Seasonal Habitat Use by Gray Foxes on the Savannah River Site

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Abstract: Thirteen radio equipped gray foxes (*Urocyon cinereoargenteus*) were located by triangulation during 24-hour tracking periods on the Savannah River Site, Aiken, South Carolina, between 22 March 1985 and 24 May 1986. Diurnal and nocturnal habitat use was evaluated for each sex within seasonal (pup rearing $N = 6$, dispersal and mating $N = 9$, and denning $N = 7$) and comprehensive ($N = 13$) home ranges. Proportional use of available habitats was not observed for 13 of 16 sex-temporal groupings ($P < 0.05$). Tests for relative use of 7 available habitat types demonstrated diurnal preference by both sexes of 5- to 14-year-old pine stands and, depending on sex and season, random or preferred use of these stands at night. Males and females in most seasonal groupings used ≥15-year-old pine stands less than expected during the day and randomly used them at night. Less than expected use of the 0- to 4-year-old pine/old field category was frequently exhibited, depending on sex and season. All other habitat categories varied in relative use depending on sex and season. Differences in habitat use occurred between sexes within seasons and between seasons within sexes. Seasonal differences in habitat use probably resulted from seasonally changing food habits, cover requirements, and reproductive behaviors. Intersexual differences in habitat use resulted from female habitat selection during denning and pup rearing seasons.

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Variations in gray fox home range size are possibly reflections of underlying habitat characteristics (Trapp and Hallberg 1975, Fuller 1978, Jeselnik 1981, Nicholson and Hill 1981, Progulske 1982, Foote 1984) and/or gray fox density (Trapp and Hallberg 1975, Jeselnik 1981, Nicholson and Hill 1981). Habitat variability affects gray fox food abundance and possibly gray fox density (Wood et al. 1958, Progulske 1982). Because gray foxes are adept at exploiting diverse,

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seasonally available food sources, corresponding shifts in habitat use are expected (Fritzell 1987). Determining degree that gray foxes use various habitat types should, therefore, enhance understanding of the species' spatial and temporal requirements. The objective of this study was to evaluate temporal habitat use of gray foxes on the Savannah River Site, by examining relative use of recognizable habitat categories.

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Methods

This study was conducted on a 110-km^2 portion of Savannah River Site (SRS) located in Aiken, Allendale, and Barnwell counties, South Carolina. The SRS was closed to public access in 1952 and the U.S. Forest Service initiated a forest management program. The study area, previously described by Buie (1980) and Griffith (1985), is located in the center of the SRS on the Aiken Plateau.

Most managed forests consisted of longleaf pine (*Pinus palustris*), slash pine (*P. elliottii*), and loblolly pine (*P. taeda*) plantations of varying ages with varying degrees of understory (Buie 1980). Also present were stands of mixed pine hardwood, upland hardwood, and bottomland hardwood. Because of intensive forest management practices by the U.S. Forest Service, there was a high degree of clearcut and pine stand interspersion. Clearcuts were $\leq$16 ha (Buie 1980). Additional contribution to habitat interspersion was provided by many old field habitats around industrial areas and within gas and power line corridors dispersed throughout the study area. A detailed description of SRS forest types and their components was presented by Jones et al. (1981).

We depicted 0.252-ha habitat units within U.S. Forest Service timber compartments. Major overstory types, pine regeneration stages, gas and power line corridors, plant maintenance and industrial areas, and water were used to partition the map into habitat categories. All pine species were considered a single overstory type. Identified habitat categories and their prevalence on the study area were: bottomland hardwood 14%, upland hardwood 2%, mixed pine-hardwood 1%, 0- to 4-year-old pine/old field 7%, 5- to 14-year-old pine 9%, $\geq$15-year-old pine 60%, and industrial areas 6%. Ponds and lakes covered 1% of the study area.

Thirteen gray foxes were equipped with radio-transmitter collars and located between 22 March 1985 and 24 May 1986. Directional bearings were ob-

tained by triangulation from at least 2 reference points, geographic features clearly recognizable on SRS maps. Because of the large number of reference points available, most triangulation approximated 90° from the signal source at a distance of about 0.40 km. Radio-equipped foxes were proximate in location and azimuths could usually be obtained for 2 or 3 foxes at a single reference point. Therefore, time between first and second bearings for a particular fox was about 5 minutes. Average error polygon size was estimated as 0.40 ha based on replicated azimuths obtained from transmitters at locations unknown to the observer. The tracking procedure consisted of obtaining locations every 2 hours during 24-hour tracking periods (diels), conducted 3 times/month. Home range sizes were computed by Mohr's (1947) minimum area method.

