DETERMINING FERAL PIG (*SUS SCROFA*) ATTRACTANT SELECTION PREFERENCE AND RESPONSE TO MOCK CORRAL TRAPS

Melissa L. Karlin* **and Harun A. Khan**
Department of Physics and Environmental Sciences,
St. Mary's University, San Antonio, Texas 78228
**Corresponding author; Email: mkarlin@stmarytx.edu*

Abstract.–Feral pigs are an invasive exotic pest that damage habitat and compete with native species. Trapping feral pigs using a variety of baits or lures is the primary method for eradication, with little success. The purpose of this study was to use a variety of lures, with and without the presence of a mock corral trap, to determine if there was a preferred lure selected even in the presence of a trap. We also identified non-target species attraction to the lures, to identify a preferred choice by feral pigs that minimized these non-target species. We deployed 10 stations from July 2017 to March 2018 and used trail cameras to assess feral pig visitation frequency. The majority of feral pig visitation events occurred at the orange flavored corn without a mock corral trap present (43.20%). There was no significant difference in feral pig visitation rates to stations based on presence or absence of corral, but there were differences based on lure: orange corn had a significantly higher visitation rate than any other lure type. The plain corn station without a corral had only 15% of the feral pig visitation events, while the majority of non-target species (i.e., axis – 45.93%, white-tailed deer – 39.42%, and raccoon – 85.38% of visitation events) were associated with this bait. For these reasons, we suggest that orange flavored corn may be the better primary attractant in feral pig management activities in south Texas.

Keywords: bait, invasive exotic, scent lure

Feral pigs (*Sus scrofa* Linnaeus 1758) are an invasive exotic pest that have been expanding in population throughout the United States, damaging habitat and predating on and competing with native species (Choquenot et al. 1996; Taft 1999). Feral pigs have the highest reproductive potential of any large mammal in North America (Wood & Barrett 1979; Hellgren 1999), and they can transmit a number of diseases to both livestock and humans (Becker et al. 1978; Conger et al. 1999; Taft 1999). Numerous studies have tested a variety of baits, attractants and lures for feral pig management, with corn and other grains being the most widely used bait (e.g., Matschke 1962; Wyckoff et al. 2005). There is considerable consumption, however, by non-

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target animals (Hartin 2006), which decreases its effectiveness when incorporated into a management plan. A variety of scent attractants have also been tested in control methods, such as apple, strawberry, anise, banana, butterscotch and caramel (Campbell & Long 2008), and soured corn (Williams 2010).

In addition to drawing feral pig into an area using a bait or attractant, property managers need to contain or restrain the pigs in order to successfully eradicate them from the site. Trapping is still the most commonly used method for controlling feral pigs (Williams 2010), even though its success rate is quite low. The most commonly used traps are box traps and corral traps, and at least one study found that the capture rate for corral traps was over four times that of box traps (Williams 2010). Funding to manage feral pigs and restore habitat is extremely limited for both private and public land, and considering the continued increase in feral pig abundance and distribution, current management methods have not been very effective and additional research is needed (Dickson et al. 2001; Adams et al. 2016).

The purpose of this study was to determine frequency of visitation by feral pigs to a variety of scent and bait stations, with and without the presence of mock corral traps in order to aid in more effective eradication programs for feral pigs in south Texas. The specific objectives were to: (1) determine if there was a preferred scent or bait based on frequency of visitation, and (2) determine if there were differences in visitation rates between sites with scent or bait only versus sites that have corral traps with the addition of the scent or bait.

Materials & Methods

The study site was approximately 0.40 km^2 of private property located in Mountain Home, TX, and was characterized by land cover including invasive Ashe juniper (*Juniperus ashei*), honey mesquite (*Prosopis glandulosa*), as well as Plateau live oak (*Quercus fusiformis*), and hydrological features of Johnson Creek and the Fessenden Branch. The area corresponds with the Edwards Plateau

Woodland ecoregion, and is characterized by a karst topography, predominately Mollisol soils, and a fire-adapted community (Griffith et al. 2004). The size of the study site was significantly smaller than many estimates of average feral pig home range size (i.e., 1.95 – 26.78 km^2 in Franckowiak & Poche (2018)).

The most common wildlife species known to occur on the property include an overabundance of the invasive exotic axis deer (*Axis axis*), the common raccoon (*Procyon lotor*), and white-tailed deer (*Odocoileus virginianus*) (Karlin & Rankin 2017). Feral pigs were documented on the property in relatively low abundance in 2015, although the landowner has since reported a notable increase in feral pig sightings.

