CHAPTER 6

VEGETATION AND HABITAT CHARACTERISTICS

INTRODUCTION

During the 2003 study, we measured vegetation and habitat characteristics at plots located throughout the four life history study areas to obtain an overall description of the whole habitat block. We also measured vegetation and habitat characteristics in Southwestern Willow Flycatcher nesting and non-use plots at the four life history study areas and Bill Williams. Our specific objectives for vegetation sampling are to understand how habitat characteristics at sites used by nesting willow flycatchers differ from those at unused sites, and to identify specific variables that may contribute to the characterization of breeding habitat throughout the Virgin and lower Colorado River riparian systems. Data from nesting and non-use plots in 2003 will be pooled with data acquired in subsequent years to contribute to an understanding of general habitat features that characterize Southwestern Willow Flycatcher breeding habitat.

METHODS

At each of the four life history study areas and Bill Williams, we described and measured vegetation and habitat features following a modification of the methods of James and Shugart (1970). These methods were developed over several seasons by the Arizona Game and Fish Department (see data form, Appendix A). All vegetation characteristics were measured within an 11.3-m-radius circle (0.04 ha). A plot this size centered on a nest is likely to be sufficient to describe variability within a flycatcher territory without measuring areas outside the territory (Sedgwick and Knopf 1992). We also chose a distance of 30 m from plot centers to record presence or absence of certain habitat features. An area of this size (2,827 m^2) should represent an unbiased characterization of willow flycatcher habitat selection given that it encompasses approximately 25–50% of the home range of a breeding willow flycatcher (Paxton et al. 2003, Sedgwick 2000). To avoid disrupting flycatcher breeding activities, we measured vegetation in late August when the nest, territory, and adjacent flycatcher territories were inactive for at least two weeks.

We measured habitat characteristics at approximately thirty 11.3-m-radius plots throughout each of the four life history study areas to obtain a description of the overall characteristics and the variability of habitat characteristics within the habitat block. We considered the habitat block to include all riparian areas that were potential nesting habitat or use areas (e.g., foraging, roosting, feeding young) for willow flycatchers. At Mesquite and Pahranagat, these areas were contiguous with nesting habitat that was occupied in 2003, while at Topock and Mormon Mesa, portions of the habitat block were separated from occupied habitat by roads, open water, dry washes, marshes, or dead vegetation. At the life history study areas that are separated into several noncontiguous sites, the number of plots measured in each site was proportional to the area of the site in relation to the total area of all sites in the study area to obtain a representative sampling of the habitat. Nest and non-use plots (see below) were included in the habitat block measurements as long as they did not overlap with an adjacent plot and did not result in disproportionate representation of a site.

Plot center locations for habitat block points were selected by superimposing a 25 × 25 m grid on an ArcView® GIS 3.3 software shapefile of the study area boundary, numbering the grid blocks, selecting blocks by using a random number generator, and using the centroid of each selected block. Plot centers were located in the field by navigating to the given coordinates using a Rino 110 GPS unit.

At each plot, we laid out four 11.3-m–long ropes from plot center, one in each of the four cardinal directions. Each rope was marked at 1 m and 5 m from the center of the plot. At 1 m from the center of the plot in each cardinal direction, we measured vertical foliage density using a 7.5-m-tall survey rod. Working our way up the rod, we recorded the presence of vegetation, by species, within a 10-cm radius of the rod in 0.1-m intervals (presence of the species within the 0.1-m interval equaled one "hit" on the rod), and tallied all hits in 1-m intervals. Presence of dead vegetation (snags) was recorded in the same manner, but not identified to species. If canopy vegetation continued above 7.5 m, we estimated the number of hits as greater than or less than five hits per 1-m interval until the canopy vegetation stopped (modified from Rotenberry 1985). We measured total canopy and sub-canopy closure using a Model-A spherical densiometer at 1 m north and south of the center of each plot and averaged these measurements to obtain a single canopy closure value for each plot. We measured average canopy height within each 11.3-m plot by selecting a representative tree and using a survey rod or a clinometer and measuring tape to measure the height of the selected tree. We measured the distance, if less than 30 m, from plot center to the nearest native broadleaf tree (e.g., cottonwood, willow, and mesquite); canopy gap (at least 1 m square); and standing water or saturated soil. If any of the distances were >30 m, they were recorded as such.

We estimated percent woody ground cover, alive and dead, using a Daubenmire-type frame with the lower edge of the frame centered at 1 m north, south, east, and west of plot center. These percentages were averaged to obtain a single measure of percent woody ground cover for each plot. We tallied the number of live shrub and sapling stems for each species, by quadrant, within 5 m of the center of the plot and summed all species over all quadrants to obtain the total stem count for each plot. Shrub and sapling stems were tallied if they were at least 1.4 m tall and >2.5 cm in diameter at 10 cm above the ground. If a stem branched above 10 cm but below 1.4 m above the ground, only the largest stem was tallied. Stems were tallied by the following dbh categories: <1 cm, 1–2.5 cm, 2.6–5.5 cm, and 5.6–8 cm. Dead stems were also tallied in these categories, but not identified to species. We tallied live trees (defined as dbh >8 cm) by species, in each quadrant of the 5-m-radius circle, in 8.1–10.5 cm and 10.5–15 cm dbh categories. Any trees greater than 15 cm dbh were measured and the exact dbh was recorded. Snags were also recorded in these categories, but not identified to species. Within each quadrant between 5 and 11.3 m of plot center, we tallied live trees >8 cm dbh by species but did not separate trees into size categories. Snags >8 cm dbh were also tallied, and tallies for each species and quadrant were summed to obtain a total tree count for the plot. Additional information recorded at each plot included the date when the measurements were taken, observer initials, and UTM coordinates for each plot center.

