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Habitat Characteristics of Eastern Wild Turkey Nest and Ground-roost Sites in 2 Longleaf Pine Forests

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Abstract: Managing and restoring longleaf pine forests throughout the Southeast is a conservation priority. Prescribed fire is an integral part of these activities, as it is the primary means of controlling hardwood encroachment and maintaining native groundcover. Nest site and preflight brood ground-roost site selection of eastern wild turkeys (*Meleagris gallopavo silvestris*) has not been well studied in longleaf pine systems. Therefore, we determined habitat characteristics associated with wild turkey nests and ground-roosts in 2 longleaf pine forests in southwestern Georgia. We radio-tagged 45 female turkeys and evaluated habitat characteristics associated with 84 nests and 51 ground-roosts during the 2011–2013 nesting seasons. Nests were located farther from mature pine and mature pine-hardwood stands and closer to shrub/scrub habitats than expected. Nests were also negatively associated with percent canopy closure and positively associated with percent woody ground cover and vegetation height. Ground-roosts were closer to mature pine-hardwood stands and open water than were random sites. We suggest that management of longleaf pine forests should focus on maintaining open-canopied forests with adequate understory vegetation to serve as nesting and brood-rearing cover. Our findings suggest that frequent prescribed fire (≤ 2 years), when the management goal is to optimize restoration of longleaf ecosystems, is conducive to maintaining wild turkey populations.

Key words: Pinus palustris, *Meleagris gallopavo silvestris*, nest site selection, ground-roost site selection, prescribed fire, Georgia, wild turkey

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Prescribed fire is commonly used in the Southeast to control hardwood encroachment and maintain native groundcover within longleaf pine ecosystems (Waldrop et al. 1992, Steen et al. 2013). Various ground-nesting birds use this groundcover as nesting and brood-rearing habitat (Hurst 1981, Landers 1981). Historically, fire in the longleaf (*Pinus palustris*)–wiregrass (*Aristida stricta*) ecosystem was initiated by lightning during the growing-season (Komarek 1964, Robbins and Myers 1992). Growing-season prescribed fires (1 March – 31 July) have been advocated to control invading hardwoods and understory shrubs (Lotti 1956), and have had the benefit of improving turkey brood-rearing habitat by increasing insect abundance and enhancing plant growth (McGlincy 1985, Exum 1988). However, growing-season fires can destroy nests and have a negative effect on wild turkey populations (Sisson and Speake 1994).

Nest site selection of eastern wild turkey (*Meleagris gallopavo silvestris*; hereafter, wild turkey) within the longleaf pine ecosystem has not been well investigated, and ground-roost site selection by broods has been even less studied. Wild turkeys nest in dense groundcover within managed mature pine stands and mixed forests (Speake et al. 1975, Seiss et al. 1990, Still and Bauman 1990, Badyaev 1995) and edge habitats are believed to be important to turkeys when selecting nests (Speake et al. 1975, Seiss et al. 1990). Within intensively-managed pine ecosystems with frequent prescribed fire (≤3 years), wild turkeys will readily nest and brood in stands that were burned 2 years prior to nesting (Sisson et al. 1990, Still and Bauman 1990).

Knowledge of habitat characteristics associated with preflight ground-roost locations of wild turkey broods is limited. During this 2-week period, poults brood under the female on the ground at night (Williams 1974). Ground-roosts of wild turkeys in Florida are typically located under forest canopies with sparse understory ground cover and occasionally in canopy openings (Barwick et al. 1970). Wild turkey broods use a variety of forest stand types, often selecting areas with moderate herbaceous ground cover (Jones et al. 2005). Likewise, broods often select more open areas, such as pastures or forest openings, due to increased invertebrate abundance in these areas (Hillestad and

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Speake 1970, Hurst and Stringer 1975, Martin and McGinnes 1975).

Frequency of prescribed fire has been shown to influence brood habitat use, but whether broods that specifically are ground-roosting are similarly influenced by prescribed fire regimes is unclear. Broods have been documented using mixed pine-hardwood stands burned on a 2–3-year rotation, mature bottomland hardwoods where upland pine stands were burned infrequently (Jones et al. 2005) and mature pine stands burned ≤3 years prior (Burk et al. 1990, Palmer 1990).