We created a total of 10 stations: three scent stations (strawberry, commercial soured corn and commercial berry/fruit/molasses), two bait stations (corn and orange-flavored corn); and five identical scent/bait stations that also had a mock corral trap present (Fig. 1). The scents were deployed using a drip system that released approximately one drop of scent liquid every 30 min and bait was deployed using deer feeders set to disperse bait twice a day, at dusk and dawn, for 30 sec. All stations were placed in areas that had documented feral pig activity from Karlin & Rankin (2017) or that had current feral pig evidence of use, and each station was located in an open, grassy location with no canopy cover. Mock corral traps consisted of six panels connected in a circular fashion, with one 1.524 m wide opening on each side. Each panel consisted of a 3.8 cm by 8.9 cm by 1.83 m base and 3.8 cm by 8.9 cm by 0.914 m sides, with heavy duty chicken wire as walls. The length of these panels were similar to a design employed in another Texas study (Davis et al. 2017). Researchers in another study evaluating the effects of gate widths examined the selection by pigs of corral traps with gate widths ranging from 0.9 m to 1.8 m, and found no significant differences (Metcalf et al. 2014), suggesting our overall size may not be atypical. Trail cameras were set within 5 m of the bait or scent at each station to assess frequency of visitation, and programmed with a three-minute