Seasonal and comprehensive gray fox home ranges were overlaid onto the habitat map using a computer program developed by Boyle (1986). The program calculated area of each habitat type within home range boundaries and number of radio locations within each habitat type. Although the estimated error polygon size (0.40 ha) was larger than a single unit of the habitat map (0.252 ha), few habitat stands consisted of <5 map units (<1.25 ha). Upland hardwood, mixed pine-hardwood (2% and 1% of the study area respectively), and bottomland hardwood stands associated with small headwater streams were the primary habitats with small stand sizes. Radio locations were plotted on the habitat map as points and were placed within a single map unit.

Proportion of diurnal and nocturnal radio locations within each habitat type (observed) was compared to proportion of locations that would have occurred (expected) if habitat types within home ranges had been used in proportion to their availability (Bradley and Fagre 1988). Habitat use within seasonal (3 seasons) and comprehensive home ranges was evaluated for each sex during diurnal and nocturnal periods (16 sex-temporal groupings). The hypothesis of proportional use of available habitat types within each sex-temporal grouping was subjected to a Chi-Square Goodness-of-Fit test (alpha = 0.05). Relative use of habitats was determined for groupings which rejected the hypothesis using the Bonferroni confidence interval procedure (Neu et al. 1974, Byers et al. 1984, Bradley and Fagre 1988) and was rated as random, avoided, or preferred.

Seasonal habitat use was evaluated for the following seasons: pup rearing (24 May–31 Aug 1985), dispersal and mating (1 Sep 1985–28 Feb 1986), and denning (1 Mar–23 May 1986). Evaluations were based on locations within home ranges estimated for 3 foxes of each sex during pup rearing, for 5 males and 4 females during dispersal and mating, and for 4 males and 3 females during denning. Evaluation of habitat use within comprehensive home ranges (i.e., home ranges calculated from all available data for each fox) was based on 7 male and 6 female home ranges. Analysis and discussion of seasonal and comprehensive home ranges and methods used to delineate seasons are provided by Sawyer and Fendley (1990).

Results

Interpretation of Analysis

Only 3 of the 16 sex-temporal groupings failed to reject the hypothesis of proportional use of available habitats (Table 1). Upland hardwood and mixed pine-hardwood habitats were the least prevalent habitats in the study areas and had the smallest stand sizes. Where present in home ranges, these 2 habitats were randomly used by both sexes during all seasons (Tables 2–4). However, due to low expected values, small stand size, and lack of observed locations, conclusions regarding relative use of these habitat categories were considered uncertain. Because few foxes included industrial areas in their home ranges and habitats within them ranged from old field and mowed grass to fenced parking lots, relative use of industrial areas should probably be disregarded.

Habitat Use

Pup Rearing Season.—Males demonstrated random use of the 0- to 4-year-old pine/old field category at night, and were not observed in it diurnally (Table 2). The single female that had this habitat within her home range, used it randomly diurnally and was not observed in it at night (Table 2). Both sexes used 5- to 14-year-old pine stands more than expected during diurnal periods and randomly used them at night. The ≥15-year-old pine category was avoided by both sexes diurnally. Males randomly used ≥15-year-old pine stands at night, while females preferred them. Males randomly used bottomland hardwoods during both periods, while females avoided them nocturnally and randomly used them diurnally.

Dispersal and Mating Season.—The 0- to 4-year-old pine/old field category

Table 1. Comparisons of seasonal and comprehensive gray fox habitat use on the Savannah River Site, South Carolina, 1985–1986.

		Period	
Season	Sex	Diurnal	Nocturnal
Pup Rearing	M	91.32(6)[a]	3.73(6) f[b]
	F	18.28(4)	14.70(4)
Dispersal and mating	M	418.52(6)	24.29(6)
	F	126.77(6)	7.55(6) f
Denning	M	45.27(3)	3.52(3) f
	F	56.27(6)	29.41(6)
Comprehensive	M	861.77(6)	64.98(6)
	F	425.44(6)	60.60(6)

[a]Degrees of freedom are in parentheses (number of available habitats − 1). X^2 values with alpha = 0.05 are: 12.60 with 6 df, 9.49 with 4 df, and 7.81 with 3 df.

[b]Values followed by the letter f failed to reject the hypothesis of proportional use of available habitats.