We recorded these habitat and vegetation characteristics at each willow flycatcher nest located during the 2003 breeding season, including renests by the same female, in which at least one flycatcher egg had been laid. In addition to the variables described above, we recorded nest height and substrate species, diameter of substrate species at breast height (dbh), and height of the nesting substrate. If the distance to standing water or saturated soil was different during nesting than at the time of vegetation measurement, distance during nesting was estimated and recorded.

All habitat characteristics, excluding those specific to the nest, were also measured at non-use plots located between 50 and 200 m from any willow flycatcher nest or territory center. Each non-use plot was surveyed multiple times throughout the season to confirm the absence of flycatchers. One non-use plot was selected for each willow flycatcher nest in which at least one flycatcher egg was laid. Non-use plot locations were randomly selected by superimposing a 25 x 25-m grid over an ArcView® GIS 3.3 software shapefile of the study area boundaries, including nest and territory locations, and clipping the grid to include areas between 50 and 200 m of known nests or territories, and within the study area boundaries. Each grid square was numbered, and grid squares were chosen using a random number generator. The centroid of each selected grid was the target location for the non-use plots. Non-use plots were located in the field by navigating to the given coordinates using a Rino 110 GPS unit and selecting the nearest woody plant at least 3 m tall. The plot was centered at a distance and direction from the bole of the tree determined by random number tables. Because randomly chosen non-use plots in clearly unsuitable habitat (e.g., desertscrub or open cattail or bulrush marsh) would have exaggerated differences between nesting and non-use plots, we only used non-use plots that contained at least one live, woody stem a minimum of 3 m in height (approximate average nest height in 2003), per Allison et al. (2003).

DATA ANALYSES

We used JMP IN® Version 4 (SAS Institute Inc.) software for statistical analyses. A statistical significance level of $P \leq 0.05$ was chosen to reject null hypotheses. Data presented are means ± standard error (SE) unless otherwise stated.

Analyses of habitat blocks – Canopy closure, canopy height, percent woody ground cover, and total stem counts at habitat block plots were compared across study areas using one-way analysis of variance (ANOVA). If differences across study areas were indicated by the ANOVA, we used Tukey's multiple comparison test to determine which study areas differed.

Measures of distance to canopy gap, distance to broadleaf tree, and distance to water or saturated soil often contained both continuous and categorical (>30 m) data. If less than 5% of the measurements for a given variable were categorical, we converted all >30 m measurements to 31 m and analyzed distance using ANOVA. If greater than 5% of the measurements were categorical, we categorized all data as ≤30 m or >30 m and analyzed the data across sites using 4 x 2 contingency tables. If differences were indicated across sites, we used 2 x 2 contingency tables to determine which sites differed.

Vertical foliage density data in each habitat block were summarized graphically, but we did not make between-site comparisons. Vertical foliage density measurements above 7.5 m that were recorded as < or > 5 hits per meter were converted to 2.5 and 7.5 hits, respectively, to allow analyses of these data as continuous rather than categorical.

Analyses of nest characteristics – Characteristics specific to the nest (nest height, nest substrate species, nest substrate height, and nest substrate dbh) were compared between study areas using ANOVA and Tukey's multiple comparison test. Study areas where sample size was <5 were excluded from comparisons.

Analyses of nest vs. non-use sites – Canopy closure, canopy height, percent woody ground cover, total stem counts, and vertical foliage density within each meter interval were compared between nest and non-use sites at each life history study area using Student's *t*-tests. Distance to water, canopy gap, and broadleaf tree were analyzed as described above. Although sample sizes at each study area in 2003 were small, we did not pool data across study areas because of significant differences in many variables between study areas.

RESULTS

At the four life history study areas and Bill Williams in 2003, we gathered data on vegetation and habitat characteristics at 49 nest plots and 48 non-use plots. We gathered data at an additional 35 habitat block plots at the life history study areas.

VEGETATION MEASUREMENTS OF ENTIRE HABITAT BLOCKS

Quantitative measurements of vegetation and habitat characteristics across habitat blocks at the four life history study areas varied within and between sites in canopy height and closure, percent woody ground cover, and number of shrub/sapling and tree stems (Table 6.1). Distance to canopy gap had 5% of the measurements recorded as >30 m. These values were converted to 31 m, and data were analyzed as continuous. Distance to broadleaf tree and water or saturated soil had greater than 5% of the measurements recorded as >30 m and were analyzed as categorical variables. All variables differed significantly between sites. Regardless of overall canopy height, all sites had the densest foliage within 4 m of the ground (Figures 6.1–6.4).

VEGETATION MEASUREMENTS AT THE NEST

Willow flycatcher nest height at the four life history study areas and Bill Williams ranged from 1.0 to 9.3 m, with a mean nest height of 2.9 m (SE=0.19). Nest substrate included three woody species of trees, two native and one exotic. Flycatchers placed 57% of all nests at the study areas in tamarisk, 18% in coyote willow, and 24% in Goodding willow. Nest substrate height at all sites ranged from 1.7 to 18.0 m, with a mean nest substrate height of 5.5 m (SE=0.47). Nest substrate dbh was highly variable, ranging from 1.0 to 133.0 cm, with a mean nest substrate dbh of 11.5 cm (SE=3.24). Nest height at Mesquite was lower than at the other three study areas, while nest substrate height and dbh were greater at Pahranagat than at the other study areas (Table 6.2).