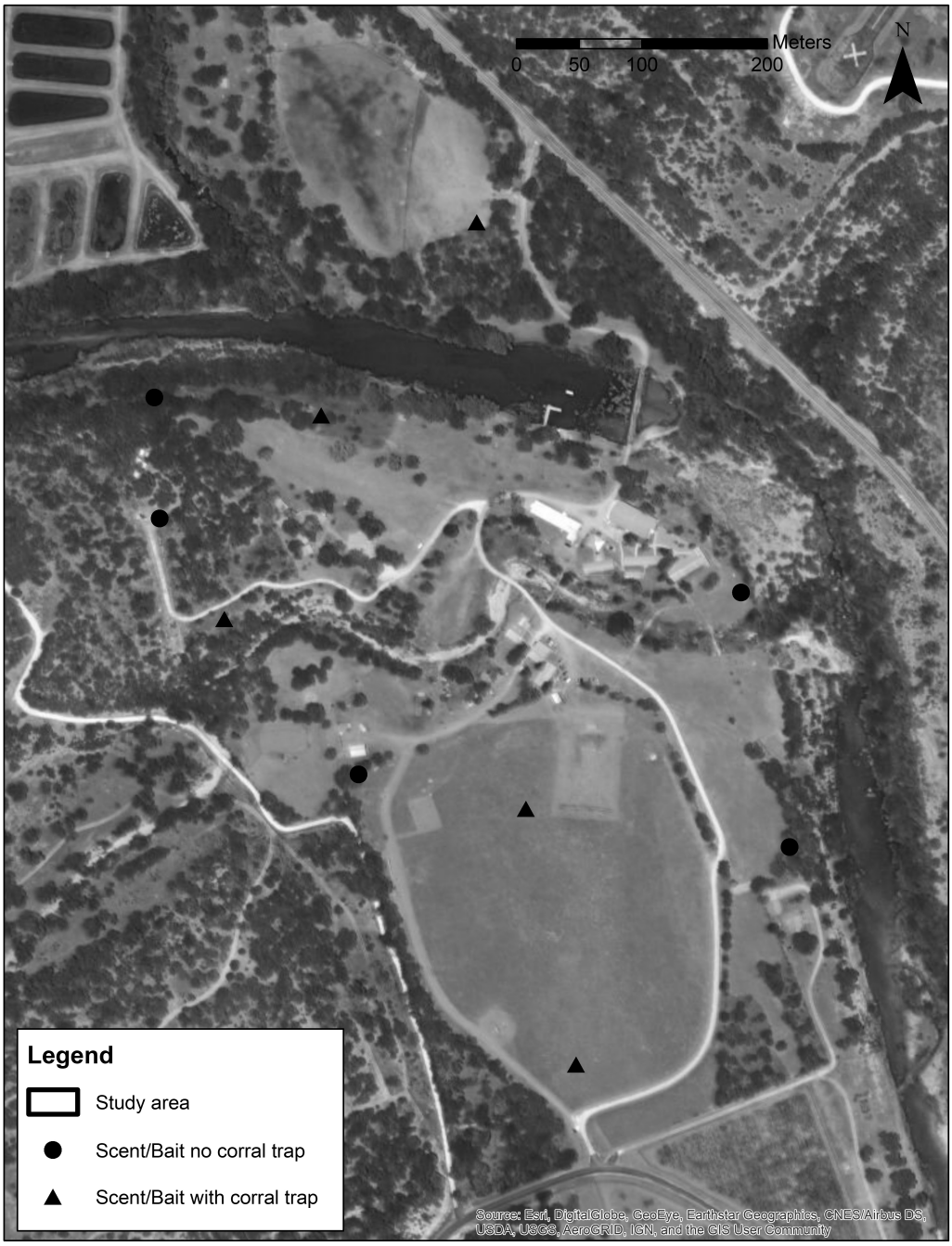

Figure 1. The study area and sampling design for determining feral pig (*Sus scrofa*) attractant selection in order to improve eradication programs, Mountain Home, TX.

interval between trips to take one photograph. The cameras that were used were DLC Covert Extreme Black 60 (Covert Scouting Cameras, Lewisburg, KY). This camera is a black infrared (IR) camera with a 12-megapixel (MP) resolution and 12.3 m detection range. The IR technology detects motion and the camera is activated when the animal moves into the detection zone (Brown & Gehrt 2009).

All stations were at least 200 m apart (Campbell & Long 2008; 2009), and were active from July 2017 to March 2018. Based on estimates of average hourly feral pig movement rate (Campbell et al. 2010), an individual pig could potentially visit all stations in this study during a 12-24 hr period. After each sampling period, cameras were checked and photos downloaded every 4-6 weeks, when baits and scents were also refreshed. Once all photos were recovered for the duration of the study, we determined species type and visitation rates. We calculated a visitation event by using a variation of the trap events (Kelly & Holub 2008) and used a 10-min threshold to decide when to count an event. If the same species was recorded within 10 min, it was assumed to be the same individual and was not counted as a new visitation. We used a 10 min threshold for counting a trap event, or visitation event, instead of 30 min as is commonly used (Kelly & Holub 2008) because we were interested in calculating visitation rates and not estimating species abundance. To calculate monthly visitation rate for each species, we divided the total number of visitation events per month by the number of days in that month in which the trail camera was active (visits/day). In our analysis, we included species with at least five visitation events, and those that might be considered a management nuisance at a bait or scent station (i.e., raccoons) in order to determine which station optimized feral pig visitation but minimized by-catch of such species. We used a two-way ANOVA ($\alpha = 0.10$) to determine differences in feral pig visitation rates between sites with and without corral traps for the bait choices and scent stations. We also measured visitation rates for non-target species attracted to the baits/scents to determine if there was a significant difference in non-target species visitations. We calculated camera success (number of events per 100 nights) to examine relative success of capturing visitation by the different species (Kelly & Holub 2008).

RESULTS

A total of six species had at least five visitation events and were included in the analysis: axis deer, coyote (*Canis latrans*), feral pig, gray fox (*Urocyon cinereoargenteus*), raccoon and white-tailed deer. Summing visitation events over the study period, feral pig constituted less than 8% of all recordings (Table 1).

Examining visitation events by station, the plain corn station without a mock corral had 50.97% of all species observations recorded over the study period. However, considering only feral pig visits, the station with the highest percentage of feral pig visitation events (43.20%) was the orange flavored corn without a mock corral trap present (Table 2). The highest percentage of observations for all species except the gray fox was recorded at stations without corral traps; 47.93% of the gray fox observations were at the strawberry scent with corral (Table 2).

There was no significant effect of corral presence or absence on feral pig visitation rate (visits/day) ($F = 0.049$, $df = 1$, $P = 0.826$), but there was a significant effect of lure type when considering all bait and scent types together ($F = 4.5$, $df = 4$, $P = 0.002$) without factoring in corral presence or absence. The orange-flavored corn had a significantly higher mean visitation rate ($\bar{x} = 0.32$) than any other lure type: corn ($\bar{x} = 0.047$, $P = 0.025$), strawberry ($\bar{x} = 0.005$, $P = 0.006$), soured corn ($\bar{x} = 0.018$, $P = 0.01$), and commercial molasses

Table 1. Visitation events for six species monitored at scent or bait stations.