Table 2. Confidence intervals for determining relative habitat use from observed and expected proportions of habitat use within pup rearing season gray fox home ranges on the Savannah River Site, South Carolina, 24 May–31 August 1985.

			Diurnal selection		Nocturnal selection	
Habitat category	*N*	Expected	Observed	95% CI	Observed	95% CI
Males						
Bottomland hardwood	3	0.082	0.074(14)[a]	0.023–0.125(r)[b]	0.111(11)	c
Upland hardwood	1	0.005	0.000(0)	—	0.010(1)	c
Mixed pine hardwood	1	0.005	0.000(0)	—	0.000(0)	c
Pine 0–4 years old	2	0.063	0.000(0)	—	0.061(6)	c
Pine 5–14 years old	3	0.238	0.521(99)	0.424–0.618(+)	0.192(19)	c
Pine ≥15 years old	3	0.600	0.405(77)	0.309–0.501(−)	0.626(62)	c
Industrial areas	1	0.007	0.000(0)	—	0.000(0)	c
Females						
Bottomland hardwood	3	0.118	0.114(20)	0.052–0.176(r)	0.038(3)	−0.017–0.093(−)
Upland hardwood	0	0.000	0.000(0)	—	0.000(0)	—
Mixed pine hardwood	0	0.000	0.000(0)	—	0.000(0)	—
Pine 0–4 years old	1	0.031	0.023(4)	−0.006–0.052(r)	0.000(0)	—
Pine 5–14 years old	3	0.322	0.468(82)	0.371–0.565(+)	0.325(26)	0.190–0.460(r)
Pine ≥15 years old	3	0.464	0.354(62)	0.261–0.447(−)	0.625(50)	0.486–0.764(+)
Industrial areas	1	0.065	0.040(7)	0.002–0.078(r)	0.012(1)	−0.019–0.043(−)

[a]Number of radio locations in parentheses.
[b](+) and (−) indicate preference and avoidance, respectively ($P < 0.05$), (r) indicates random use.
[c]Failed to reject the Chi-Square test for proportional use of available habitats ($P > 0.05$).

Table 3. Confidence intervals for determining relative habitat use from observed and expected proportions of habitat use within dispersal and mating season gray fox home ranges on the Savannah River Site, South Carolina, 1 September 1985–28 February 1986.

			Diurnal selection		Nocturnal selection	
Habitat category	*N*	Expected	Observed	95% CI	Observed	95% CI
Males						
Bottomland hardwood	5	0.120	0.059(20)[a]	0.025–0.093(−)[b]	0.124(31)	0.068–0.180(r)
Upland hardwood	2	0.025	0.018(6)	−0.001–0.037(r)	0.012(3)	−0.007–0.031(r)
Mixed pine hardwood	1	0.005	0.000(0)	—	0.012(3)	−0.007–0.031(r)
Pine 0–4 years old	3	0.075	0.041(14)	0.012–0.070(−)	0.036(9)	0.004–0.068(−)
Pine 5–14 years old	4	0.124	0.490(166)	0.417–0.563(+)	0.208(52)	0.139–0.277(+)
Pine ≥15 years old	5	0.634	0.386(131)	0.315–0.457(−)	0.596(149)	0.513–0.679(r)
Industrial areas	2	0.016	0.006(2)	−0.005–0.017(r)	0.012(3)	−0.007–0.031(r)
Females						
Bottomland hardwood	4	0.158	0.045(11)	0.009–0.081(−)	0.107(19)	c
Upland hardwood	1	0.003	0.000(0)	—	0.000(0)	c
Mixed pine hardwood	1	0.011	0.000(0)	—	0.006(1)	c
Pine 0–4 years old	3	0.057	0.058(14)	0.018–0.098(r)	0.040(7)	c
Pine 5–14 years old	4	0.190	0.463(112)	0.377–0.549(+)	0.237(42)	c
Pine ≥15 years old	4	0.577	0.430(104)	0.344–0.516(−)	0.604(107)	c
Industrial areas	1	0.003	0.004(1)	−0.007–0.015(r)	0.006(1)	c

[a]Number of radio locations in parentheses.
[b](+) and (−) indicate preference and avoidance, respectively ($P < 0.05$), (r) indicates random use.
[c]Failed to reject the Chi-Square test for proportional use of available habitats ($P > 0.05$).