To address the effects of managing and restoring longleaf pine forests on wild turkey nest and brood-site habitat characteristics, our objectives were: (1) to evaluate the habitat characteristics associated to nest sites; and (2) to evaluate the habitat characteristics associated to brood-sites. We hypothesized that ground-roosts were more likely to occur closer to agriculture/food plot habitats because of a higher invertebrate abundance in these areas.

Study Area

This research was conducted on two similar study sites in southwestern Georgia. The Joseph W. Jones Ecological Research Center at Ichauway (Jones Center) was an 11,735-ha area located in Baker County, Georgia. The Silver Lake Wildlife Management Area (Silver Lake WMA) was a 3,900-ha state-owned property in Decatur County, Georgia. Both sites were comprised mostly of longleaf-wiregrass stands amongst a diversity of other forest types, including longleaf pine, loblolly pine, slash pine, mixed pine and hardwood forests, hardwood forests, and lowland hardwood hammocks as well as many depressional wetlands and ponds. More specifically, the Jones Center was comprised of approximately 39% mature pine (>20 years old), 24% mixed-pine hardwood, 11% agriculture/food plot, 8% young pine (<20 years old), 7% hardwoods, 4% scrub-shrub, 3% wetland, 3% open water, and 1% urban/barren. Silver Lake WMA was comprised of approximately 56% mature pine (>20 years old), 22% young pine (<20 years old), 10% open water, 9% mature pine-hardwood, 1% shrub-scrub, 1% hardwood, and 1% urban/barren. Prescribed fire was the primary management tool on our study sites. Prescribed fires were conducted during the dormant and growing seasons (1 January–31 July) in a mosaic pattern across the sites with a burn interval of 1–3 years. Burn area sizes averaged approximately 21.4 ha (SE = 0.8; range = 0.0–240.6 ha) on the Jones Center and 14.4 ha (SE = 0.6; range = 0.7–88.3 ha) on Silver Lake WMA during the study.

Methods

We captured female wild turkeys with rocket nets during December–March of 2011–2013 and June–August of 2011–2012. We fitted females with serially numbered, butt-end (left leg) and riveted (right leg) aluminum leg bands (National Band and Tag Co., Newport, Kentucky). We radio-marked females with 60-g mortality-sensitive VHF radio-transmitters (Sirtrack, Havelock North, New Zealand, and Telenax, Playa del Carmen, Mexico). All birds were released at the capture site immediately after processing, and all capture and handling protocols were approved by The University of Georgia Institutional Animal Care and Use Committee (Protocol #A2013 05-034-Y1-A0).

We used a hand-held, 3-element Yagi antenna and Wildlife Materials TRX 2000S receiver (Wildlife Materials, Murphysboro, Illinois) to locate radio-marked females ≥2 times per week from mid-July to mid-March and ≥1 time per day from mid-March to mid-July. We estimated turkey locations using triangulation and recorded their location in the field using a mobile phone fitted with Location of a Signal-SD software (Ecological Software Solutions, LLC) and a Bluetooth-Global Positioning System (GPS). We determined a female had initiated incubation when she was found in the same location for 3 consecutive days. After determining incubation initiation, we approached the nest to within 25 m and recorded compass bearings towards the nest. After termination of incubation, we located the nest to determine nest fate, clutch size, and brood size, and we recorded its GPS location. If a nest could not be located, then we used the location where the recorded compass bearings crossed as the nest site. During the brood's flightless period (≤14 days post-hatch), we located ground-roost sites 30 minutes before dawn 3–4 times per brood-rearing female or until poult loss. We approached ground-roosts to within 15 m and recorded 3–4 compass bearings in the direction of the female wild turkey. After brood departure, we located the ground-roost site and recorded its location using GPS.

