A petition to list Three Grassland and Thicket (Early-sucessional) Species as Threatened or Endangered under Section 4 or the Endangered Species Act of 1973.

We will present the best available science to show that The Plains Spotted Skunk, The Prairie Gray Fox, and the Grand Prairie DPS of the Easten Cottontail have declined between 90-100 percent through most of their ranges. Due to a of loss of grassland and early sucessional habitat all of them require at some stage in their lives as cover or forage or both. This meets the requirements of a 90 day finding that shows that there is evidence of a threat that is acting on the species. We will provide empirical studies that have shown a dependence on this habitat and that these species have already undergone dramatic declines.

While we request these specific "species" as defined under the Endangered Species Act as either a species, subspecies or vertebrate population, the service is free to list more or differently if it so wishes. We have already provided the service with additional references to support listing which covers a larger range of each of these species. For instance, the Eastern Cottontail subspecies to which this DPS belongs is declining in every single state it inhabits to some degree. It simply has lost all its habitat in the former Grand Prairie region and now depends on a declining number of farmsteads and a newly evolved behavior (a much larger home range) to survive. The service could list the entire subspecies for this region or find that this DPS is a significant portion of the range for the subspecies or all the eastern subspecies. The animals large range in the core of the Eastern Cottontail range has already split this subspecies in half which clearly limits the subspecies resiliency and redundancy. The same case could be made for the Gray Fox. The loss of the plains subspecies cuts the already divergent Eastern and Western Subspecies in half (Bozarth,et.al,2011). The threats the Prairie subspecies faces have either spread east in the dramatic declines that that Gray Fox populations have shown in Illinois, Indiana and Mississippi. The coyote population is spreading and increasing throughout the Eastern United States so the service could view this subspecies as a significant portion of the range for even more urgent reasons than the cottontail because it can't live in farmsteads. Also, like the spotted skunk subspecies both would be Distinct Vertebrate populations under the Act. The Gray Fox's discreteness is evidenced by morphology and the fact the subspecies itself it is physically separated within the subspecies and it physically separtated from the other subspecies of Gray Foxes. We have discussed its significance and will do so when we review its status. The Plains Spotted Shrunk occupies the majority of the range of the entire species which also faces the loss of habitat throughout its range. It is discrete even within the subspecies genetically because there are different karyotypes within the subspecies.

We cite a recent thesis which discusses the collapse of grassland and thicket habitats in the eastern United States (Gillen, 2011) and in the Federal Register. We concur with those findings. We know the service has in it files the dire situation these habitats face (Sewell, 2009). We do disagree with the petitioner that these habitats became dominate in the eastern US because of

European settlement. This thesis discusses their long history of grasslands and sucessional habitats and we think that represents the best available science. While early European settlement vastly increased these habitats and created as Seaton once called them, “the bunny billions”, there was a long history of diverse landscape in the eastern US and now that is going or gone due to changes in agriculture, sylviculture, and climate.

We have picked three of the most charismatic and endangered examples of these habitats. We also picked species that have had major collapses in population and or range. Large range and adaptability to humans cannot save a species when the landscape turns against it. We have chosen these four as our canaries in the coal mine. It is our hope that listing these species will serve the conservation of all the grassland and thicket species along with the warbler and the New England Cottontail and we can avoid further listings. Now we go on to describe the specific habitat needs, losses of each species, the population declines they have suffered, and the secondary threatening factors.

We have not mentioned critical habitat because we do not see how it applies here. It is difficult to ask plants to stop growing. These species all live on fragmented mostly privately owned land in scattered pockets.

And now on to the last survivors.

Thank-you

Dave Wade

Tom Alton

Spilogale putorius interrupta

The Plains Spotted Skunk

This is a long recognized subspecies of the spotted skunk and thus is a listable entity under the Endangered Species Act of 1973. In fact, it has been considered a species at some points in taxonomic history (Anthony, 1928) and it is a subspecies with two karyotypes (Perleman, et.al, 2008). It has a unique baculum (Verts, etal. 2001) among other morphological features. These genetic and morphological factors would make the addition discrete, but at the same time the change would be significate because it encompasses more than half the range of the species. We would also note all the threats to this subspecies, like the Gray Fox, apply to the rest of the species. We hope by listing the Plains Spotted Skunk, like the prairie Gray Fox, that listing the rest of the species can be avoided.