Table 4. Confidence intervals for determining relative habitat use from observed and expected proportions of habitat use within denning season gray fox home ranges on the Savannah River Site, South Carolina, 1 March–23 May 1986.

			Diurnal selection		Nocturnal selection	
Habitat category	*N*	Expected	Observed	95% CI	Observed	95% CI
Males						
Bottomland hardwood	4	0.087	0.115(25)[a]	0.061–0.169(r)[b]	0.063(8)	c
Upland hardwood	0	0.000	0.000(0)	—	0.000(0)	c
Mixed pine hardwood	0	0.000	0.000(0)	—	0.000(0)	c
Pine 0–4 years old	0	0.000	0.000(0)	—	0.000(0)	c
Pine 5–14 years old	3	0.240	0.373(81)	0.291–0.455(+)	0.252(32)	c
Pine ≥15 years old	4	0.561	0.336(73)	0.256–0.416(−)	0.528(67)	c
Industrial areas	2	0.112	0.175(38)	0.111–0.239(r)	0.157(20)	c
Females						
Bottomland hardwood	3	0.061	0.012(2)	−0.011–0.035(−)	0.050(5)	−0.008–0.108(r)
Upland hardwood	1	0.024	0.000(0)	—	0.010(1)	−0.017–0.037(r)
Mixed pine hardwood	1	0.001	0.000(0)	—	0.000(0)	—
Pine 0–4 years old	2	0.096	0.006(1)	−0.010–0.022(−)	0.040(4)	−0.013–0.093(−)
Pine 5–14 years old	3	0.302	0.491(82)	0.387–0.595(+)	0.346(35)	0.219–0.473(r)
Pine ≥15 years old	3	0.476	0.401(67)	0.299–0.503(r)	0.416(42)	0.284–0.548(r)
Industrial areas	2	0.041	0.090(15)	0.030–0.150(r)	0.139(14)	0.046–0.232(+)

[a]Number of radio locations in parentheses.
[b](+) and (−) indicate preference and avoidance, respectively ($P < 0.05$), (r) indicates random use.
[c]Failed to reject the Chi-Square test for proportional use of available habitats ($P > 0.05$).

was avoided both diurnally and nocturnally by males and was used randomly during both periods by females (Table 3). Both sexes diurnally preferred 5- to 14-year-old pine stands. Five 14-year-old pine stands were used randomly by females and preferred by males during nocturnal periods. Both sexes avoided bottomland hardwoods and ≥15-year-old pine stands during the day and used these habitats randomly at night.

Denning Season.—The 0- to 4-year-old pine/old field category was avoided by females and was not present in the home ranges of males (Table 4). Both sexes used 5- to 14-year-old pine stands randomly at night and preferentially during the day. Except for diurnal avoidance by males, ≥15-year-old pine stands were used randomly in all groupings. Except for diurnal avoidance by females, bottomland hardwoods were randomly used in all groupings.

Comprehensive.—Analysis of diurnal habitat use within comprehensive home ranges indicated less than expected use by both sexes of the bottomland hardwood, 0- to 4-year-old pine/old field, and ≥15-year-old pine categories (Table 5). Both sexes diurnally preferred 5- to 14-year-old pine stands. During nocturnal periods, both sexes randomly used ≥15-year-old pine stands, avoided 0- to 4-year-old pine/old field habitats, and preferred 5- to 14-year-old pine stands. Males randomly used bottomland hardwoods during nocturnal periods and females avoided them.

Table 5. Confidence intervals for determining relative habitat use from observed and expected proportions of habitat use within comprehensive gray fox home ranges on the Savannah River Site, South Carolina, 1985–1986.

