (i.e. evergreen forests), then their chances of taking a pig may increase.

Managers and biologists often come up with new methods to control animals. They developed a technique to reduce numbers of an unwanted species through the use of telemetry. The 'Judas' pig technique was based on the 'Judas' goat method (Pech et al. 1992, Conover 2002) of radio-collaring one member of a group and then allowing them to rejoin the group. After a sufficient time period has passed to allow the goats to join others, they were tracked down, and the other goats with them were removed. Since sows are more sociable than boars, most of these techniques have been implemented by collaring adult sows (McIlroy and Gifford 1997). After the study was finished, we used the Yagi antennae and receiver to track down the remaining pigs to collect the transmitters. This proved to be an effective mode of removing pigs. In 7 days of tracking, we removed approximately 20 pigs (including 6 fetuses) in March 2006. We tracked down a collared sow and dispatched her, while her collared juvenile daughter escaped. On subsequent days, we followed this juvenile female, harvesting pigs with whom she was associating. Tracking a collared juvenile female that was motherless proved to be an effective 'Judas' pig system. Sows are independent of other pigs and may or may not join up with other pigs. Since we harvested the adult sow (mother), the juvenile female (daughter) quickly found other pigs with whom to associate, because she was probably dependent on other pigs for company and leadership. So, collaring a motherless, juvenile female proved to be an effective method in population control for this study.

While hunting pigs to retrieve the transmitters, we flushed many pigs that were bedded up in blown down trees.

The trees were blown down from a hurricane the previous year. This provided the pigs with extra shade and concealment while providing a structure for protection to their back. The pigs were protected from predators on one side by having the log at their back while maintaining a visible field to their front. A blown down tree provided the pigs with an optimal bedding site. If a piece of property contains a large amount of blown down trees, it would be beneficial for managers to focus removal efforts around these trees.

On this study, several pigs showed the capacity for quick learning. One collared adult boar was trapped a total of 7 times. After being trapped on the third occasion, the boar appeared to be calm and collected in the trap while we worked on setting him free. We deduced that he was satisfied with receiving a meal of corn and molasses while being confined in the trap for several hours before being set free. Another collared adult boar showed a learning curve with regard to a heavily hunted area of the WMA. While tracking him at night, we found that he traversed food plots and surrounding areas, but when day came, he bedded up in the same impenetrable thicket many times during the hunting season. When the hunters walked through the woods during the day, he became a creature of habit by resting in a thicket where hunters did not go.

The collared pigs were mostly nocturnal and crepuscular. Also, we noticed an increase in pig sightings (movements) after a rain. When the ground is moist, animals that rely heavily on smell can pick up scents more easily (Lemel and Soderberg 2003). Also, pigs can root up ground more easily when the ground is soft and moist. To optimize their control efforts, managers and biologists can focus control efforts during dawn and dusk periods and after rain showers.

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Table 2.1: Wildlife management area harvest report 2005-2006 summary for Lowndes County WMA, Alabama (McCutcheon 2006).

Season	Man-days hunted	Number of animals harvested
High Pressure		
(Aug. 1, 2005-Jan. 31, 2006)		
Deer (gun)	2010	155
Deer (archery)	875	91
Feral swine	2100	300
Totals	4985	546
Low Pressure		
(Feb. 1, 2005-July 31, 2005)		
Turkey	250	15
Turkey (youth)	10	0
Totals	260	15

Table 2.2: Feral pigs monitored during the low pressure hunting season (February 1, 2005-July 31, 2005) on Lowndes County WMA, Alabama.

Pig ID	Pressure	Sex	Age	Home Range *	Core Range *
300	Low	M	Adult	100.4	34.2
399	Low	M	Juvenile	324.9	78.1
418	Low	F	Juvenile	198	39.9
439-1	Low	M	Juvenile	459.8	132.4
457-2	Low	M	Juvenile	888.3	173.1
479	Low	M	Juvenile	383.5	139.6
500-861	Low	M	Juvenile	400	135.6
539-2	Low	F	Juvenile	1085	170.2
560	Low	F	Juvenile	258.9	54.4
578	Low	F	Adult	104.2	31.3
658	Low	M	Adult	228.9	38.7
679	Low	F	Adult	520.4	99.8
701	Low	M	Adult	554	195.1
779	Low	M	Adult	639.1	71.7
800	Low	M	Adult	305	67.2
880	Low	M	Adult	150.6	28.1
921	Low	F	Adult	260	42.9

*measurement in hectares

Table 2.3: Feral pigs monitored during the high pressure hunting season (August 1, 2005-January 31, 2006) on Lowndes County WMA, Alabama. *measurement in hectares

Pig ID	Pressure	Sex	Age	Home Range *	Core Range *
375	High	F	Juvenile	148.4	42.1
439-2	High	M	Juvenile	42.1	13.5
500-861	High	M	Juvenile	490.9	110.4
539-2	High	F	Juvenile	734.6	120.4
658	High	M	Adult	192.7	46.6
701	High	M	Adult	459.7	54.7
880	High	M	Adult	140.9	33.5
900	High	F	Adult	198.7	39.4
921	High	F	Adult	44.2	13.1
940-737	High	M	Adult	376.2	114.5
960	High	F	Adult	236.7	49.6

Table 2.4: Low pressure habitat preference ranking matrix of home range vs. study area from February 1, 2005-July 31, 2005 on Lowndes County WMA.

