LANDBIRD RESPONSE TO FINE-SCALE HABITAT CHARACTERISTICS
WITHIN RIPARIAN FORESTS OF THE CENTRAL CALIFORNIA COAST

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By

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ABSTRACT

Landbird Response to Fine-scale Habitat Characteristics within Riparian Forests of the Central California Coast

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Riparian corridors in California are known to be an important but reduced and degraded resource for landbirds. In spite of previous research, the habitat characteristics that correlate with high landbird abundance remain poorly understood. In particular, the scale at which predictive models are useful (fine scale, watershed, sub-region or region) is ill defined. Herein, point count-based abundance indices for 8 riparian associated/obligate species with uniform and high detection probabilities are correlated with biotic and abiotic habitat variables: a sums of squares procedure is used to select the top 5 predictive variables for each species, best fit linear models are selected in an information theoretic framework, and the relative importance of individual variables assessed. These analyses identified site and vegetation characteristics that could serve as targets for restoration and conservation efforts within this coastal central California region. The specific characteristics vary somewhat across the 8 species I surveyed. In addition, the characteristics that I have found important as predictors are distinct from analyses that others have conducted. Therefore, just as we should probably accept regional variation in the composition of riparian avifaunas, we should also probably expect regional variation in the relationship between habitat variables and avian abundance. It appears that important habitat characteristics vary at the fine, watershed, sub-region and regional scales thus reducing the generality of all of the currently available models.

Keywords: avian, habitat association, Akaike Information Criteria,

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1. INTRODUCTION

In the semi-arid western United States, riparian vegetation supports the most species-rich and abundant communities of birds, and provides critically important habitat for many other wildlife taxa (Katibah 1984, Knopf et al. 1988, Dobkin 1994, Faber 2003). Riparian ecosystems within California maintain populations of Neotropical and Neotemperate breeding birds, as well as migrant and winter resident species (Cogswell 1962, Gaines 1977, Ralph 1998, Humple and Geupel 2002, Flannery et al. 2004, Carlisle et al. 2004).

These same riparian ecosystems throughout the west have suffered substantial losses in distribution and quality due to urban and water resource development, agriculture, and non-native species. Riparian vegetation has been degraded and reduced, currently remaining in only 2-5% of the historical range (Katibah 1984, Dawdy 1989, Kondolf et al. 1996). This loss of distribution and quality of riverine-associated vegetation has been implicated as one of the most important drivers in the decline of riparian-associated birds (DeSante and George 1994). Recovery and conservation of remaining riparian-dependent bird populations depend significantly on landscape-scale restoration of the distribution and quality of these vegetation communities (Miller 1951, Gaines 1974, Manley and Davidson 1993, Rich 1998, Askins 2002, Donovan et al. 2002). With that said, the landscape-level restoration of river floodplains and riparian vegetation communities has become a conservation priority on the California landscape for birds and other taxa (Jeffres et al. 2008). An example of this elevated prioritization is the Riparian Habitat Joint Venture (RHJV), a collaborative of

State, federal and non-governmental agencies which has developed a body of technical information with which to strategically implement conservation and restoration of landbird habitats throughout California (RHJV 2004). A major research effort of the RHJV has been to identify the characteristics of riparian habitats needed to maintain healthy species populations. From an avian conservation perspective, understanding these characteristics at multiple spatial scales is a crucial component of science-based restoration and management (Saab 1999, Strong and Bock 1990). More recently, studies have shown that bird species' response to fine scale habitat features varies between landscape regions (Nur et al. 2008, Heath and Ballard 2003). This variation between regions requires land managers and restoration practitioners not only to understand the response at various spatial scales, but also to consider the regional response of bird species to fine scale habitat associations.

Few published studies have addressed landbird trends, demography, or response to habitat characteristics of central California coast riparian vegetation communities. Over the past 20 years, data collection efforts have occurred on California National Guard Camp Roberts, U.S. Army Fort Hunter Liggett, and Vandenberg U.S. Air Force Base (J. Griffiths 2008, N. Seavy 2010, pers. comm.). However, peer-reviewed findings are lacking from these efforts. The current understanding of bird distribution and habitat associations within the central California coast is coarse, and based on the initial works of documentation of birds collected between Monterey and San Simeon by Hubert (1906) and Grinnell and Miller (1944), and the un-published graduate work of Marantz (1988)

describing the birds of San Luis Obispo and their distribution throughout the county.