Table 6.1. Summary of vegetation and habitat characteristics of entire habitat blocks at the four life history study areas in 2003. Data presented for continuous variables are means, (standard error), and range. Significant differences (Tukey's test, α=0.05) between sites for a given continuous variable are indicated by alpha codes; sites with different letters differed from one another while sites with the same letter did not. Categorical variables were analyzed using Pearson chi-square.

Parameter	Pahranagat (n=25)	Mesquite (n=29)	Mormon Mesa (n=30)	Topock (n=30)
Average canopy height (m)	15.3 (1.6) 3.0–34.5 A	4.0 (0.2) 1.0–6.0 B	4.7 (0.6) 1.8–13.4 B	6.0 (0.3) 11.0–2.5 B
% total canopy closure	90.8 (2.57) 55.2–100.0 A	76.7 (5.5) 4.2–100.0 A,B	70.7 (4.7) 18.2–99.5 B	91.2 (2.8) 50.0–100.0 A
% woody ground cover	13.8 (3.4) 0.0–52.5 A	2.8 (0.7) 0.0–17.3 B	2.2 (0.7) 0.0–19.3 B	15.1 (3.3) 0.3–73.8 A
% of plot centers within 30 m of standing water or saturated soil	24.0 A,B	65.5 C	10.0 A	36.7 B
Distance (m) to nearest canopy gap	5.9 (0.8) 0.0–13.0 A,B	4.7 (1.2) 0.0–31.0 B	3.4 (0.6) 0.0–13.0 B	9.8 (2.0) 0.0–31.0 A
% of plot centers within 30 m of a broadleaf tree	100.0 A	100.0 A	73.3 B	26.7 C
# shrubs/sapling stems within 5-m radius of plot center	10.6 (5.9) 0.0–107.0 A	180.5 (19.8) 21.0–519.0 C	102.3 (12.8) 20.0–270.0 B	113.9 (15.3) 4.0–305.0 B
# tree stems within 11.3-m radius of plot center	11.2 (2.3) 0.0–52.0 A	2.4 (1.0) 0.0–24.0 B	11.1 (2.6) 0.0–51.0 A	13.6 (2.7) 0.0–64.0 A

Table 6.2. Summary of nest measurements at the four life history study areas and Bill Williams in 2003. Numerical data presented are means, (standard error), and range. Significant differences (Tukey's test, α=0.05) between sites for a given continuous variable are indicated by alpha codes; sites with different letters differed from one another while sites with the same letter did not. Bill Williams was excluded from between-site comparisons because of low sample size.

Parameter	Pahranagat (n=11)	Mesquite (n=18)	Mormon Mesa (n=10)	Topock (n=8)	Bill Williams (n=2)
Nest height (m)	3.5 (0.3) 2.0–4.9 A	2.0 (0.1) 1.0–3.4 B	3.4 (0.7) 1.8–9.3 A	3.7 (0.2) 3.0–4.5 A	3.0 (1.3) 1.7–4.3
Nest substrate[1]	9% SAEX 91% SAGO	67% TASP 33% SAEX	60% TASP 20% SAEX 20% SAGO	100% TASP	100% TASP
Nest substrate height (m)	9.0 (1.3) 5.0–18.0 A	3.4 (0.3) 1.7–6.0 B	5.6 (0.9) 5.0–18.0 B	5.5 (0.5) 3.6–7.5 B	4.6 (1.5) 3.1–6.0
Nest substrate dbh (cm)	37.0 (11.7) 2.9–133.0 A	2.5 (0.4) 1.0–6.9 B	5.3 (1.5) 2.3–17.4 B	5.2 (1.0) 2.5–10.9 B	9.2 (4.5) 4.7–13.6

[1]TASP = *Tamarix* sp. (tamarisk), SAEX = *Salix exigua* (coyote willow), SAGO = *Salix gooddingii* (Goodding willow)