The action of threat (population decline) caught the notice of scientists before the cause was determined. The Spotted Skunk was a C-2 candidate species of the US FWS until that category was dropped. Gomper reviewed the range decline of the Spotted Skunk in "Long term range wide Decline of Once Common Carnivore" (Gomper and Hackett, 2005). We concur with this paper as it represents the best available science on the huge decline. Only the state of Kansas monitors the Spotted Skunk population, and it has been absent from their roadside survey (Peek, 2008). Iowa collects records when the skunk is sighted. The Gray Fox has had better monitoring than the skunk, but this review shows an amazing parallel to the decline we have seen more recently with the Gray Fox. We also agree that it is particularly disturbing to see an abundant species with a larger range collapse so suddenly; we petition for three species that have almost been eradicated. The big mystery was the cause.

It is again, Listing Factor A, a loss of habitat that leads to Listing Factor C, Predation. As shown by Lesmeister and others in several studies (Lesmeister ,2007; Lesmeister et.al,2009) it is once again loss of cover habitat, best supplied by early sucessional habitat, which cause these little skunks to become an easy meal for birds of prey. As Lesmeister states, "Forest structure appears to be important to the Eastern Spotted Skunk ecology and populations maybe be limited to areas with dense cover." As we have discussed, these early succesional habitats are disappearing. The threat has been historic and is ongoing.

Although the skunk is protected by most states as mentioned previously, there are so few that any more lost would have an effect. Those states do not have the ability to protect habitat or marshal resources that the ESA provides, thus the skunk suffers from a lack of protection as well.

Therefore, we request that the Plains Spotted Skunk be listed as threatened or endangered under the Endangered Species Act.

All three of these species are threatened by the exact same factor- the loss of cover habitat to protect them from excessive predation. There are differences: the Gray Fox probably declined

later because it had a larger home range and could find usable hiding patches; the rabbit and skunk face general predators while the fox faces one determined predator (Gehrt personal communication). The rabbit has adapted to use human structure that the fox and skunk never were or are no longer able to. Even so, the declines in these structures have left the rabbit down 90 percent. All three need the protection of the Endangered Species Act.

Thank-you

Dave Wade

Member IUCN Small Carnivore Conservation specialist Group

Tom Alton

Western Illinois University

Sylvilagus floridanus mearnsi DPS

Mearn's Eastern Cottontail Distinct Population Segment

Taxonomy and Description

The Distinct Population segments(DPS) is part of a recognized subspecies of the Eastern Cottontail Rabbit (Hall, 1981) which was described by standard morphology for mammal subspecies and is additionally supported by nuclear DNA (Lee et.al, 2010). The Subspecies and DPS generally fit the description of the Eastern Cottontail as a species (Chapman, 1980) in terms of life history and behavior with the major exception of home range behavior as discussed below.

Distinct Population Segment

The US Fish and Wildlife Service has a policy on recognizing vertebrate population segments as distinct which it issued in 1996.

The population must be discrete. This rabbit population is physically discrete from the rest of the subspecies and is broken up into small populations itself (Mankin, 1999). It is also in an ecologically distinct region of intensive agriculture which contains only artificial remnants of its original habitat. Additionally, it is behaviorally distinct because its home range is 7 times larger than that of all other members of its species. Home range is usually a species level characteristic. Even with this huge home range, the distance between most farmsteads in Illinois, at least a mile, makes all these populations physcially separated.

This population is discrete. Is it significant? Yes, this region covers the former Grand Prairie region of Illinois and Western Indiana. This is the very center of the range of mearnsi. Mearnsi is declining through its range (Bogenschutz et al,2011 DNR, 2011,Haroldson,2011,Stewart,2011) and, as we shall show below the DPS is in even more severe decline. There would be a huge gap in the middle of the subspecies. It is about 20 percent of the range of mearnsi that was not hybridized by introductions of other subspecies (Chapman, 1973). So it would, in fact, be creating a major gap in the range of the species thus, splitting the subspecies in half. We would argue because of the central location in a declining subspecies that it could be considered a significant portion of the subspecies range as well. We will focus on this unique population for now.

The US FWS asks for threats and evidence that those threats are acting on the species. While it does not have to be empirical - we have empirical evidence of the threats acting on the species.