	H20	DEV	DM	GREEN	SS	GRASS	WET	RANK
H20		- - -	- - -	- - -	- - -	- - -	- - -	0
DEV	+ + +		+	+	-	+	-	4
DM	+ + +	-		+	-	+	-	3
GREEN	+ + +	-	-		-	+	-	2
SS	+ + +	+	+	+		+ + +	-	5
GRASS	+ + +	-	-	-	- - -		- - -	1
WET	+ + +	+	+	+	+	+ + +		6

*H2O = water; DEV = developed; DM = deciduous/mixed; GREEN = evergreen; SS = shrub/scrub; GRASS = grassland/pasture/cultivated crops; WET = wetlands

Table 2.5: High pressure habitat preference ranking matrix for home range vs. study area from August 1, 2005-January 31, 2006 on Lowndes County WMA.

	H20	DEV	DM	GREEN	SS	GRASS	WET	RANK
H20		+	+	- - -	-	+	-	2
DEV	-		-	-	-	-	-	0
DM	-	+		- - -	-	+	-	1
GREEN	+ + +	+	+ + +		+	+	+	5
SS	+	+	+	-		+ + +	+	4
GRASS	-	+	-	-	- - -		-	0
WET	+	+	+	-	-	+		3

*H2O = water; DEV = developed; DM = deciduous/mixed; GREEN = evergreen; SS = shrub/scrub; GRASS = grassland/pasture/cultivated crops; WET = wetlands

Table 2.6: Habitat preference ranking matrix for core range vs. home range for Lowndes County WMA 2005-2006.

	H20	DEV	DM	GREEN	SS	GRASS	WET	RANK
H20		-	- - -	-	- - -	- - -	- - -	0
DEV	+		- - -	+	- - -	- - -	- - -	2
DM	+ + +	+ + +		+ + +	+ + +	+ + +	+	5
GREEN	+	-	- - -		- - -	- - -	- - -	1
SS	+ + +	+ + +	- - -	+ + +		+	+	4
GRASS	+ + +	+ + +	- - -	+ + +	-		-	3
WET	+ + +	+ + +	-	+ + +	-	+		4

*H2O = water; DEV = developed; DM = deciduous/mixed; GREEN = evergreen; SS = shrub/ scrub; GRASS = grassland/pasture/cultivated crops; WET = wetlands

Figure 2.1: Adult core areas during the low pressure hunting season (February 1, 2005- July 31, 2005) on Lowndes County WMA, Alabama.

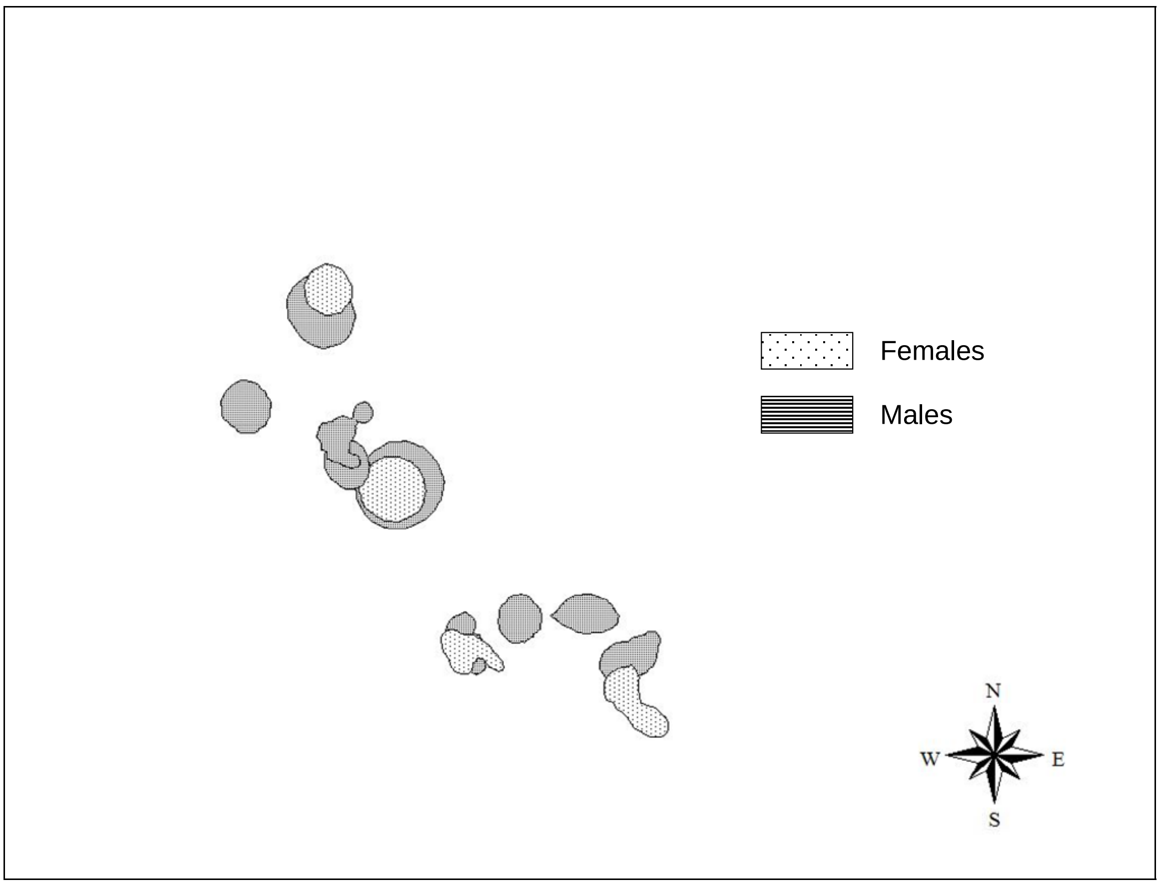

Figure 2.2: Adult core areas during the high pressure hunting season (August 1, 2005-January 31, 2006) on Lowndes County WMA, Alabama.