Most of the current research targeting riparian-associated landbirds in California has taken place along the major river systems in the Central Valley (Nur and Geupel 2008, Seavy et. al. 2009), and within the Sierra Nevada and eastern Sierra Nevada riparian vegetation communities (Heath and Ballard 2003). These studies were conducted in highly managed watersheds with significantly altered or reduced vegetation communities, resulting from water resource development, agricultural practices, and flood management activities. Studies of riparian landbird communities in coastal California are also based on systems with degraded and altered vegetation communities. In the more arid southern coastal region, Oneil and Rotenberry (2009) incorporated fine scale habitat features in their analysis of the response of multiple species of birds to urbanization. Struis-Timmer (2009) investigated the response of a single riparian-associated species, Yellow Warbler (*Setophaga petechia*), on a degraded and altered watershed in north-western Monterey County, to fine scale habitat characteristics such as percent cover and species composition of vegetation.

While the vegetation communities within larger watersheds of the San Luis Obispo and southern Monterey Counties (Salinas River, Santa Maria Valley) have been heavily disturbed or eliminated through agricultural and water development activities, many of the smaller coastal creeks, support structurally diverse native vegetation communities (Melcer pers. obs.). The high quality

habitats that these watersheds provide present a unique opportunity for investigating the relationships of the region's diverse riparian landbird community in habitats that maintain a high level of native diversity and function.

During the spring of 2006, I initiated a study investigating the breeding bird response to habitat features within these relatively healthy, intact riparian vegetation communities of central coast California. This study did not manipulate variables and assess avian responses. Instead, the study was observational and evaluated independent variables as predictors of avian abundance and distribution. Specific objectives of this study were (1) to collect species-level information on bird abundance, (2) to collect information on habitat structure and the plant community, (3) to develop and rank species-specific correlative models of bird response to region-specific fine scale habitat characteristics, and (4) to identify and assess the relative importance of predictor variables resulting from the models. I utilized standard methods in achieving these objectives in order to produce results that were comparable to similar studies conducted in riparian communities such as Heath and Ballard's work in the eastern Sierra Nevada (Heath and Ballard 2003), Gardali and others work along the Sacramento River (Gardali et al. 2006), and Nur and others investigations throughout the Central Valley of California (Nur et al. 2008).

Here I present an analysis on 8 species of birds that commonly nest in riparian vegetation within the central California coast. A set of candidate models was developed and evaluated for each species. Habitat variables from these models were assessed and ranked according to relative importance.

2. FIELD METHODS

Study Sites: I conducted surveys at 8 field sites along 70 km of the central California coast (35.38° N, 120.86° W) between Cambria and Pismo Beach (Figure 1). Watersheds were selected based on the presence of riparian vegetation and availability of access. The downstream survey point at each site was selected based on the presence of forest or woodland physiognomy and riparian-associated tree and shrub species. Subsequent upstream points were placed at 200 m intervals. GPS locations (recorded in UTM; datum WGS 84) for all survey points and site maps are provided in Appendix A, Table A1 and Figures A1-A9.

The western coast range is characterized by coastal scrub, maritime chaparral, and oak woodlands, with dense montane riparian vegetation adjacent to creeks (CWC 2002). Dominant tree species at study sites included red willow (*Salix laevigata*), arroyo willow (*Salix lasiolepus*), sandbar willow (*Salix exigua*), white alder (*Alnus rhombifolia*), California bay (*Umbellularia californica*), red-stem dogwood (*Cornus sericea*), California sycamore (*Plantanus racemosa*), and black cottonwood (*Populus balsamifera*). Common shrub species included creeping blackberry (*Rubus ursinus*), poison oak (*Toxicodendron diversilobum*), and coyote brush (*Baccharis pilularis*).

FIGURE 1. Study region and eight riparian study sites with acronyms. Survey point locations are summarized in Appendix A, Table A1.

Bird Surveys: I conducted variable distance point count surveys ($n = 96$) once annually during the breeding season from May through early June for the four years from 2006-2009, using methods described in Ralph et al. (1993, 1995). During each 5 minute sampling event, I recorded the species, number, and distance of all birds detected. I divided the 5 minute sampling period into two time intervals (3 min, and 2 min) in order to make available the ability to compare results to the Breeding Bird Survey, which uses 3 minute time intervals (Sauer et al. 2011). Birds that were recorded in the first 3 minute time interval were not re-recorded in the second time interval. All surveys were initiated 10 minutes after sunrise and completed within 4 hours. Surveys were not conducted under windy or rainy conditions.