The population of this species has declined 90 percent (Scharine et, al, 2011) in the intense agricultural region of Illinois and Indiana because:

Habitat and Predation

The Eastern Cottontail is the most successful of the early successional species (Scharine et.al, 2011). The service has recognized the decline of this habitat (Sewell, 2009 and Federal Register) (Gillen, 2011). This loss of habitat results in unsustainable predation and has been seen in the less adaptable New England Cottontail. The remaining Eastern Cottontail Populations are tied to farm houses which are still in decline (NASS) (Mankin, 1999). There is no original habitat left for the rabbits, yet they have adapted to survive in a landscape that mimics the cover provided by the early succcessional thickets. According to Mankin that is why they evolved to the larger home range. But even this will not be enough to save them as those remaining farmsteads go away.

The other factors

There are so few cottontail rabbits that the hunting pressure that remains is a threat. Illinois and Indiana allows hunting of this cottontail and does not have the means to protect their remaining habitats. So these are threats as well.

This behaviorally distinct cottontail is a key part of the whole species in decline. Through its range (State Data) because of threats acting on it and the species as a whole has led to a 90 percent decline in its population. As such, only protection of the Endangered Species Act can save it and thus we petition to list it as threatened or endangered

Urocyon cinereoargenteus ocythous

The Gray Fox in the Prairies

We petition this subspecies of the Gray Fox because it has seriously declined in all parts of its range by as much as 100 percent. It is now absent from as much as half of its recent and historical range because of loss of habitat. This loss of habitat has resulted in a loss of cover which has allowed increased predation by coyotes and loss of food sources like cottontails.

The Gray Fox subspecies, Ocythous is a recognized subspecies by all authorities. It was first described by Otrum Bangs of Harvard who described many subspecies at that time including the California Gnatcatcher and the New England Cottontail (Hall, 1981). When Hamilton (1943) reviewed the subspecies of eastern mammals he noted among other characteristics that "audital bullae very much smaller and flatter than cinereoargentus (another subspecies)." The audital bullae are especially significant in carnivore evolution because of the key importance of hearing for carnivores and especially the canids (Hunt, 1974; Peters et.al, 2010).

Ocythous would qualify as a Distinct Population Segment as well. It is physically separated at several points within the subspecies, areas far beyond its normal home range of a mile. Except for parts of Missouri and Arkansas, it lives in the grasslands of North America which is unusual for this species. It is significant because it represents a third of its range in the United States and would create a huge gap between the other subspecies which have very different genetic histories (Bozarth etal., 2011).

We agree with the life history information in its Mammalian Species account. That account assocaties the Gray Fox with decidous forest which is true, but as we shall see they also need thick cover like ealy successional forest or dense parries (Fritzell and Haroldson, 1982). The account later notes its favorite food, the Eastern Cottontail, a species iconic of the early sucessional deciduous forests. Eastern Cottontails are not mature forest dwellers because they lack cover from predators like the Gray Fox. The Gray Fox itself needs cover to protect itself from coyotes and for its food (Personal Communication with Stan Gehrt). In fact, authors Haroldson and Fritzell did a telemetry study of the Gray Fox in Missouri and found they indeed need dense cover and young forests/early sucessional.

> "Dense vegetation is important as diurnal cover for Gray Foxes; foxes on the PRWM frequently were in dense stands of young oak-hickory during the day. Gray foxes in east-central Alabama also used areas of dense vegetation during the day. Seventy to 85% of the diurnal locations of gray foxes in West Virgina were in woodlands characterized by a brushy understory. Thus, dense protective cover is characteristic of the diurnal retreats of Gray Foxes throughout their range," (Haroldson and Fritzell, 1984)."

Also, known to early observers, “It is also found in brushy areas where thickets of low shrubbeery afford hunting and hiding places,” (Anthony, 1928). This Discussion leads us to the documented threats to the Gray Foxes existence.

Loss of Habitat and Predation.

We have discussed the loss of the Early Successional Habitats in the introduction and the other species.

Recent research summarized by Cooper (2008), shows the Gray Fox needs a landscape with early sucessional cover, grassland, or dense forest; all of which are in decline (Gillen, 2011). The Gray foxes were all killed by coyotes, its only major non human predator. Stan Gehrt confirmed the same fate in Northern Illinois. Gray Fox populations are being wiped out because they have no place to hide. Gehrt pointed out that their studies showed the coyotes studied were relentless, and killed the Gray Foxes, and did not consume them (personal Communication) (McFarland, 2007).

These trends have been occurring in the habitat of Ocythous. Ocythous has lived in coyote territory; however, when Ocythous lost it’s cover habitat, it’s population collapsed. Now this landscape is disappearing. Coyote’s populations have only recently expanded in the east (Bozarth et. al 2011). We have not petitioned Urocyon Cinereoargenteus Cinereoargenteus at this point, but hope this petition brings attention to the plight of the Gray Fox and further listings can be avoided.