To evaluate habitat characteristics associated with nest and ground-roost sites, we used a resource selection function approach (Manly et al. 2002), which required the generation of random locations within the study area boundary equal to number of nest and ground-roost site locations to assess non-random habitat selection. We used a random point generator in ArcGIS 10.0 to generate an equal number of random points within the study area boundary similar to a Design II analysis (Johnson 1980). Habitat selection was analyzed as a binomial response variable (1 = nest or ground-roost site; 0 = random location), which yields values proportional to the probability of use of a resource unit (Boyce et al. 2002). We measured microhabitat variables associated with nests, ground-roosts, and random sites for the 2011–2013 nesting seasons to investigate nest and ground-roost site selection at the microhabitat level. We used a Robel pole (Robel et al. 1970) to measure the minimum (VOmin), average (VOavg), and maximum (VOmax) vegetation height (cm) of understory vegetation at each site. The Robel pole readings were recorded from a distance of 15 m in each cardinal direction from the site center at 1 m in height. We used a spherical densiometer (Lemmon 1956) to measure percent canopy closure (CC) and a 1-m^2 Daubenmire frame (Daubenmire 1959) to measure percent ground cover at the site center and at a distance of 15 m in each cardinal direction. Ground cover was partitioned into seven cover types: bare ground, debris, fern, forb, grass, vine, and woody. Microhabitat vegetation sampling at ground-roost sites did not occur during the 2013 monitoring season.

We used ArcGIS 10.0 (Environmental Systems Research Institute Inc., Redlands, California) to measure how various habitat variables at the landscape-level influenced nest and ground-roost site selection. We partitioned habitat types into mature pine (>20 years old; MP), young pine (<20 years old; YP), mature pine-hardwood (MPH), hardwood (H), shrub/scrub (SS), forested/herbaceous wetlands (WD), agriculture/food plot (AG), water (W), and urban (U). We assumed, given structural similarities of mature pine (>20 years old) and young pine (<20 years old), that females perceived these habitat classes similarly within the class. Likewise, frequent fire return intervals implemented on both study sites create relatively homogenous understory conditions in the mature pine and young pine classes. We calculated the linear distance (m) from each nest, ground-roost, and random location to each habitat type, transition from forest to opening (edge), and road. The linear distance to the habitat type that the nest, ground-roost, or random site was located within was 0 meters. Distance-based metrics are advantageous because they are not restricted to linear or point habitat features, require no explicit error handling, and permit extraction of more information than classification-based analyses such as compositional analysis (Conner et al. 2003). Likewise, biotic and abiotic processes operate and interact at multiple spatial scales on the landscape (Turner 1989); therefore, choosing the correct scale(s) of selection can be fairly arbitrary. For these reasons, we chose a distance-based approach to address habitat selection for nests and brood-sites. Lastly, we determined the time-since-fire in years (0, 1, 2, ≥3) for each habitat where a nest, ground-roost, or random site occurred.

To reduce the number of variables used in modeling, we used univariate statistics (*t*-tests, for unequal variances) to first identify significant ($P < 0.1$) variables (Johnson 1981, Rexstad et al. 1988). We further reduced the number of variables by eliminating highly correlated ($|r| > 0.7$) variables (Brennan et al. 1986). We used logistic regression analysis to predict selection of nest and ground-roost sites relative to habitat variables and time-since-fire using the GLM procedure (R Core Team 2013). We also used a logistic regression analysis to develop models to predict whether nest site and ground-roost site selection were associated with microhabitat variables. We developed 11 models to describe nest site selection at the landscape-level and 7 models to describe nest site selection at the microhabitat level. We developed 6 models to describe ground-roost site selection at the landscape-level. No models were developed to describe ground-roost site selection at the microhabitat level as our analysis failed to identify any important predictor variables. We used the second-order Akaike's Information Criteria (AIC_c) to determine the weight of evidence in support of those models (Burnham and Anderson 2002). Adjusted Akaike weights (w_i) for each model were calculated as an estimate of the probability of a model being the most predictive model of the model set. We then used model-averaging to calculate parameter estimates, unconditional standard errors, and variable weights of the top-performing models within 4 AIC_c based on their adjusted Akaike weights (w_i) (Burnham and Anderson 2002). For easier interpretation, scaled odds ratios and their associated 95% confidence intervals were calculated for all model-averaged parameter estimates using scalers that were believed to be biologically relevant (Hosmer and Lemeshow 1989). We only considered parameter estimates with 95% confidence intervals that excluded zero to be informative (Miller and Conner 2007).