Habitat Surveys: I recorded habitat characteristics during April of 2009 using 50 m radius (0.785 ha) sampling plots located at each point count location. The habitat characterization was done using a relevé approach at each sampling plot (Ralph et al. 1993). I recorded a suite of 13 abiotic, 9 structural, and 6 species-level metrics in each plot. Abiotic variables were watershed, site, plot, elevation, slope, aspect, landform, riparian vegetation corridor width, topography, soil moisture, presence of standing water, presence and character of running water. Structural variables recorded were leaf phenology (e.g., evergreen, cold deciduous, drought-deciduous) and physiognomic class (e.g., forest, woodland, shrubland) of the plot, ocular estimation of percent cover of all vegetative cover at each of four height strata (ground cover [0.0 m], herbaceous [1.0m], shrub [1.0-5.0m], and canopy [>5.0m]), diameter at breast height (dbh) of the single largest tree in plot, ocular estimation of average tree height, and the number of snags present. Species-level variables recorded were percent cover of individual shrub and tree species at each of the four height strata. I summed the number of tree species found in each sampling plot and used this as a predictor variable named Tree Species Richness. I calculated an identical predictor variable using the number of shrub species found in each sampling plot and named this predictor variable Shrub Species Richness. *Baccharis*, willow, and grass species were each pooled for analyses due to the difficulty in identification and the within-genus similarity in habitat values each of these provide.

3. MODEL BUILDING AND ASSESSMENT

Avian Species Selection: For this investigation, I selected 8 regionally common breeding passerine species: Black-headed Grosbeak, Orange-crowned Warbler, Pacific-slope Flycatcher, Song Sparrow, Spotted Towhee, Swainson's Thrush, Warbling Vireo, and Wilson's Warbler (Table 1). Scientific names, four letter banding acronym, and total number of detections are summarized in Table 1.

TABLE 1. Common names of species analyzed, scientific names, known riparian associated species, and RHJV focal species (BLM 1998, RHJV 2004), and total detections at all point counts stations (n=96).

SPECIES NAME	SCIENTIFIC NAME	RIPARIAN ASSOCIATED	RHJV FOCAL SPECIES	TOTAL DETECTIONS
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	X	X	247
Orange-crowned Warbler	<i>Oreothlypis celata</i>	X		281
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>			295
Song Sparrow	<i>Melospiza melodia</i>	X	X	495
Spotted Towhee	<i>Pipilo maculatus</i>			255
Swainson's Thrush	<i>Catharus ustulatus</i>	X	X	223
Warbling Vireo	<i>Vireo gilvus</i>	X	X	312
Wilson's Warbler	<i>Wilsonia pusilla</i>	X	X	365

These 8 species have close associations with riparian habitats. Orange-crowned Warbler, Song Sparrow, Wilson's Warbler, Black-headed Grosbeak, Swainson's Thrush, and Warbling Vireo have been identified as riparian obligate or dependent species, with 60- 90% of their nests and abundance in riparian vegetation during the breeding season (BLM 1998). Pacific-slope Flycatcher is a sensitive Neotropical migrant species that breeds in dense, moist habitat in California (Lowether 2000). Black-headed Grosbeak, Song Sparrow, Swainson's Thrush, Warbling Vireo and Wilson's Warbler have been selected as Riparian Habitat Joint Venture Focal Species, as they breed primarily in riparian habitat and are of conservation concern due to population declines on the landscape (RHJV 2004, Chase and Geupel 2005). These species also have utility as

monitoring tools due to their quick population response to management and restoration actions (RHJV 2004). While Spotted Towhee is not reliant solely on riparian habitat, studies have found strong relationships between this species abundance and riparian habitat attributes. Spotted Towhee abundance has also been correlated with riparian bird species richness in riparian vegetation, indicating that they are responding to similar habitat characteristics as other riparian species (Chase and Geupel 2005).