Other Threatening Factors

Other threatening factors include continued human hunting or trapping which is an additional stressor on populations that have declined 99 percent. As this suggests, there is no protection under existing law or regulation for the Gray Fox or its habitat. Without ESA listing, there will be no more Gray Foxes in the Midwest (or perhaps at some point elsewhere since serious declines are confirmed in Illinois, Indiana, Ohio and Mississippi).

The US FWS requires in addition to a listable entity which this subspecies is and documented threats which we have shown as threats to Gray Foxes in the literature, that there be some evidence these factors are acting on the species. This does not have to be empirical, an example would be declines. We can show empirical evidence of declines throughout the range of Ocythous. In the case of Ocythous it seems to follow the maturation of forest lands in time. Farther east it seems to be a combination of coyote expansion and loss of cover habitat.

Several methods can be used to track the populations of cryptic carnivores like the Gray Fox. The most popular is the Observations of Archery Deer Hunters. Missouri uses scent stations as well.

The trends shown in both methods match well. The USDI used scent stations to track coyotes in the plains and west for many years until 1980 (Bean, 1980). This showed that Gray Foxes were largely absent or rare in all the plains states by 1980. This alone is remarkable since many of the mammal books of the region show Gray Foxes had been residents of the eastern parts of the plains states for a long time (Knoxjones, 1985). There were even occasional reports that Gray Foxes were moving farther west (Knoxjones, 1985). Since 1986 they have been occassionally observed in the roadside survey (Peek, 2008). This is consistent with the USDI surveys. The Gray Fox was at one, the Spotted Skunk at zero, the lowest of the terrestrial mammal species survey. In all the surveyed states the Gray Fox is the rarest or next to rarest terrestrial species. Some states include sightings of aquatics and hard to see species like weasels.

Minnesota scent stations survey includes Gray Foxes under "foxes" which have been in a decline in the farming region (Erb, 2010). Historically, the Red Fox outnumbered the Gray Fox 40 to 1. The 1981 survey showed the Gray Fox to be rare in Minnesota (CUSPI, 1981); Wisconsin (Kitchell, 2010) uses a mammal observation form by its staff which shows the fox at low levels comparable to the state endangered listed badger.

Missouri has shown a long term decline to low levels, a decline of 75% since 1983 (Forbes, 2010). Missouri uses Archary Deer Hunter and scent stations. There seems to be populations in the Ozarks and scattered observations in the center of the state. Arkansas Gray Fox population has been at a low level in the last few years in their Archery Dear Hunters survey (Sasse, 2011).

We find the Iowa decline to be most disturbing (Roberts and Clark, 2011). Iowa has not monitored the species for long with Archery Deer hunters, but it has declined precipictly in the last few years. In last year's survey the Gray Fox was in the margin of error of zero in Iowa. It is virtually extinct in a state where it was common and secure not more than 20 years ago. Iowa's forests are maturing like all others. Agriculture has intensified as it has everywhere and as we have seen in its habitat requirements that the Gray Fox cannot live in farm fields (Cooper, 2011).

We agree with the Service that these species are suffering chronic declines due to ongoing habitat changes; we do think this new data from Iowa needs to be considered when the service considers emergency listing.

The Gray Fox is threatened by coyote predation and loss of food because of changes in the landscape due to agricultural intensification. This has resulted in loss of remaining non prairie grasslands and the maturation and browsing of forest by deer that have resulted in loss of early succession forest habitat and understory that many studies have shown that Gray Foxes need for cover, resting and feeding.

This has resulted in a dramatic decline in population and range of the Gray Fox. Ocythous is a quarter of the United States range of the Gray Fox. It is now extirpated or remnant in 70 percent of that range. Its populations have declined by as much as 99 percent in parts of its range like Iowa within a few years. It has declined over its entire range in recent years.

Bibliography

Anthony, H.E. (1928). *The Field Book of North American Mammals.* NY: G.P. Putnum.

Anonyoumos. (1981). *Indices of* p*redator abundance in the Western United States.* ID: U.S. Department of the Interior.

Bean, J. and Roughton, R. (1980). *Indices of* p*redator abundance in the Western United States.* ID: U.S. Department of the Interior.