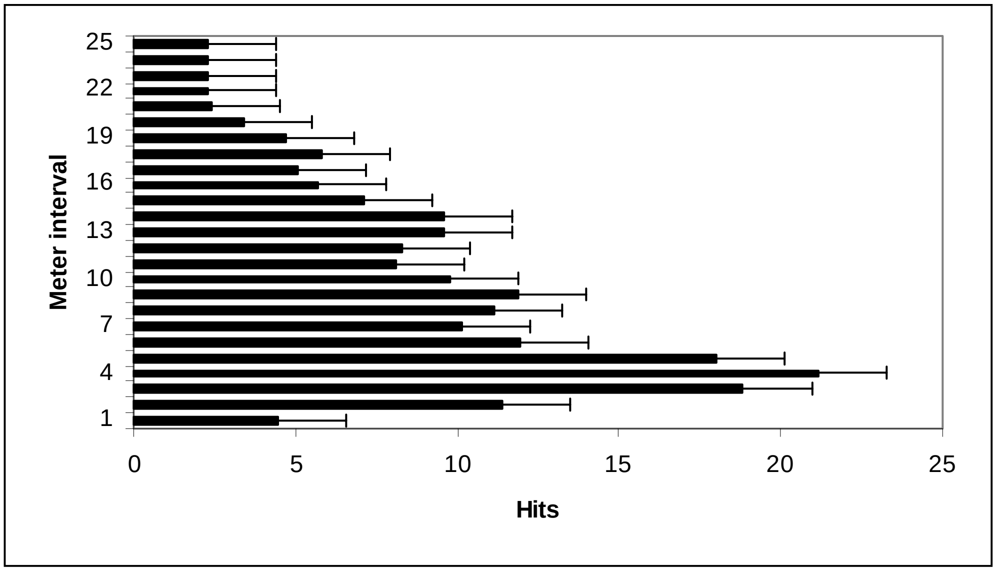

Figure 6.1. Vertical foliage density at habitat block points, Pahranagat NWR, NV, 2003. Values shown are mean and standard error of hits per meter interval. Standard error is pooled across all intervals.

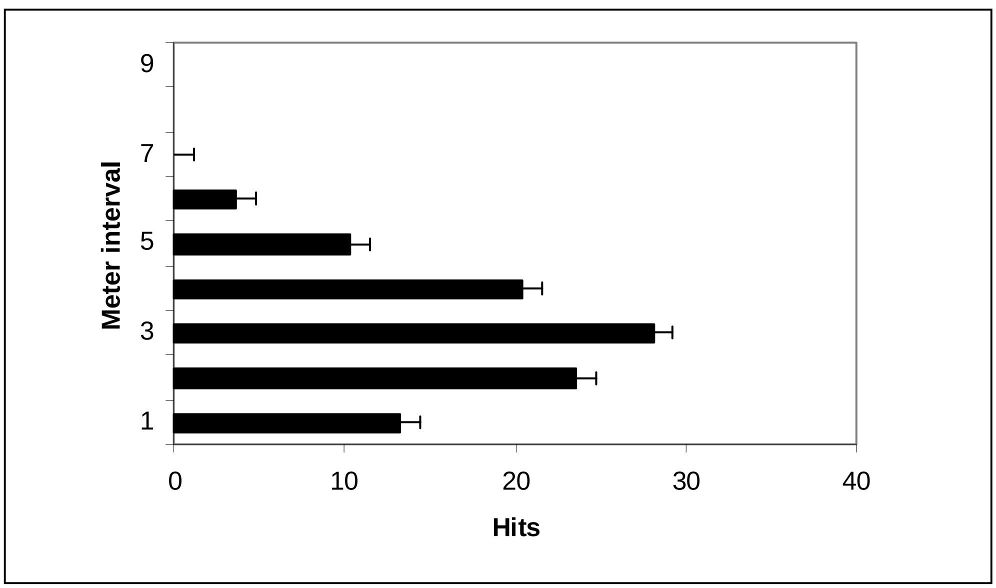

Figure 6.2. Vertical foliage density at habitat block points, Mesquite, NV, 2003. Values shown are mean and standard error of hits per meter interval. Standard error is pooled across all intervals.

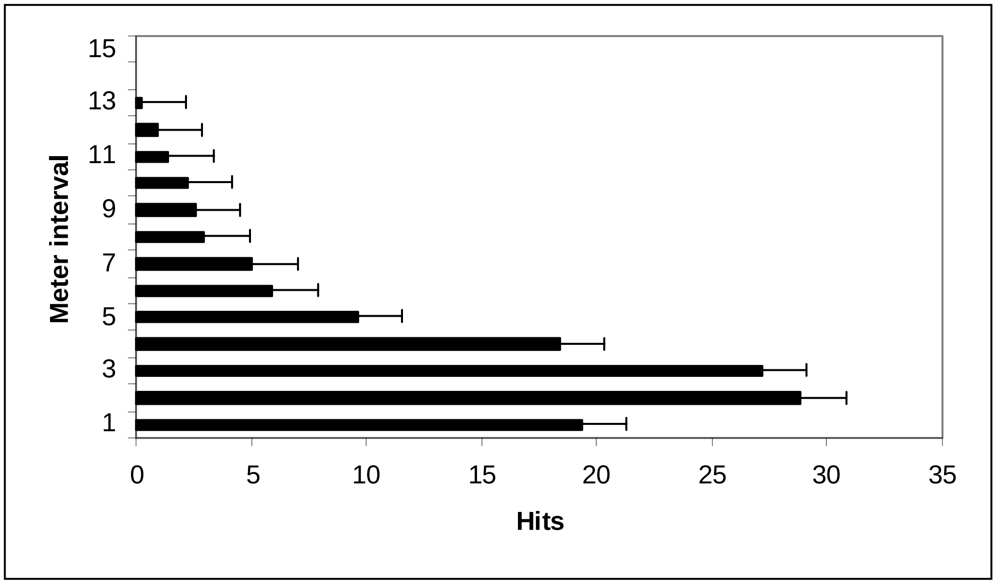

Figure 6.3. Vertical foliage density at habitat block points, Mormon Mesa, NV, 2003. Values shown are mean and standard error of hits per meter interval. Standard error is pooled across all intervals.