Habitat Variable Selection: For this analysis, I selected 19 of the 28 habitat variables collected in the field based on their relevance to land managers and restoration practitioners (Table 2). This subset of variables describes riparian forest structure, tree and shrub heterogeneity, and species composition at the plot scale, all of which are easily assessed and directly influenced by management activities or targeted in restoration efforts within the study region (MBNEP 2000, LCSLO 2010). Thus, these variables reflect modifications that are intentionally or inadvertently manipulated by land use or management. Also, 14 of these variables have been found to be important in predicting bird response to fine scale habitat features within riparian habitats on the California landscape (Nur et al. 2008, Heath and Ballard 2003), as summarized in Table 2. I also included an additional landscape-scale categorical predictor, Watershed, in order to test for a watershed effect, for a total of 20 analytical variables. I assessed all 19 quantitative variables for multicollinearity using Pearson's correlation coefficient (Whitlock and Schluter 2009), with a critical r-value of 0.6 (Appendix B, Table B1). Elevation correlated with both % Cover Oak and % Cover Bay,

exceeding the critical r-value, and indicating the presence of a linear relationship.

I also reviewed scatter plots visually for the presence of obvious non-linear relationships. These did not suggest the presence of any non-linear relationships (i.e. quadratic) and so no additional tests of covariance were conducted.

TABLE 2. Subset of predictor variables evaluated for analysis, their unit of measure, inclusion in previous studies of riparian bird habitat associations, and disposition in final models of this study.

HABITAT VARIABLE	CODE	UNIT OF MEASURE	NUR ET AL. 2008	HEATH AND BALLARD 2003	INCLUDED IN SELECTED MODEL(S)
<i>Abiotic</i>					
Elevation	ELEV	meters		X	X
Corridor Width	CORW	feet		X	X
<i>Structural</i>					
% Cover Forb	%CFB	percent	X	X	X
% Cover Grass	%CGR	percent	X	X	X
% Cover Shrub	%CSH	percent	X	X	X
% Cover Canopy	%CCA	percent	X	X	X
Tree Height Index	TRHI	meters	X	X	X
DBH Index	DBHI	centimeters	X	X	X
<i>Species level</i>					
Tree Species Richness	TSRI	count	X	X	X
Shrub Species Richness	SSRI	count	X	X	X
% Cover Blackberry	%CBB	percent	X		X
% Cover Poison Oak	%CPO	percent			X
% Cover Dogwood	%CDO	percent			X
% Cover Baccharis	%CBA	percent			
% Cover Willow	%CWI	percent	X	X	X
% Cover Sycamore	%CSY	percent			
% Cover Cottonwood	%CCO	percent	X	X	X
% Cover Oak	%COA	percent	X	X	X
% Cover Bay	%CBA	percent			X
<i>Landscape Level</i>					
Watershed	WSHD	(categorical)	x	x	x

Detection Probability: Measurement error and imperfect detection have been shown to introduce significant bias when estimating density from variable distance point count data (Alldredge et al. 2007, Simons et al. 2007, Simons et al. 2009, Johnson 2008). To address this concern, I used a truncated sampling plot (50 meter radius), and calculated indices of abundance, assuming perfect

detection within the sampling plot. I tested this assumption using a removal model, which allowed us to estimate both components of detection probability (*availability* by sight or sound, and visual or auditory *detection* when available) (Farnsworth et al. 2002, Johnson 2007). Analyses were conducted using the program SURVIV (White 1982), following methods described in Farnsworth et al. (2002) for data derived from 2 point count time intervals (five minute counts divided into first 3 minutes and second 2 minutes). Results of this analysis indicated that detection probabilities were high ($\bullet 0.9$) for all species within a 50 m radius plot, and in all cases a detection probability of 1.0 was included in the 95% confidence intervals (Appendix D, Table D1). I also calculated annual estimates of detection probability within a 50 m radius plot for each sampling year (2006-2009). For these analyses, annual partitioning of the dataset resulted in greater variability in the point estimates, and served to increase the breadth of confidence intervals. Despite this loss in statistical resolution, detection probabilities remained high ($\bullet 0.78$), and a detection probability of 1.0 was included in the 95% confidence intervals for all species, for each year of the study period (Appendix D, Table D2). In summary, my results indicate that for the bird species selected, detection probability was high, and remained relatively constant throughout the study period. Therefore, I have incorporated the use of indices of abundance instead of attempting to estimate true density. To be specific: the assumption of equal detection probability across all species and all years, which is implicit in the use of an index, is apparently not violated.