	Visitation Events	
Species	Number	Percentage (%)
Axis	577	26.79
Coyote	16	0.74
Feral pig	169	7.85
Gray fox	217	10.07
Raccoon	759	35.24
White-tailed deer	416	19.31

Table 2. Percentage of visitation events for each species monitored across all stations from July 2017 – March 2018. Stations include orange corn with corral (OCC), corn with corral (CC), orange corn (OC), corn (C), strawberry scent with corral (SC), commercial sour corn scent with corral (SCC), commercial molasses scent with corral (MC), strawberry scent (S), commercial sour corn scent (CSC), commercial molasses scent (M).

	Stations									
	OCC	CC	OC	C	SC	SCC	MC	S	CSC	M
Axis	9.36	15.25	6.41	45.93	2.08	2.25	6.24	5.37	3.12	3.99
Coyote	0.00	6.25	12.5	6.25	0.00	0.00	0.00	25.0	12.5	37.5
Feral pig	30.18	14.20	43.2	1.18	1.18	0.59	0.59	0.59	4.73	3.55
Gray fox	2.76	0.92	9.68	8.29	47.93	13.36	2.76	6.45	5.53	2.30
Raccoon	2.64	0.00	3.16	85.38	1.71	1.71	0.00	0.00	0.53	4.87
White-tailed deer	7.21	24.04	2.88	39.42	1.68	0.96	6.01	3.13	0.96	13.7
Total	7.47	9.98	7.85	50.97	6.41	2.79	3.16	2.92	2.23	6.22

($\bar{x}$ = 0.018, P = 0.01). Examining feral pig visitation rates to baited stations and scent stations separately, there was no significant effect of corral presence or absence on visitation rates to baited stations (P = 0.682) or scented stations (P = 0.156) and no significant effect of lure type on visitation rates at scent stations (P = 0.64). However, there was a significant effect of lure type on visitation rates at the baited stations with orange corn having the higher visitation rate than regular corn (P = 0.06).

We found significant differences in average visitation rates (Table 3) by the various non-target species and feral pigs at eight stations (Table 4). Feral pig visitation rate was greatest at the orange corn with a corral station ($\bar{x}$ = 0.34) and the orange corn without a corral station ($\bar{x}$ = 0.30), and similarly low at all other stations (< 0.10). Axis and white-tailed deer generally had high visitation rates at all stations with orange corn and plain corn, with the exception of white-tailed deer at the orange corn station. Raccoon had the highest average visitation rate of all species (2.35) and this was found at the plain corn without a mock corral station. Gray fox visitation was highest at all three types of scent lures with corral stations (Table 3). Examining the statistically significant comparisons of visitation rates by all species

Table 3. Mean visitation rates to each station, sorted by descending value, from July 2017 - March 2018. Visitation rate was calculated monthly by dividing the visitation event number per species by the number of days that month that the camera trap was active.

Station	Species	$\bar{x}$	*SD*
Orange corn with corral	Axis	0.86	1.45
Total number of active camera trap days = 181	Feral pig	0.34	0.62
	White-tailed deer	0.26	0.50
	Raccoon	0.12	0.18
	Gray fox	0.07	0.16
	Coyote	0.00	0.00
Corn with corral	White-tailed deer	0.35	0.68
Total number of active camera trap days = 170	Axis	0.27	0.33
	Feral pig	0.09	0.23
	Gray fox	0.01	0.01
	Coyote	0.00	0.01
	Raccoon	0.00	0.00
Orange corn	Feral pig	0.30	0.52
Total number of active camera trap days = 240	Axis	0.14	0.27
	Raccoon	0.10	0.21
	Gray fox	0.09	0.15
	White-tailed deer	0.05	0.08
	Coyote	0.01	0.03
Corn	Raccoon	2.35	3.85
Total number of active camera trap days = 250	Axis	0.96	1.68
	White-tailed deer	0.59	1.09
	Gray fox	0.07	0.12
	Feral pig	0.01	0.02
	Coyote	0.00	0.01
Strawberry scent with corral	Gray fox	0.38	0.48
Total number of active camera trap days = 254	Raccoon	0.05	0.05
	Axis	0.04	0.08
	White-tailed deer	0.03	0.06
	Feral pig	0.01	0.01
	Coyote	0.00	0.00

Table 3 Continued.