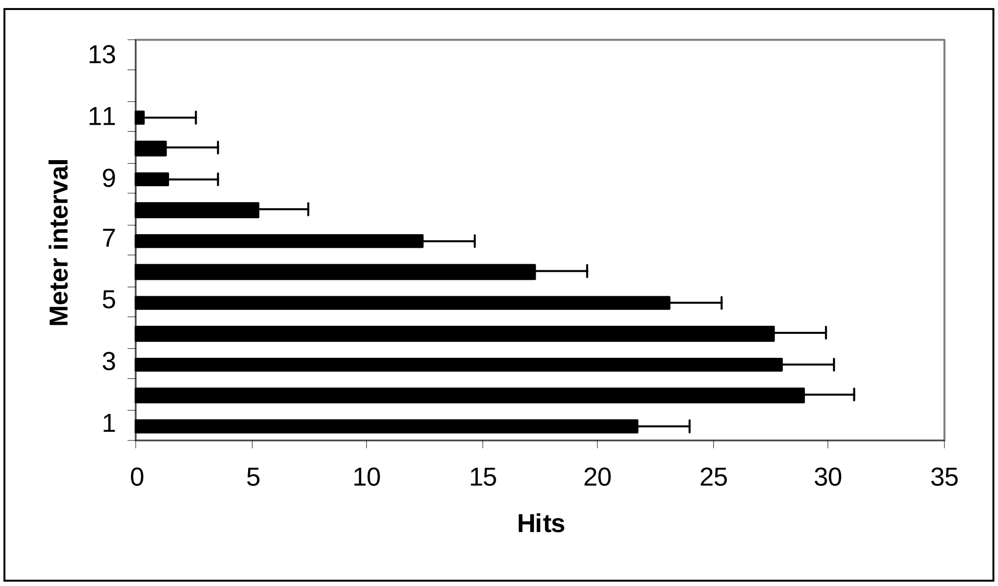

Figure 6.4. Vertical foliage density at habitat block points, Topock, AZ, 2003. Values shown are mean and standard error of hits per meter interval. Standard error is pooled across all intervals.

VEGETATION MEASUREMENTS AT NEST PLOTS VS. NON-USE PLOTS

Canopy height and closure, distance to water and broadleaf, and shrub and tree stem counts differed between nest and non-use sites in at least one of the life history study areas (Table 6.3). Average canopy height was taller at nest sites than non-use sites at Mesquite, Mormon Mesa, and Topock. Canopy closure was significantly higher at nest sites than at non-use sites at Pahranagat and Mesquite and tended to be higher (*P*=0.06) at nest sites vs. non-use sites at Mormon Mesa.

Table 6.3. Comparison of habitat characteristics between willow flycatcher nests and non-use sites at the four life history study area, lower Colorado River, 2003. Data are presented as mean (SE). Data from Bill Williams were not included because of small sample size (n=2). Significant differences (α=0.05) between nest and non-use plots in a given study area are indicated by asterisks.

Parameter	Pahranagat		Mesquite		Topock		Mormon Mesa	
	Nest n=11	Non-use n=11	Nest n=18	Non-use n=17	Nest n=8	Non-use n=8	Nest n=10	Non-use n=10
Average canopy height (m)	15.0 (2.2)	16.2 (2.8)	4.7 (0.2)	3.3**** (0.2)	7.1 (0.2)	5.5* (0.6)	9.4 (1.1)	3.7**** (0.3)
% canopy closure	98.3 (0.4)	86.8** (3.7)	96.5 (3.8)	57.5**** (7.1)	99.3 (0.2)	96.2 (2.3)	92.5 (2.1)	83.4 (4.1)
% woody ground cover	19.0 (5.9)	7.1 (2.8)	3.1 (1.0)	2.3 (0.6)	17.9 (5.7)	21.2 (8.3)	2.8 (0.7)	3.9 (2.0)
% of plot centers within 30 m of standing water or saturated soil	18.2	18.2	94.4	29.4****	37.5	12.5	0.0	0.0
Distance (m) to nearest canopy gap	5.2 (1.1)	7.5 (1.4)	7.4 (1.6)	1.2*** (0.5)	14.9 (4.4)	7.8 (2.5)	4.9 (0.9)	3.4 (1.1)
% of plot centers within 30 m of a broadleaf tree	100.0	100.0	100.0	100.0	12.5	25.0	100.0	70.0
# shrub/sapling stems within 5 m of plot center	9.7 (9.7)	13.7 (9.5)	210.9 (15.8)	126.6* (29.9)	194.4 (22.1)	132.1 (23.5)	169.0 (35.0)	170.2 (18.1)
# tree stems within 11.3 m of plot center	14.2 (4.1)	8.6 (2.7)	2.3 (1.0)	2.9 (1.5)	31.8 (6.7)	14.4 (4.7)	25.0 (5.0)	3.2*** (1.8)

**P* < 0.05
***P* < 0.01
****P* < 0.001
*****P* < 0.0001

Percent of woody ground cover and distance to broadleaf tree did not differ between nest and non-use sites at any study area. At Mesquite, distance to canopy gap was shorter at non-use plots than at nest sites, while more non-use plots than nest sites were more than 30 m from standing water or saturated soil. Shrub/sapling stem count was higher at Mesquite and tended to be higher (*P*=0.08) at Topock at nest vs. non-use sites. Tree stem count was higher at Mormon Mesa and tended to be higher at Topock (*P*=0.06) at nest vs. non-use sites.

Foliage density at Pahranagat (Figure 6.5) did not differ between nest and non-use plots in any meter interval, though there was a trend for vegetation below 13 m in height to be denser at nest sites and vegetation above 13 m height to be denser at non-use sites. At Mesquite, Mormon Mesa, and Topock, foliage was denser toward the top of the canopy at nest sites vs. non-use sites (Figures 6.6–6.8).