Treatment of the Response Variables: I used one index of bird abundance as the response variable for regression analyses. In the case of four species (Pacific-slope Flycatcher, Song Sparrow, Swainson's Thrush, Wilson's Warbler), detections within a 50 meter radius were summed across all years at each point (Nur et al. 1999). For the remaining four species (Black-headed Grosbeak, Orange-crowned Warbler, Spotted Towhee, Warbling Vireo), I modified the above index as followings: natural logarithm ($\ln$) * (summed count detections + 1). This log transformation was applied based on the error structure of the distribution of summed detections for each of these species, and allowed for normalization of the residuals in regression models (Nur et al. 1999).

Statistical Analysis Including Model Selection: Prior to the development of candidate models, I used residual sum of squares values from univariate regressions to identify and rank variables associated with bird abundance (Hosmer and Lemeshow 2000). This ranking procedure provided a quantitative approach to selecting a subset of predictors for inclusion in candidate models. The top five covariates and an additional categorical predictor, watershed, were used in defining all possible candidate models for modeling species response.

I used simple linear regression to model the relative abundance of the selected species using fine scale habitat variables identified by the sums of squares analysis. I tested the normality of residuals of the full model sets. Normality plots with Ryan Joiner test statistics and p-values are summarized in Appendix B (Figure B1-B10). I tested for departures of equal variance in the response variable using Levene's Test, and reviewed scatterplots. I did not find

any pervasive violation of this assumption, with the exception of bird response to % Cover *Baccharis*. Levene's test statistics (W) and p-values are summarized in Appendix B (Table B2). Models were ranked using Akaike's Information Criteria (AIC), corrected for small sample size (AIC_c) and over-dispersion ($QAIC_c$) when appropriate (Burnham and Anderson 2002). These extended criteria include a bias correction term which addresses AIC's tendency to perform poorly when the ratio of sample size to number of parameters is small (i.e. $n/K < 40$) (Burnham and Anderson 2002). I also evaluated the relative importance of predictor variables using summed Akaike weights (w_i) (Burnham and Anderson 2002). All analyses were conducted in the statistical package R (R Development Core Team 2010).

Linear regression has been widely used to assess bird habitat relationships despite poor predictive and explanatory performance. (Morrison et al. 1987, Mauer 1986). In order to address species-level questions, and have results which were comparable to the current body of literature on bird-habitat associations, I have taken a consistent analytical approach by using general linear regression.

4. RESULTS

Avian Assemblage: I detected one hundred and twenty-five species using variable distance point count surveys during the four year study period (Table C1). The avian assemblage throughout the study region varies from other regions of the California landscape. Through surveys, I encountered Band-tailed Pigeon breeding within the riparian habitats within the county. This species is

currently absent from Central Valley riparian where it previously occurred, likely due to hunting-driven population declines and loss of habitat (Grinnell and Miller 1944). Also, Brown-headed Cowbird abundance was extremely low compared to other regions (Melcer et al. 2006, Lindgren et al. 2006), and consistent with previous studies of Central Coast populations (Farmer 1999). Chestnut-backed Chickadee is an extremely abundant permanent resident within riparian vegetation communities throughout the study region. This species is absent from Central Valley riparian habitats with the exception of a few wintering birds that travel down corridors out of the coast range (Lindgren et al. 2006). Pacific-slope Flycatcher is associated with shaded, moist habitats near water sources. I found this species to be a common throughout the study region. I found both Swainson's Thrush and Warbling Vireo to be abundant throughout the study area. These species have suffered significant range contractions as breeders in southern California and the Central Valley where they were historically found as a common summer residents from late April through August (Grinnell and Miller 1944). Swainson's Thrush has also suffered extirpation from most of the Sierra Nevada, where two sub-species were historically common (Grinnell and Miller 1944). I also routinely detected MacGillivray's Warbler, Cassin's Vireo, Western Tanager, and Olive-sided Flycatcher at the Cerro Alto and Santa Rita study sites throughout the study period. These species are typically associated with higher elevations and pine forests. I failed to detect State or federal threatened or endangered species during the study period, however; I detected Yellow-

breasted Chat, a Species of Special Concern (Shuford and Gardali 2008) at several sites, over several years.