Results

We monitored 84 nests during the 2011–2013 nesting seasons, 79 were associated with 45 radio-marked wild turkeys and 5 were found opportunistically by staff on the study sites. Of all nests, 7 (8%) were exposed to growing-season prescribed fire and of those only 2 (29%) were successful. We located nests in mature pine ($n = 31$; 37%), agriculture ($n = 17$; 20%), hardwood ($n = 10$; 12%), mature pine-hardwood ($n = 10$; 12%), shrub/scrub ($n = 9$; 11%), young pine ($n = 3$, 4%), urban ($n = 3$, 4%), and wetland habitats ($n = 1$, 1%). Our study sites were dominated by mature pine and mature-pine hardwood stands, but most (51%) nests were located in other habitat types. We excluded one outlier nest from 2011 (distance to nearest mature pine was >800 m or nearly two times greater than the next farthest nest); therefore, we developed our predictive models of nest selection at the landscape-level based on 83 nests. We found that the global model was the most parsimonious model ($w_i = 0.37$; Table 1) but was similar to the MP+YP+MPH+SS model ($w_i = 0.33$). Model-averaged parameter estimates suggested that distances from mature pine, mature pine-hardwood, and shrub/scrub habitats were important predictors (Table 2), with nests being farther from mature pine and mature pine-hardwood stands and closer to shrub/scrub stands than random locations (Figure 1). Scaled odds ratios suggested that nests were 1.38 times more likely to occur for every 50 m farther from

Table 1. Top-performing landscape-level models associated with nest site selection of female wild turkeys in southwestern Georgia, 2011–2013.

Model[a]	K[b]	AICc[c]	ΔAICc[d]	Adjusted[e] w_i
Landcover (MP + YP + MPH + SS + W)	6	204.52	0.00	0.37
Landcover2 (MP + MPH + SS + YP)	5	204.80	0.27	0.33
Landcover3 (MP + MPH + SS)	4	206.09	1.57	0.17
Global (Edge + MP + YP + MPH + SS + W)	7	206.64	2.11	0.13

a. Landscape-level variables within models include distances to mature pine (MP), young pine (YP), mature pine-hardwood (MPH), shrub/scrub (SS), water (W), and edge (Edge)
b. Number of variables (*K*).
c. Second-order Akaike's Information Criterion (AIC*c*)
d. Distance from the second-order Akaike's Information Criterion (ΔAIC*c*)
e. Adjusted model weights of top-performing models within $AIC_c < 4.0$ of the best model

Table 2. Model-averaged parameter estimates of landscape-level parameters from top-performing models used to predict nest site selection of female wild turkeys in southwestern Georgia, 2011–2013.

Parameter[a]	Estimate	SE[b]	Variable weight	Scaler[c]	Scaled odds ratio	Scaled lower 95% odds ratio	Scaled upper 95% odds ratio
MP	0.006	0.002	1.000	50.0	1.384	1.104	1.734
MPH	0.001	0.001	1.000	50.0	1.054	1.003	1.108
SS	–0.005	0.001	1.000	50.0	0.787	0.690	0.897
W	–0.001	0.000	0.830				
YP	0.001	0.001	0.500				
Edge	–0.001	0.002	0.130				

a. Landscape-level parameters include distances to mature pine (MP), mature pine-hardwood (MPH), shrub/scrub (SS), water (W), young pine (YP), and edge (Edge)
b. Standard error (SE) of the estimate.
c. Biologically relevant scaler in meters (m).

Table 3. Top performing microhabitat-level models associated with nest site selection of female wild turkeys in southwestern Georgia, 2011–2013.