This shows the gray fox was already extinct in most of the Great Plains. Also, it shows it was not particularly abundant in Minnesota and Wisconsin. This shows the gray fox was present in a part of Illinois where it is now extinct. It was most abundant in Arizona and California. The only area where it seemed to have expanded was Nevada.

Bogenschutz, T., McInroy, M. and Kruger, L. (2011). *2011 Iowa August Roadside Survey.* IA Iowa Department of the Natural Resources.

Bozarth, C. and others (2011). Phylogeography of the gray fox (Urocyon cinereoargenteus) in the eastern United States. *Journal of Mammalogy,* 92(2), 283-294.

Chamberlain, M.J. and Leopold, Bruce D. (2005, January). Overlap in space use among bobcats, coyotes, and gray foxes. *American Midland Naturalist,* 153(1), 171-179.

This paper shows clearly the gray foxes are trying to avoid coyotes and bobcats.

Chapman, J., Hockman, J., and Ojeda, M. (1980, April). Sylvilagus floridanus. *Mammalian Species, 136*, 1-8.

Chapman, J.A., and Morgan, R.A. (1973, December). Systematic Status of the cottontail complex in Western Maryland and near by West Virginia. *Wildlife Monographs no. 36*.

Cooper, Susan (2008). *Surveying and Habitat Modeling for Gray Foxes in Illinois. Southern Illinois* University.

Erb, John. (2010). *Carnivore Scent Station Survey Summary, 2010.* MN: Minnesota Department of the Natural Resources, Forest Wildlife Research Group.

Federal Register (2011, June 2), 76, 31920-31926.

Fedriani, J. M., et al. (2000). Competition intraguild predation among three sympatric carnivores. *Oecologia,* 125, 258-270.

This paper showed the gray fox is being killed by the coyote in California. The western gray fox subspecies still have brushy cover that the eastern subspecies do not. However, they are being over trapped in some states.

Forbes, Liz. (2010). *Monitoring Furbearer Trends using Data Gathered from Cooperatior Bowhunters.* Missouri Department of Conservation.

Fritzell, E. and Haroldson, K. (1982, Novemberl). Urocyon cinereoargenteus. *Mammalian Species, 189*, 1-8.

Gillen, Carolyn (2011). *Effects of Forest Composition on Trophic Relationships Among Mast Production and Mammals in Southern Illinois.* Southern Illinois University Carbondale.

Gompper, M. and Hackett, H. (2005). The long-term, range-wide decline of a once common carnivore: the eastern spotted skunk (Spilogale putorius). *Animal Conservation, 8*, 195-201.

Gosslink, Todd, et al. (2007). Survival and cause specific mortality of red foxes in agricultural and urban areas of Illinois. *Journal of Wildlife Management,* 71(6), 1862-1873.

The red fox can no longer survive in habitats because of coyotes. Northern Illinois study showed the gray fox cannot survive at all.

Hall, E. R. (1981). *Mammals of North America.* NJ: Reprinted Black burn Press.

Hamilton, W. (1943). *The Mammals of the Eastern U.S.* NY: Comstock.

Haroldson, Kurt (2011, September). *2011 Minnesota August Roadside Survey.* MN: Minnesota Department of the Natural Resources.

Haraldson, K.. J. and Fritzell, E. K. (1984). Home ranges activity and habitat use by gray foxes in an oak-hickory forest. *Journal of Wildlife Management,* 48(1), 222-227.

This paper shows that gray foxes need some area of dense vegetation.

Hunt, R.M. (1974, May). The Auditory bulla in carnivore: An anatomical basis for reappraisal of carnivore evolution. *Journal of Morphology, 143(1)*, 21-75.

Jones, J. Knox (1985). *Guide to Mammals of the Plain States.* NE: University of Nebraska Press.

Kitchell, J. (2010). *Annual Mammal Survey, 2010.* WI: Wisconsin Department of the Natural Resources.

Kozlowski, A.J. and Arjo, Wendy. (2008, July). Niche and resource partitioning between Sympatric kit foxes and coyotes in the great basin desert of Western Utah. *American Midland Naturalist*, 160(1), 191-208.

This paper shows another fox species threatened by and avoiding coyotes.

Lesmeister, Damon (2007). *Space Use and Resource Selection by Eastern Spotted Skunks in the Ouachita Mountains, Arkansas.* Univeristy of Missouri-Columbia.