			Diurnal selection		Nocturnal selection	
Habitat category	*N*	Expected	Observed	95% CI	Observed	95% CI
Males						
Bottomland hardwood	7	0.109	0.078(71)[a]	0.054–0.102(−)[b]	0.097(57)	0.064–0.130(r)
Upland hardwood	3	0.020	0.013(12)	0.003–0.023(r)	0.007(4)	−0.002–0.016(−)
Mixed pine hardwood	2	0.005	0.000(0)	—	0.005(3)	−0.003–0.013(r)
Pine 0–4 years old	4	0.076	0.020(18)	0.008–0.032(−)	0.036(21)	0.015–0.057(−)
Pine 5–14 years old	6	0.116	0.409(372)	0.365–0.453(+)	0.197(116)	0.153–0.241(+)
Pine ≥15 years old	7	0.638	0.398(362)	0.354–0.442(−)	0.597(352)	0.543–0.651(r)
Industrial areas	4	0.036	0.082(75)	0.058–0.106(+)	0.063(37)	0.036–0.090(r)
Females						
Bottomland hardwood	6	0.147	0.060(39)	0.035–0.085(−)	0.071(29)	0.037–0.105(−)
Upland hardwood	2	0.006	0.000(0)	—	0.005(2)	−0.004–0.014(r)
Mixed pine hardwood	2	0.008	0.002(1)	−0.003–0.007(−)	0.002(1)	−0.004–0.008(r)
Pine 0–4 years old	4	0.058	0.029(19)	0.011–0.047(−)	0.032(13)	0.009–0.055(−)
Pine 5–14 years old	6	0.180	0.485(318)	0.433–0.537(+)	0.297(121)	0.236–0.358(+)
Pine ≥15 years old	6	0.526	0.383(251)	0.332–0.434(−)	0.553(225)	0.487–0.619(r)
Industrial areas	2	0.074	0.041(27)	0.020–0.062(−)	0.039(16)	0.013–0.065(−)

[a]Number of radio locations in parentheses.
[b](+) and (−) indicate preference and avoidance, respectively ($P < 0.05$), (r) indicates random use.

Seasonal Comparisons

Differential use of habitats between seasons was demonstrated by both sexes. Males randomly used 0- to 4-year-old pine/old field areas at night during the pup rearing season (Table 2) and avoided these areas during the dispersal and mating season while increasing their use of 5- to 14-year-old stands (Table 3). Males used bottomland hardwoods randomly during the day in warmer months (pup rearing and denning seasons) and avoided them during cooler months (Tables 2–4).

Females demonstrated several differences in diurnal habitat use (Tables 2–4). When compared to other seasons, denning season females decreased their use of 0- to 4-year-old pine/old field areas and increased their use of ≥15-year-old pine stands. Females randomly used bottomland hardwoods on summer (pup rearing season) days and diurnally avoided them during other months. During nocturnal periods, females randomly used bottomland hardwoods and ≥15-year-old pine stands except during the pup rearing season when bottomland hardwoods were avoided and ≥15-year-old pine stands were preferred (Tables 2–4). Although avoided or not used in other seasons, females randomly used 0- to 4-year-old pine/old field habitats at night during the dispersal and mating season.

Discussion

Differences in habitat use between sexes occurred during each of the 3 seasons. All 3 females in both the pup rearing and denning seasons were suspected to have pups. Between-sex differences in relative use of available habitats during the denning season (Table 4) were probably the combined result of the actual den locations and small denning season travel rates (Sawyer and Fendley 1990). During the pup rearing season, females nocturnally avoided bottomland hardwoods and preferred ≥15-year-old pine stands, while males randomly used all available habitats (Table 2). Females used these 2 habitats randomly at night in other seasons, indicating ≥15-year-old pine stands may have been important foraging habitats for young gray foxes. Why the 2 sexes demonstrated seasonal differences in nocturnal use of 0- to 4-year-old pine/old field habitats is unknown.

Jeselnik (1981) previously described SRS gray foxes to randomly use hardwood, managed pine, and road edges during mating ($N = 9$), denning ($N = 3$), and post denning ($N = 3$) seasons, and concluded that 1 or both sexes significantly preferred mixed pine-hardwood habitats during each season. The higher frequency of non-random habitat use within the sex and season groupings of our study was probably from larger within season sample sizes, classification of pine habitats by age, and analysis by diurnal and nocturnal periods. Variability with respect to both individual habitat availability and individual habitat use was apparently low in our study. Although individual habitat preferences were not tested, had the variation between animals been great, more proportional use of available habitats would have been expected. Jeselnik (1981) found significant differences among individuals within separate season/sex treatment groups.

We found gray foxes frequently avoided 0- to 4-year-old pine stands and old field areas. In West Virginia, Yearsley and Samuel (1980) reported a higher percentage of telemetry locations in woodland than in farmland and surface mine habitats. In the Missouri Ozarks, Haroldson and Fritzell (1984) found no significant difference between habitat use and availability of combined radiotracked gray foxes ($N = 7$), but described individual foxes as having seldom used old field habitats during diurnal or nocturnal periods. Preferences for early successional habitats have been reported from Louisiana ($N = 8$) by Foote (1984) and from southern Illinois ($N = 6$) by Follman (1973).