Model[a]	K[b]	AICc[c]	ΔAICc[d]	Adjusted[e] w_i
Global (Debris + Woody + CC + VOmax + VOmin)	6	100.14	0.00	0.94
VOmin	2	105.70	5.56	0.06

a. Microhabitat variables within models include % debris (Debris), % woody (Woody), % canopy closure (CC), maximum vegetation height (VOmax), and minimum vegetation height (VOmin).
b. Number of variables (*K*)
c. Second-order Akaike's Information Criterion (AIC*c*)
d. Distance from the second-order Akaike's Information Criterion (ΔAIC*c*)
e. Adjusted model weights of top-performing models within $AIC_c < 4.0$ of the best model

Table 4. Model-averaged parameter estimates of microhabitat parameters from top-performing models used to predict nest site selection of female wild turkeys in southwestern Georgia, 2011–2013.

Parameter[a]	Estimate	SE[b]	Variable weight	Scaler	Scaled odds ratio	Scaled lower 95% odds ratio	Scaled upper 95% odds ratio
VOmin	0.361	0.109	1.000	10.0[c]	36.855	4.363	311.330
CC	–0.022	0.010	0.940	5.0[d]	0.895	0.810	0.988
Debris	0.010	0.017	0.940				
VOmax	0.197	0.132	0.940				
Woody	0.051	0.026	0.940	5.0[d]	1.292	1.005	1.661

a. Microhabitat parameters include minimum vegetation height (VOmin), maximum vegetation height (VOmax), % canopy closure (CC), % debris (Debris), and % woody (Woody).
b. Standard error (SE) of the estimate
c. Biologically relevant scaler in centimeters (cm)
d. Biologically relevant scaler in percent (%)

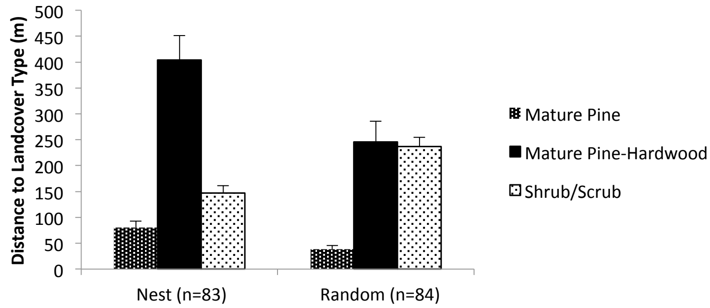

Figure 1. Mean and standard error of important landscape-level parameters (distance to mature pine and shrub/scrub habitats) used to predict nest site selection of wild turkeys in southwestern Georgia, 2011–2013.

mature pine stands and 1.05 times more likely to occur for every 50 m farther from mature pine-hardwood stands. For every 50 m farther away from shrub/scrub habitats, nests were 1.27 times less likely to occur (Table 2).

We used 52 nests to develop 7 predictive models of nest selection relative to vegetative characteristics. We found that the global model was the most parsimonious model ($w_i = 0.94$; Table 3), followed by the VOmin model ($w_i = 0.06$). Percent canopy closure, minimum vegetation height, and percent woody ground cover were important predictors of nest site selection (Table 4), with nest sites having less canopy closure and greater minimum vegetation height and percent woody vegetation. Scaled odds ratios suggested that nests were 36.9 times more likely to occur for every 10 cm increase in minimum vegetation height and 1.29 times more likely to occur for every 5% increase in woody ground cover. For every 5% increase in canopy cover, nests were 1.12 times less likely to occur (Table 4). The average percent canopy closure at nest sites was 54% compared to random locations (65%), the average minimum vegetation height was 85 cm compared to random locations (39 cm), and the average percent woody ground cover was 24% compared to random locations (12%).