DISCUSSION

Overall, the vegetation and habitat characteristics of entire habitat blocks at the four life history study areas show willow flycatchers breed in widely different types of riparian habitat throughout the Virgin and lower Colorado River regions. Although occupied flycatcher habitat at each of the four life history study areas consists of relatively homogeneous, contiguous stands of riparian vegetation, the sites differ from each other both structurally and compositionally. Pahranagat differs markedly in structure and vegetation species composition from Mesquite, Mormon Mesa and Topock. The habitat block at Pahranagat consists of mature, native, large-diameter trees up to 20 m in height with little shrub and sapling understory, while the habitat blocks at Mesquite, Mormon Mesa, and Topock are composed primarily of very dense stands of both mixed-native (Mesquite and Mormon Mesa) and exotic (Topock) woody vegetation 4–8 m in height. Total canopy closure also differed among study areas, with Pahranagat and Topock exhibiting significantly greater canopy closure than Mesquite and Mormon Mesa. Of the four study areas, Mesquite has the most recently established vegetation and was first surveyed in 2000 after runoff of surface water from adjacent areas promoted riparian vegetation growth between the breeding seasons of 1999 and 2000 (McKernan and Braden 2001b). The relatively young age of the vegetation at Mesquite in 2003 was reflected in its having the shortest canopy, highest shrub count, and lowest tree count of the four study areas. The one pattern exhibited for entire habitat blocks at all occupied study areas regardless of plant species composition, height, and canopy closure is that vertical foliage density was always greatest 2–4 m above the ground.

Differences in nest-site characteristics between study areas are reflective of the differences in overall habitat characteristics of the sites, in particular, vegetation age, structure, and species composition. Mesquite had a significantly lower average nest height than Pahranagat, Mormon Mesa, and Topock, as well as the lowest average canopy height. Pahranagat had the tallest average nest substrate height as well as the largest average nest substrate dbh. The overall taller height and larger dbh of nest substrate vegetation at the Pahranagat study area compared to the other study areas reflect differences in the age and structure of the vegetation, with Pahranagat comprising very mature, widely spaced, large trees. Clearly, these differences show that Southwestern Willow Flycatchers breed in a diverse array of riparian habitats across their range.

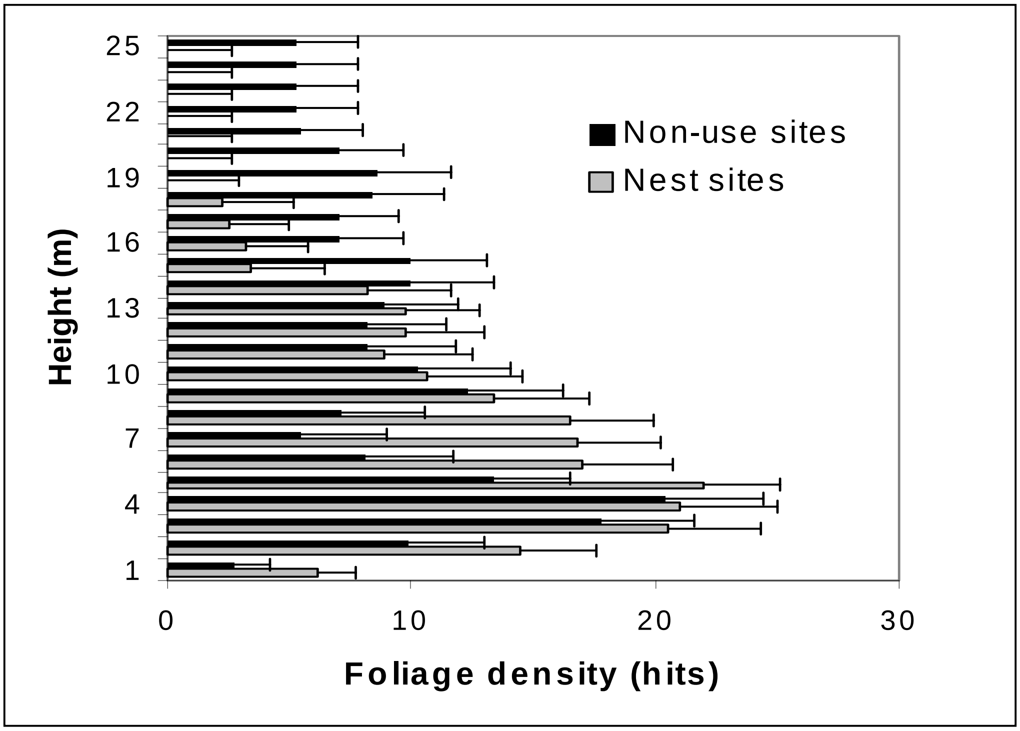

Figure 6.5. Vertical foliage density and standard error at willow flycatcher nest sites versus non-use sites at Pahranagat NWR, 2003.