Gray foxes of our study diurnally preferred 5- to 14-year-old pine stands over the more available ≥15-year-old stands and increased their use of ≥15-year-old stands to random or preferred at night. The consistent diurnal preference of 5- to 14-year-old pine stands exhibited by both sexes was probably due to an abundance of suitable cover for denning and resting sites. Progulske (1982) described habitat use by gray foxes in Florida to differ between diurnal and nocturnal periods. Areas characterized by dense understories (pine flatwoods and live oak, *Quercus virginiana,* scrub) were used diurnally and more open areas, i.e., longleaf pine/turkey oak (*Quercus laevis*) sandhills and meadows, were used at night.

Gray foxes demonstrated greater nocturnal use of 5- to 14-year-old pine stands than 0- to 4-year-old pine/old field habitats. Nocturnal use of 5- to 14-year-old pine stands was probably due to availability of gray fox foods. Mengak et al. (1989) described small mammal numbers in South Carolina to decrease with increase in loblolly pine stand age. Peaks in small mammal capture rates and biomass occurred when plantations were 7 years old and a sharp break in both catch and weight occurred between stand ages 9 and 13 (Mengak et al. 1989). In addition to prey abundance, we suspect that vegetational characteristics of habitats are important with respect to prey capture success. Although small mammal densities may be greater in recently planted pine stands, gray foxes may be more adept at hunting within older pine stands where ground level vegetation is less dense. Availability of certain fruits may have contributed to greater use of 5- to 14-year-old stands. Grapes (*Vitis* spp.) and persimmons (*Diospyros virginiana*) are important fall foods of gray foxes (Fritzell 1987), and plum (*Prunus* spp.) seeds were observed in study area gray fox scats. Fruit production of these species is limited until plants exceed 4 years of age.

Our results indicated gray foxes either avoided or randomly used bottomland hardwoods, depending on the sex and time of year. Because bottomland hardwoods were associated with streams, the width of this habitat (especially adjacent to headwater streams) was often narrow (100–200 m) resulting in potential for non-random use from telemetry error. Progulske (1982) found bottomland hardwoods and oak hammocks to be avoided both nocturnally and diurnally. Fuller (1978) found significantly non-random use of riparian habitat by 4 individually tested female gray foxes in California, and attributed preferred use of this habitat to an abundance of essential resources available.

Interstudy comparison of seasonal habitat use by gray foxes is limited by the small number of studies providing information and dissimilarity of available habitats within study areas. Dissimilarity of available habitats in study areas is primarily from studies addressing gray fox habitat throughout the species' extensive range. Differential use of habitats in the sex-temporal groupings of our study probably resulted from seasonally changing food habits, cover requirements, and reproductive behaviors.

A few trends appear evident when comparing gray fox habitat use derived from comprehensive (i.e., cumulative or composite in some studies) home ranges (Table 5). Dense protective cover is characteristic of diurnal retreats (Haroldson and Fritzell 1984), more open forest types are frequently used at night, and, depending on location, non-forested areas (especially their interiors) tend to be used less than expected. Considering the range of this species and its omnivorous feeding habits (Fritzell and Haroldson 1982, Fritzell 1987), a thorough understanding of its habitat requirements and temporal habitat preferences may be limited to specific geographic locations.

Management Implications

Habitat availability-utilization data must be interpreted carefully. Small sample sizes and small expected and observed values provide uncertain results. Telemetry error results in further uncertainty as to the importance of habitat types with small stand sizes such as our upland hardwood and mixed pine-hardwood habitats. Additionally, although interiors of certain habitats may be infrequently entered, their edges may contribute considerably to the foraging requirements of the animal. For example, although analysis suggested frequent avoidance of the 0- to 4-year-old pine/old field category, edges of these habitats were probably regularly used. Eight of our 13 foxes had this habitat category within their comprehensive home ranges (Table 5), and many foxes were captured on the edges of these habitats.

Conducting scent station surveys during seasons when gray fox travel rates and home range sizes are largest could increase and probability of scent station visitation (Sawyer and Fendley 1990). Probability of scent station visitation could be increased further if only randomly used and/or preferred habitats were sampled. Results of our study indicate visitation to individual scent stations on the SRS should be most frequent to those stations established in or adjacent to 5- to 14-year-old and ≥15-year-old pine stands. Knowledge of habitat preferences could be used to achieve other management objectives, such as application of oral rabies vaccines, trapping and predator control, or habitat enhancement for the gray fox.

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