Lesmeister, Damon (2008). Summer resting and den site selection by eastern spotted skunks (Spilogale putorius) in Arkansas. *Journal of Mammalogy, 89(6), 1512-1520.*

Lesmeister, Damon (2010). Eastern spotted skunk (Spilogale putorius) survival and cause-specificmortality in the Ouachita Mountains, Arkansas. *American Midland Naturalist, 164 (1), 52-60.*

Lord, R. D. (1961). A population study of the gray fox. *American Midland Naturalist,* 66(1), 87-109.

This study when compared to the more recent South Carolina study shows the gray fox population structure is extremely vulnerable to excess hunting and trapping.

Lovell, Charles D., Leopold Bruce D., and Schropshire, Katherine C. (1998). Trends in Mississippi predictor populations 1980-1995. *Wildlife Society Bulletin,* 26(3), 552-556.

Important paper that shows how to use harvest hunting data when there is no other source of data on the population. It also, shows the coyote population dramatically increased in Mississippi. In

addition, shows no change in the population of bobcats, red or gray fox despite a decrease in trapping pressures. The article concludes the coyote is suppressing the populations of these three species. Recent data (included in appendix) shows the population of the gray fox has dwindled.

Mankin, P. and Warner, R.. (1999, December). Responses of Eastern cottontails to Intensive row-crop farming. *Journal of Mammalogy,* 80(3), 940-949.

McFarland, Joe (2007, November). The Gray Fox Puzzle. *Outdoor Illniois, 15*(11), 9-12.

Moehrenschlager, A., List, R. and McDonald, David. (2007, August). Escaping intraguild partition: Mexican kit foxes survive while coyotes and golden eagles kill Canadian swift foxes. *Journal of Mammalogy,* 88(4), 1029-1049.

The article begins with this statement, "Although interspecfic killings among carnivore can drive populations…" The paper explains they have found small foxes need cover to hide from predators. The island fox was listed because of golden eagle predation. It is clear from this article the Fish and Wildlife Service was premature to drop the swift fox from the candidate list. The swift fox needs prairie dog colonies for cover just like the gray fox need early successional habitat in the east.

National Agriculture Statistical Service (2006). Number of Farms in Illinois. *Farm & Food Facts'06, 8*.

Parker, Gerry. (1995). *Eastern coyote story of its success.* NS: Nimbus Publishing.

An important book showing the expansion of the coyotes' range after the wolf was killed off by hunting and trapping. Also, discusses the effect of coyotes on red foxes and bobcats. This book was published before we new the effect on the gray fox.

Peek, Matt. (2007, January). *2007 Summer Roadside Survey.* Kansas Department of Wildlife and Parks.

Perelman, P.L and others (2008). Chromosome painting shows that skunks (Mephitidae, Carnivora) have highly rearranged karyotypes. *Chromosome Research, 16*, 1215-1231.

Peters, J.E. (2010, December). Morphometrics of Mink subspecies. *Journal of Mammalogy, 91(6),* 1459-1466.

Stewart, C. (2011, April). *2010 Archer's Index of Furbearer Populations.* Indiana Division of Fish & Wildlife.

Roberts, S. and Clark, W. (2011). *2010 Bowhunter Observation Survey.* Iowa Department of Natural Resources.

Sasse, Blake (2011, July). *2010-11 Furbearing Animal Report.* Arkansas Game and Fish Commission Wildlife Management Bureau.

Scharine, P., Nielsen, C., Schauber, E. Rubert, L, and Crawford, J. (2011). Occupancy, detection, and habitat associations of sympatric lagomorphs in early-successional bottomland forests. *Journal of Mammalogy,* 92(2), 880-890.

Stewart, C. (2011, April). *2010 Archer's Index of Furbearer Populations.* Indiana Division of Fish & Wildlife.

Temple, Danielle. (2007, August). *Spatial ecology of gray foxes on a long leaf pine forest and surrounding landscape in Southwestern Georgia.* LA: Louisiana State University.

This master thesis shows gray fox habitat use in the south and it also shows them avoiding bobcats and coyotes. In addition, it shows 12 percent of the population being trapped. This is notable because Georgia is not now or ever has been a major trapping state.

Verts, B. J. , Carraway, L., and Kinlaw, A. (2001, June). Spilogale gracilis. *Mammalian Species, 674*, 1-10.

Weston, J.L. and Brisdin, L.I. (2003, August). Demographics of a protected population of gray foxes in South Carolina. *Journal of Mammalogy,* 84(3), 996-1005.

This paper shows that hunting and trapping have a severe impact on gray fox population structure.