We monitored 34 broods and 11 (32%) survived the flightless period. Of the 11 surviving broods, 7 (64%) survived to 4 weeks. Only 1 (3%) brood was lost to a growing-season fire that occurred immediately post-hatch. We located ground-roosts in mature pine (*n* = 15; 29%), mature pine-hardwood (*n* = 10; 20%), hardwood (*n* = 8; 16%), agricultural (*n* = 7; 14%), shrub/scrub (*n* = 5; 10%), young pine (*n* = 4; 8%) and wetland habitats (*n* = 2; 4%). We used 51 ground-roosts to develop predictive models of ground-roost selection at the landscape-level. We found that the MPH+W model was the most parsimonious model of the set ($w_i = 0.75$; Table 5) and it was three times better than the second best model H+MPH+W ($w_i = 0.25$). Model-averaged parameter estimates suggested that distances from mature pine-hardwood and water were important predictors (Table 6), with ground-roosts being closer to mature pine-hardwood

Table 5. Top-performing landscape-level models associated with ground-roost site selection of female wild turkeys in southwestern Georgia, 2011–2013.

Model[a]	K[b]	AICc[c]	ΔAICc[d]	Adjusted[e] w_i
MPH+W	3	127.99	0.00	0.75
Global (H + MPH + W)	6	130.14	2.16	0.25

a. Landscape-level variables within models include distances to hardwood (H), mature pine-hardwood (MPH), and water (W).
b. Number of variables (*K*)
c. Second-order Akaike's Information Criterion (AIC*c*)
d. Distance from the second-order Akaike's Information Criterion (ΔAIC*c*)
e. Adjusted model weights of top-performing models within AIC_c <4.0 of the best model

Table 6. Model-averaged parameter estimates of landscape-level parameters from top-performing models used to predict ground-roost site selection of female wild turkeys in southwestern Georgia, 2011–2013.

Parameter[a]	Estimate	SE[b]	Variable weight	Scaler[c]	Scaled odds ratio	Scaled lower 95% odds ratio	Scaled upper 95% odds ratio
MPH	–0.002	0.001	1.000	50.0	0.902	0.844	0.965
W	–0.001	0.000	1.000	50.0	0.930	0.889	0.973
H	0.000	0.001	0.250				

a. Landscape-level parameters include distances to mature pine-hardwood (MPH), water (W), and hardwood (H).
b. Standard error (SE) of the estimate
c. Biologically relevant scaler in meters (m)

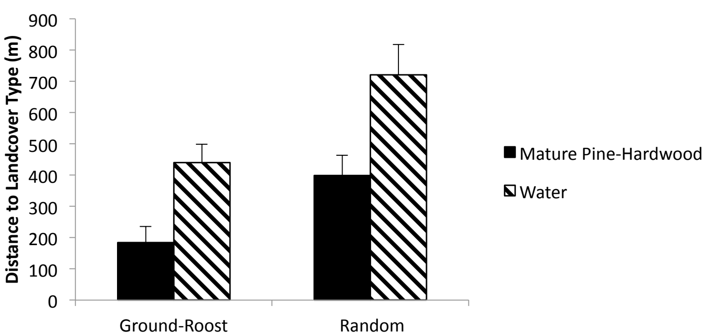

Figure 2. Mean and standard error of important landscape-level parameters (distance to mature pine-hardwood and water) used to predict ground-roost site selection of wild turkeys in southwestern Georgia, 2011–2013.

stands and water than random locations (Figure 2). Scaled odds ratios suggested that ground-roosts were 1.11 times less likely to occur for every 50 m farther from mature pine-hardwood stands and 1.07 times less likely to occur for every 50 m farther from water (Table 6).

We used 31 ground-roosts to investigate ground-roost selection relative to vegetative characteristics. No microhabitat variables were important in ground-roost site selection of wild turkeys. Overall, we identified 6 important predictor variables for nest site selection and 2 for ground-roost site selection, with a total of 7 variables combined (percent canopy closure, percent woody ground cover, minimum vegetation height, and distances to: mature pine, mature pine hardwood, shrub/scrub, and water). Comparatively, nests were more likely to occur farther from mature pine hardwood stands (Figure 1) than ground-roost sites at the landscape-level (Figure 2). At the microhabitat level, nest sites were associated with a greater woody ground cover at 24% (SD = 14.8) compared to ground-roost sites at 18% (SD = 12.3); and nest sites had a greater minimum vegetation height of 85 cm (SD = 30.6) compared to ground-roost sites at 57 cm (SD = 25.4). Distances to mature pine and water, and percent canopy closure were similar between nest and ground-roost sites.