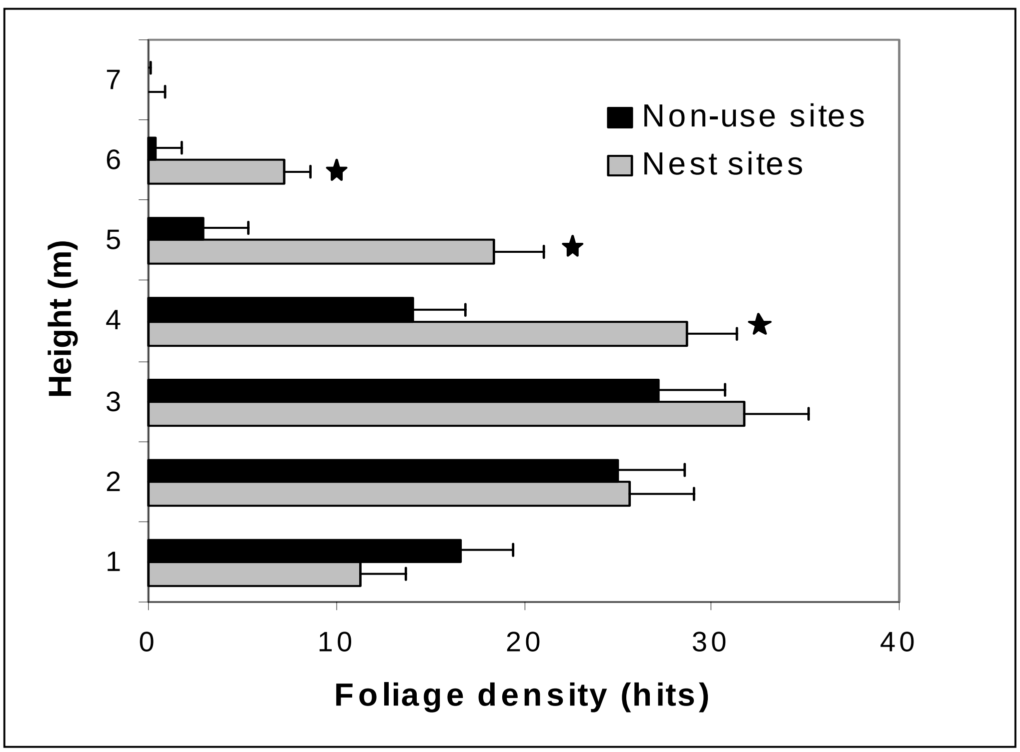

Figure 6.6. Foliage density and standard error at willow flycatcher nest sites vs. non-use sites at Mesquite, NV, 2003. Differences (Student's *t*-test, α=0.05) between nest and non-use sites within a given meter interval are indicated by asterisks.

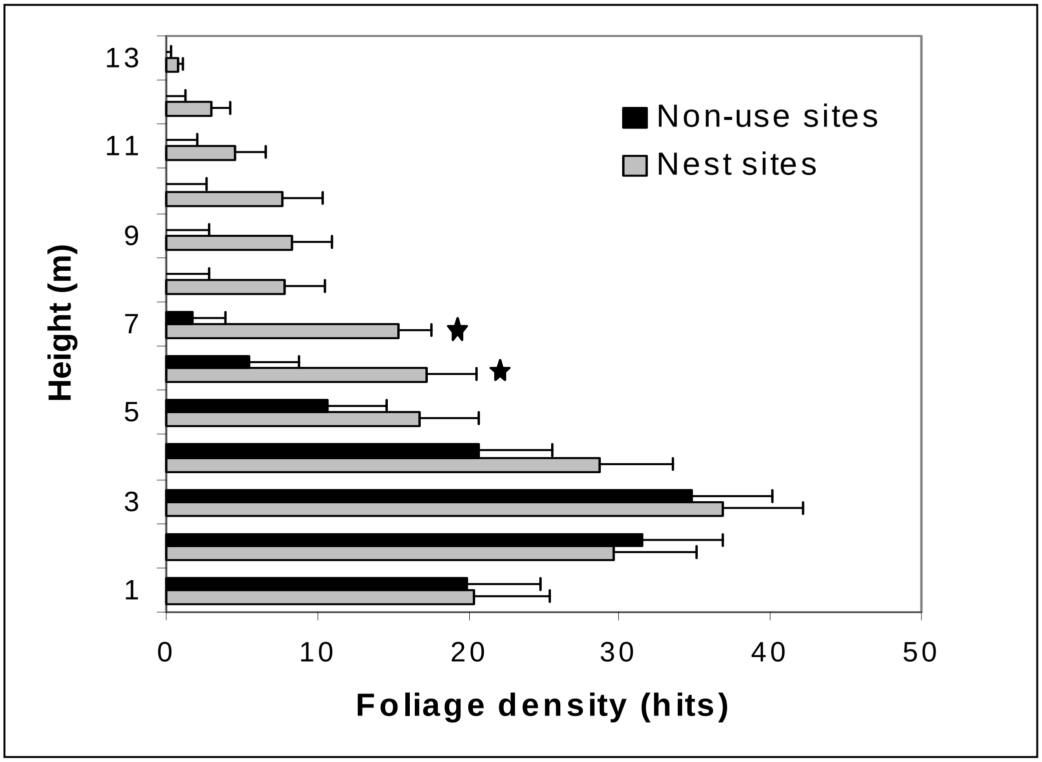

Figure 6.7. Foliage density and standard error at willow flycatcher nest sites vs. non-use sites at Mormon Mesa, NV, 2003. Differences (Student's *t*-test, α=0.05) between nest and non-use sites within a given meter interval are indicated by asterisks.