Station	Species	$\bar{x}$	*SD*
Commercial sour corn scent with corral	Gray fox	0.12	0.12
Total number of active camera trap days = 209	Axis	0.07	0.14
	Raccoon	0.05	0.07
	White-tailed deer	0.03	0.07
	Feral pig	0.00	0.01
	Coyote	0.00	0.00
Commercial molasses scent with corral	Gray fox	0.56	1.67
Total number of active camera trap days = 179	Axis	0.33	0.46
	White-tailed deer	0.19	0.56
	Feral pig	0.00	0.01
	Raccoon	0.00	0.00
	Coyote	0.00	0.00
Strawberry scent	Axis	0.14	0.16
Total number of active camera trap days = 242	White-tailed deer	0.07	0.09
	Gray fox	0.07	0.09
	Coyote	0.03	0.09
	Feral pig	0.00	0.01
	Raccoon	0.00	0.00
Commercial sour corn scent	Axis	0.08	0.17
Total number of active camera trap days = 175	Gray fox	0.06	0.07
	Feral pig	0.03	0.10
	White-tailed deer	0.03	0.07
	Raccoon	0.02	0.04
	Coyote	0.01	0.02
Commercial molasses scent	White-tailed deer	0.25	0.29
Total number of active camera trap days = 214	Raccoon	0.18	0.20
	Axis	0.09	0.12
	Coyote	0.05	0.13
	Feral pig	0.03	0.05
	Gray fox	0.03	0.04

Table 4. Statistical results of comparisons of species' mean visitation rates. Stations include orange corn with corral (OCC), corn with corral (CC), corn (C), strawberry scent with corral (SC), commercial sour corn scent with corral (SCC), commercial molasses scent with corral (MC), strawberry scent (S), commercial molasses scent (M).

Station	Kruskal Wallis test results	Post Hoc test results
OCC	H=10.35, df=5, P=0.07	Coyote vs Raccoon P=0.087 Coyote vs Feral pig P=0.064 Coyote vs White-tailed deer P=0.057 Coyote vs Axis P=0.002 Gray fox vs Axis P=0.076
CC	H=13.50, df=5, P=0.019	Raccoon vs White-tailed deer P=0.008 Raccoon vs Axis P=0.006 Coyote vs White-tailed deer P=0.025 Coyote vs Axis P=0.018 Gray fox vs White-tailed deer P=0.064 Gray fox vs Axis P=0.05 Feral pig vs Axis P=0.093
C	H=20.68, df=5, P=0.001	Coyote vs Axis P=0.025 Coyote vs White-tailed deer P=0.019 Coyote vs Raccoon P=0 Feral pig vs Axis P=0.029 Feral pig vs White-tailed deer P=0.022 Feral pig vs Raccoon P=0 Gray fox vs Raccoon P=0.014
SC	H=15.13, df=5, P=0.01	Coyote vs Axis P=0.078 Coyote vs Raccoon P=0.025 Coyote vs Gray fox P=0.001 Feral pig vs Gray fox P=0.006 White-tailed deer vs Gray fox P=0.013 Axis vs Gray fox P=0.099
SCC	H=13.08, df=5, P=0.023	Coyote vs Raccoon P=0.07 Coyote vs Gray fox P=0.001 Feral pig vs Gray fox P=0.005 White-tailed deer vs Gray fox P=0.03 Axis vs Gray fox P=0.046
MC	H=9.76, df=5, P=0.082	Raccoon vs Axis P=0.009 Coyote vs Axis P=0.009 Feral pig vs Axis P=0.042 White-tailed deer vs Axis P=0.057

Table 4 Continued.

Station	Kruskal Wallis test results	Post Hoc test results
SC	*H*=22.33, *df*=5, *P*=0	Raccoon vs White-tailed deer *P*=0.043 Raccoon vs Gray fox *P*=0.009 Raccoon vs Axis *P*=0
M	*H*=9.37, *df*=5, *P*=0.095	Coyote vs Raccoon *P*=0.042 Coyote vs White-tailed deer *P*=0.022 Gray fox vs Raccoon *P*=0.082 Gray fox vs White-tailed deer *P*=0.047 Feral pig vs Raccoon *P*=0.088 Feral pig vs White-tailed deer *P*=0.051

with regards to feral pig activity, only axis had a significantly higher visitation rate than feral pigs at the corn with corral station; axis, white-tailed deer and raccoon all had significantly higher visitation rates than feral pigs at the corn station; axis had a significantly higher visitation rate than feral pigs at the commercial molasses scent with corral; and both raccoon and white-tailed deer had significantly higher visitation rates than feral pigs at the commercial molasses scent (Table 4).