Discussion

We found that nest sites were positively associated with greater minimum vegetation height. Ground-level vegetation cover is an important factor in nest site selection of wild turkeys (Still and Bauman 1990, Chamberlain and Leopold 1998), and concealment from predators may be a driving factor influencing selection of nest sites (Lehman et al. 2008). Nests were negatively associated with greater canopy closure, presumably because increased sunlight promoted greater groundcover. This negative association with canopy closure could also be indicative of a number of the nests being located near field edges or within food plots on our study sites.

We also found that nests were positively associated with a greater percent woody cover. Similarly, other studies have shown that wild turkeys select nest sites with greater understory vegetation density and woody stem density relative to random sites (Speake et al. 1975, Healy 1981, Badyaev 1995, Byrne and Chamberlain 2013). Compared to ground-roosts, minimum vegetation height and percent woody ground cover were greater at nests, which may be related to the greater risk of predation during the long incubation period and hence, the need for security cover (Lehman et al. 2008, 2010).

Nests were more likely to occur farther from mature pines and mature-pine hardwood stands and closer to shrub/scrub stands than random locations. Habitat management, along with prescribed burning regimes, on our study sites created a mosaic of food plots and openings within the forested stands dominated by early successional plant communities. Therefore, nesting wild turkeys were likely sampling for open areas outside of mature pine and mature pine-hardwood stands which would allow more sunlight and thus greater understory vegetation and woody stem densities. These open areas, such as shrub/scrub stands and food plots, are important to broods for foraging and cover (Hillestad and Speake 1970, Hurst and Stringer 1975, Martin and McGinnes 1975, Sisson et al. 1991).

We found that ground-roosts were more likely to be closer to mature pine-hardwood stands and water relative to random locations. Mature-pine hardwood stands on both sites were typically found near or within riparian areas because prescribed fire and mechanical removal of hardwoods from the upland longleaf pine stands reduced hardwood composition in uplands. Brooding wild turkeys preferred hardwood-dominated stands; these habitats and the riparian areas associated with them should be maintained to provide wild turkey roosting areas (Miller et al. 1999, Chamberlain et al. 2000). Once poults are able to fly, broods begin to roost in tress (Spears et al. 2007). Wild turkeys may be selecting for mature pine-hardwood stands and riparian areas during ground-roosting for their proximity to suitable roost trees. Roost site proximity to water has been shown to be important to wild turkeys (Wheeler 1948). On our sites, riparian areas provided access to hardwood trees with layered horizontal branching, which are selected by roosting wild turkeys (Kilpatrick et al. 1988).

Management Implications

Although we noted differences in habitat characteristics associated with nest and ground-roosts of wild turkeys, our findings suggest that managers could target efforts directed at ensuring availability of both required habitats in longleaf pine systems. We found that prescribed fire had no impact on wild turkey nest and ground-roost site selection, which is likely a result of frequently prescribed fires creating relatively homogenous understory conditions on our study areas. Therefore, longleaf pine management with small scale (12–22 ha) and frequent fire-return intervals (≤2 years) should be compatible with management efforts focused on providing wild turkey nest and ground-roost habitats while maintaining wildlife and plant diversity. This is supported by the relatively high nest success (48%) observed on our study sites (Williams 2012). We suggest that land managers who wish to create or conserve nest cover for wild turkeys within longleaf pine ecosystems focus on maintaining a mosaic of open areas within and around mature pine stands. The open canopy areas will allow for herbaceous understory growth and woody stem growth facilitating nest concealment. Land managers should carefully consider hardwood removal from longleaf pine ecosystems, as these habitats are important for wild turkey females and broods. Managers should maintain hardwood stands, particularly in riparian areas, to allow ground-roost site locations to be near tree-roosting locations used later in the summer, and throughout the remainder of the year.

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