Focal Species: I detected Black-headed Grosbeak, Orange-crowned Warbler, Pacific-slope Flycatcher, Song Sparrow, Spotted Towhee, Swainson's Thrush, Warbling Vireo and Wilson's Warbler at all sites, in high abundance. Each of these species had high detection rates within 50 meters of the observer, and was used in the more detailed analysis of bird response to habitat features (Table 1). Blue Grosbeak, Ash-throated Flycatcher, Brown-headed Cowbird, Red-winged Blackbird, House Wren, American Goldfinch, Western Kingbird, Bullock's Oriole, Lazuli Bunting, Western Wood-pewee, and Yellow Warbler have been used in recent studies on fine-scale habitat associations; however, had low detection rates within 50 meters during this study.

Habitat Surveys: Sampling plots were located at elevations spanning from 1 to 365 meters above sea level. The width of riparian vegetation varied from 29 to 290 meters across all sampling locations. Through relevé surveys, I detected approximately 114 species of plants (Appendix C, Tables C2-C4), yet many were identified only to genus. I found non-native plant species presence at the study sites was low compared to other riparian areas in California. Native creeping blackberry was the dominant species at sampling plots; Himalayan blackberry (*Rubis discolor*) was absent from field sites. Fremont's cottonwood (*Populus fremontia*) is found east of the study region in the Salinas Valley; black cottonwood was the cottonwood species present within the study region.

Model Selection: For each of the eight focal species, I present the model selection results (Tables 3 and 6-12). I identify all of the models, out of those tested, that are most parsimonious and likely to have produced the observed data (i.e. models with $AIC_c < 2.0$). The subset of models selected for each species represent the models with the most empirical support, with other models having considerably less or essentially no support ($AIC_c < 2.0$; Burnham and Anderson 2002). Appendix E, Table E1 includes the complete output of the model selection analysis for all 63 candidate models. In addition to the results for each individual species, I also present predictor variables selected from models across all species and whether they had a positive or negative correlation with the abundance of the individual species (Table 4). The relative importance of each covariate in a model can be inferred by assessing the summed w_i (Burnham and Anderson 2002). Therefore, as a summary, I present the relative importance values of each covariate across all models selected for all species (Table 5).

Black-headed Grosbeak: Candidate models included all possible combinations of: Tree Species Richness, % Cover Blackberry, % Cover Forb, % Cover Canopy, and % Cover Dogwood. I found no linear correlations exceeding the critical value of $r = 0.6$ between these variables (Appendix B, Table B1).

Watershed was also included as a categorical predictor, resulting in the evaluation of 63 models using AIC_c . Table 3 provides a summary of the 3 highest ranked models.

TABLE 3. Summary of three models of the 63 tested for Black-headed Grosbeak with AICc values <2.0, including model terms, number of parameters (K), log likelihood value, AIC and AICc scores, change in AICc score (Δ_i AICc) between models, and AICc weight (W_i).

MODEL	K	log(L)	AIC	AIC _c	Δ_i AIC _c	W_i
TSRI + %CBB + %CFB + %CCA + %CDO	7	-80.878	175.756	177.029	0.000	0.147
TSRI + %CBB + %CCA + %CDO	6	-82.056	176.113	177.057	0.028	0.145
%CBB + %CFB + %CCA + %CDO + WSHD	13	-73.738	173.477	177.916	0.887	0.094

Tree Species Richness was included in 2 models, and had a positive correlation with the abundance index (Table 4). % Cover Blackberry, % Cover Forb, % Cover Canopy and % Cover Dogwood were included in all 3 top models, all having positive correlations with Black-headed Grosbeak abundance with the exception of % Cover Dogwood (Table 4). Watershed was included in only one model.

TABLE 4. Summary of variables used (based on sums of squares selection) which were regarded as possible predictor variables. For each of the variables which were selected in a model, the direction of their regression line slope indicates the nature of the correlation between each bird species and habitat variables.