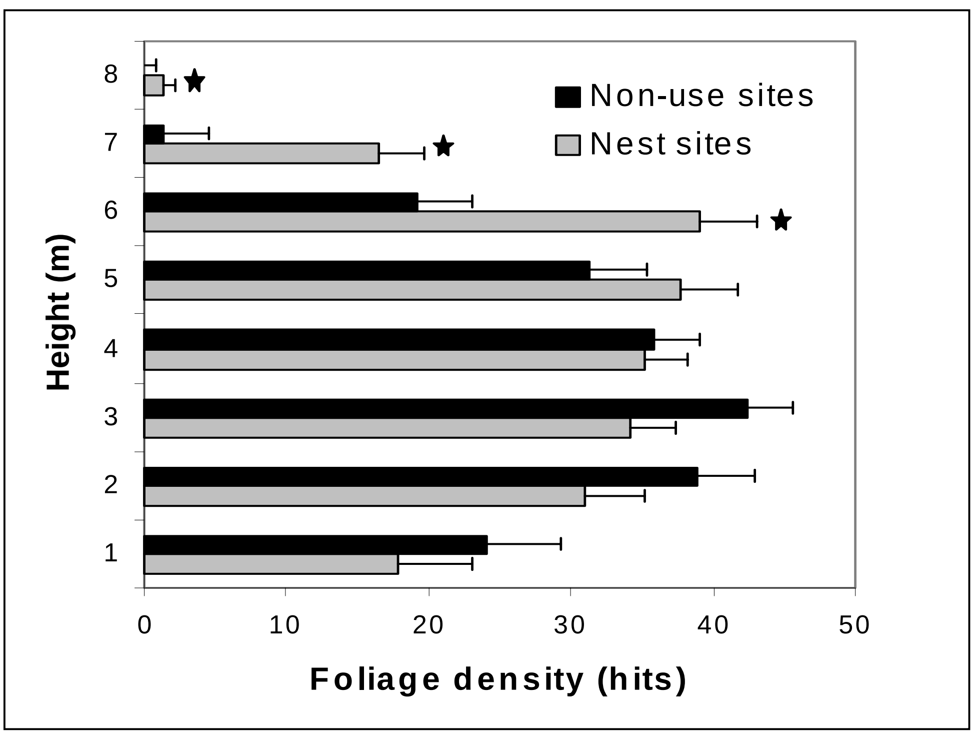

Figure 6.8. Foliage density and standard error at willow flycatcher nest sites versus non-use sites at Topock, AZ, 2003. Differences (Student's *t*-test, α=0.05) between nest and non-use sites within a given meter interval are indicated by asterisks.

Certain vegetation patterns at nest sites compared to non-use sites did emerge at the life history study areas. We found higher canopy closure at nest sites than at non-use sites, and three of the four life history study areas (Mesquite, Mormon Mesa, and Topock) had taller canopy height at nest sites than at non-use sites. Allison et al. (2003) also reported a trend for Southwestern Willow Flycatcher nest sites to have a higher percentage canopy closure and taller canopy than non-use sites, and Sedgwick and Knopf (1992) reported higher shrub density at nest sites vs. unused sites for a flycatcher population in north central Colorado. Although there was a trend for canopy height at non-use sites to be taller than at nest sites at Pahranagat, this was because many non-use sites were in very tall stringers of cottonwoods on the periphery of the main habitat block, while nest sites were within a shorter stand of Goodding willow.

We concur with Allison et al. (2003) and Sogge and Marshall (2000) in that breeding riparian birds in the desert Southwest are exposed to extreme environmental conditions and that dense vegetation at the nest may be needed to provide a more suitable microclimate for raising offspring. At all study areas, vertical foliage density was greatest at and immediately above mean nest height recorded in 2003. Allison et al. (2003) found the greatest foliage density to be at nest height at three large willow flycatcher breeding sites in Arizona. Greater canopy closure, taller canopy height, and dense foliage at nest height may facilitate a more favorable nesting microclimate and may be useful parameters in predicting preferred willow flycatcher riparian breeding habitat within the larger expanses of riparian vegetation along the Virgin and lower Colorado River regions. Given that standing water or saturated soil was present at all nest sites at the time of nest initiation, presence of water may also be a factor in providing a more suitable microclimate for raising offspring (Sogge and Marshall 2000).

Measures of distance to water were inconclusive, differing between nest and non-use sites only at Mesquite. At all study areas, standing water or saturated soil was present at all nest sites when nests were initiated. Because of extreme seasonal changes in hydrology at all study areas, with most nest sites dry by August, distance to water as measured after the breeding season may not reflect hydrologic conditions during nest-site selection. Measuring presence of water early in the breeding season may be a better indicator of preferred breeding flycatcher habitat.

Measures of distance to canopy gap were inconclusive. Previous authors have reported that, compared to the center of non-use plots, Southwestern Willow Flycatchers place nests closer to canopy gaps (Allison et al. 2003), while a willow flycatcher population in northern Colorado placed nests farther from canopy gaps (Sedgwick and Knopf 1992). Because of the variation in vegetation structure and species composition among the four life history study areas, presence of canopy gaps may not be a good predictor of flycatcher breeding habitat along the Virgin and lower Colorado Rivers.

Many of the structural vegetation patterns that emerged at flycatcher breeding sites in 2003 are consistent with those of other recent research and warrant further study. Vegetation characteristics in nesting areas are unlikely to change significantly between years, and in subsequent years we will pool data across years to further examine nest and non-use differences.