DISCUSSION

A previous camera study conducted at this location over the course of five months revealed a high abundance of axis deer and few feral pigs (Karlin & Rankin 2017). That study was not conducted using baits or scents, however, and the trap event calculation was based on a 30-min threshold. We have now documented an increase in the feral pig activity with this current study, although axis deer and white-tail deer are still the dominant species present. Both axis and white-tail, along with raccoon which was also documented with high frequency, represent significant non-target animals whose visitation rates to stations managers would want to minimize through the selection of specific baits or scents.

The plain corn station without a mock corral had the highest percentage of total observations of all species combined (50.97%) but interestingly there was little feral pig visitation documented at this station (1.18% of events). Similarly, there were only 24 feral pig visitation events to the corn with corral station over the 170 days that

the camera was active at that station. Corn is often used in field-trials for mixing baits designed to manage feral pig populations (Lapidge et al. 2012); however, our results suggest unflavored corn was less appealing to feral pigs in south Texas compared to the orange flavored corn. The plain corn station without a corral was also the station that attracted the majority of non-target species (i.e., axis – 45.93% of visitation events, white-tailed deer – 39.42% of visitation events, and raccoon – 85.38% of visitation events). For these reasons, we suggest that unflavored corn may not be the best primary attractant in feral pig management activities. The commercial feral pig attractants also performed poorly with less than 5% of visitation events recorded at any of the scent-based stations. Many other species were documented at these commercial scent stations, suggesting it was not due to a lack of scent. Another study conducted in south Texas also documented low visitation rates to a commercial pig scent, Pig frenzy, with visitation numbers equal to those at the control station (Campbell & Long 2008).

The orange flavored corn was highly desired by feral pigs, with 73% of all feral pig observations recorded at either the orange corn with mock corral or orange corn stations. Less than 16% of combined visitation events for any non-target species were recorded at stations with orange corn as the bait, supporting the use of this bait for attracting feral pigs while minimizing the attraction of the non-target species listed in this study.

In any of the analyses, we did not find a statistically significant difference in feral pig visitation rates (visits/day) to stations based on presence or absence of the corral. This suggests that in our study, the mock corrals did not affect feral pig choice of a station, but rather, the bait offered influenced visitation frequency. However, future studies should extend the period of the study and study area in order to increase sample size; should utilize mock corral traps with larger diameters and solid walls, which may appear as a more significant obstacle or threat on the landscape to the wildlife in question; and should randomize treatments at locations and switch treatments between repetitions in order to reduce bias.

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LITERATURE CITED

Adams, C. E., K. Lindsey & S. Ash. 2016. Urban Wildlife Management, Third Edition. Taylor and Francis, Boca Raton, FL, xliii+609 pp.

Becker, H. N., R. C. Belden, T. Breault, M. J. Burridge, W. B. Frankenberger & P. Nicoletti. 1978. Brucellosis in feral swine in Florida. J. Am. Vet. Med. Assoc. 173:1181–1182.

Brown, J. & S. D. Gehrt. 2009. The Basics of Using Remote Cameras to Monitor Wildlife. Natural Resources Fact Sheet, Ohio State University W-21-09:8. https://pdfs.semanticscholar.org/5d50/7159c820295ae02fa4b224da59cda028fad6.pdf. (Accessed January 25, 2017).

Campbell, T. A. & D. B. Long. 2008. Mammalian visitation to candidate feral swine attractants. J. Wildl. Manag. 72:305–309.

Campbell, T. A. & D. B. Long. 2009. Strawberry-flavored baits for pharmaceutical delivery to feral swine. J. Wildl. Manag. 73:615–619.

Campbell, T. A., D. B. Long & B. R. Leland. 2010. Feral swine behavior relative to aerial gunning in southern Texas. J. of Wildl. Manag. 74(2):337-341.

Choquenot, D., J. McIlroy & T. Korn. 1996. Managing Vertebrate Pests: Feral Pigs. Canberra, ACT, Australia: Bureau of Resource Sciences. Australian Government Publishing Service. https://www.pestsmart.org.au/wp-content/uploads/2010/03/Managing-vertebrate-pests-feral-pigs.pdf. (Accessed January 25, 2017).

Conger, T., E. Young & R. Heckmann. 1999. *Brucella suis* in Feral Swine. Pp. 98–107, i*n* Proceedings of the 1999 National Feral Swine Symposium. Texas Animal Health Commission, Austin, TX. https://agrilifecdn.tamu.edu/feralhogs/files/2010/05/Feral-Swine-Conference.pdf. (Accessed January 25, 2017).

Davis, A. J., B. Leland, M. J. Bodenchuk, K. C. VerCauteren & K. M. Pepin. 2017. Estimating population density for disease risk assessment: the importance of understanding the area of influence of traps using wild pigs as an example. Prev. Vet. Med. 141:33-37.

Dickson, J. G., J. Mayer & J. D. Dickson. 2001. Wild hogs. Pp. 191–208, *in* Wildlife of southern forests: habitat and management. Hancock House, Blaine, WA. 484 pp.

Franckowiak, G. & R. Poche. 2018. Short-term home range and habitat selection by feral hogs in northern Texas. Am. Midl. Nat. 179:28-37.

Griffith, G., S. Bryce, J. Omernik, J. Comstock, A. Rogers, B. Harrison, S. Hatch & D. Bezanson. 2004. Ecoregions of Texas. USGS, Corvallis, OR. https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NHEERL&dirEntryId=96618. (Accessed January 25, 2017).

Hartin, R. 2006. Feral hogs—status and distribution in Missouri. M.S. thesis. University of Missouri, Columbia, MS. 69 pp. https://www.aphis.usda.gov/wildlife_damage/nwrc/downloads/Hardin.pdf. (Accessed January 25, 2017).

Hellgren, E. 1999. Reproduction in feral swine. Pp. 67–68, i*n* Proceedings of the 1999 National Feral Swine Symposium. Texas Animal Health Commission, Austin, TX. https://agrilifecdn.tamu.edu/feralhogs/files/2010/05/Feral-Swine-Conference.pdf. (Accessed January 25, 2017).

Karlin, M. & J. Rankin. 2017. Collecting baseline data on wildlife diversity and abundance in a fire-suppressed Edwards Plateau Woodland community, Mountain Home, TX. Texas J. Sci. 68:54–73.

Kelly, M. J. & E. L. Holub. 2008. Camera trapping of carnivores: trap success among camera types and across species, and habitat selection by species, on Salt Pond Mountain, Giles County, Virginia. Northeast. Nat. 15:14.

Lapidge, S., J. Wishart, L. Staples, K. Fagerstone & T. Campbell. 2012. Development of a feral swine toxic bait (Hog-Gone®) and bait hopper (Hog-Hopper™) in Australia and the USA. 8. https://digitalcommons.unl.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=2156&context=icwdm_usdanwrc. (Accessed January 25, 2017).

Matschke, G. 1962. Trapping and handling European wild hogs. Pp. 21–24, i*n* Proceedings of the Southeastern Association of Fish and Wildlife Agencies. Vol. 16. http://www.seafwa.org/pdfs/articles/MATSCHKE-21.pdf. (Accessed January 25, 2017).

Metcalf, E. M., I. D. Parker, R. R. Lopez, B. Higginbotham, D. S. Davis & J. R. Gersbach. 2014. Impact of gate width of corral traps in potential wild pig trapping success. Wildl. Soc. Bull. 38(4):892-895.

Taft, A. 1999. Feral swine – national concerns. Pp. 25–26, i*n* Proceedings of the 1999 National Feral Swine Symposium. Texas Animal Health Commission, Austin, TX. https://agrilifecdn.tamu.edu/feralhogs/files/2010/05/Feral-Swine-Conference.pdf. (Accessed January 25, 2017).

Williams, B. 2010. Efficiency of surveying, baiting, and trapping wild pigs at Fort Benning, Georgia. M.S. thesis. Auburn University, Auburn, AL. 45 pp. http://wp.auburn.edu/deerlab/wp-content/uploads/2014/06/Williams-Brian-MS-Thesis.pdf. (Accessed January 25, 2017).

Wood, G. W. & R. H. Barrett. 1979. Status of Wild Pigs in the United States. Wildl. Soc. Bull. (1973-2006) 7:237–246.

Wyckoff, A. C., S. E. Henke, T. Campbell, D. G. Hewitt & K. C. Vercauteren. 2005. Preliminary serologic survey of selected diseases and movements of feral swine in Texas. Pp. 23–32, i*n* Proceedings of the Wildlife Damage Management Conference. Vol. 11. http://digitalcommons.unl.edu/icwdm_wdmconfproc/95. (Accessed January 25, 2017).