HABITAT VARIABLE	BHGR	OCWA	PSFL	SOSP	SPTO	SWTH	WAVI	WIWA
Watershed Included:	yes	yes	no	no	yes	yes	yes	yes
Elevation				↓		↓		
Corridor Width		↑						
% Cover Forb	↑			↑				
% Cover Grass			↓			↓		
% Cover Shrub		↑				↑		↑
% Cover Canopy	↑		↑					↑
Tree Height Index							↑	
DBH Index							↑	
Tree Species Richness	↑		↑				↑	
Shrub Species Richness				↓	↑			
% Cover Blackberry	↑			↑			↑	
% Cover Poison Oak				↓				
% Cover Dogwood	↓				↓			↑
% Cover Willow			↓					↑
% Cover Cottonwood		↓						
% Cover Oak			↑					
% Cover Bay								↓

↑ indicates a positive regression line slope; ↓ indicates a negative regression line slope

For Black-headed Grosbeak, the order of predictors ranked by their summed w_i was % Cover Blackberry, % Cover Canopy, Tree Species Richness, % Cover Dogwood, % Cover Forb and Watershed (Table 5).

TABLE 5. Table of the summed W_i values (derived from 63 models tested for each species) for each of the variables included in the final model sets.

HABITAT VARIABLE	BHGR	OCWA	PSFL	SOSP	SPTO	SWTH	WAVI	WIWA
Watershed	0.414	1.000			0.967	1.000	1.000	0.521
Elevation				0.444		0.527		
Corridor Width		0.322						
% Cover Forb	0.654			0.393				
% Cover Grass			0.990			0.320		
% Cover Shrub		0.412				0.699		0.362
% Cover Canopy	0.783		0.509					0.779
Tree Height Index							0.349	
DBH Index							0.404	
Tree Species Richness	0.708		0.635				0.270	
Shrub Species Richness				0.343	0.717			
% Cover Blackberry	0.830			0.453			0.602	
% Cover Poison Oak				0.312				
% Cover Dogwood	0.680				0.631			0.780
% Cover Willow			0.682					0.279
% Cover Cottonwood		0.413						
% Cover Oak			0.510					
% Cover Bay								0.677

Orange-crowned Warbler: Candidate models included all possible combinations of: % Cover Shrub, Corridor Width, Shrub Species Richness, % Cover Dogwood, and % Cover Cottonwood. I found no linear correlations exceeding the critical value of $r = 0.6$ between these variables (Appendix B, Table B1). Watershed was also included as a categorical predictor, resulting in the evaluation of 63 models using AIC_c . Table 6 provides a summary of the 6 highest ranked models. Watershed was included in all selected models. % Cover Shrub was included in three models and had a positive correlation with the abundance index (Table 4). Corridor Width and % Cover Cottonwood were included in 2 of the 6 selected models, the former positively associated and the latter negatively associated with abundance (Table 4). The order of predictors ranked by their

summed w_i was Watershed, % Cover cottonwood, % Cover Shrub, and Corridor Width (Table 5). Both % Cover Shrub and % Cover Cottonwood shared similar w_i values.

TABLE 6. Summary of six models of the 63 tested for Orange-crowned Warbler with AICc values <2.0, including model terms, number of parameters (K), log likelihood value, AIC and AICc scores, change in AICc score (Δ_i AICc) between models, and AICc weight (W_i).

MODEL	K	log(L)	AIC	AIC _c	Δ_i AIC _c	W_i
WSHD	9	-75.539	169.079	171.172	0.000	0.137
%CCO + WSHD	10	-74.556	169.112	171.700	0.529	0.105
%CSH + WSHD	10	-74.748	169.496	172.084	0.912	0.087
%CSH +%CCO + WSHD	11	-73.701	169.401	172.544	1.372	0.069
CORW + WSHD	10	-75.027	170.054	172.642	1.470	0.066
%CSH + CORW + WSHD	11	-73.966	169.931	173.074	1.902	0.053

Pacific-slope Flycatcher: Candidate models included all possible combinations of: % Cover Grass, Tree Species Richness, % Cover Oak, % Cover Canopy, and % Cover Willow. I found no linear correlations exceeding the critical value of $r = 0.6$ between these variables (Appendix B, Table B1). Watershed was also included as a categorical predictor, resulting in the evaluation of 63 models using AIC_c. Table 7 provides a summary of the 5 highest ranked models. % Cover Grass was included in all models, while Tree Species Richness was included in four models of the top five models. % Cover Oak and % Cover Willow were included in three models and % Canopy Cover was included in two of the top five models. All were positively associated with abundance except % Cover Grass and % Cover Willow (Table 4). Watershed was not included in any of the selected models. The order of predictors ranked by their summed w_i was % Cover Grass, % Cover Willow, Tree Species Richness, % Cover Oak and % Cover Canopy, the latter two having similar summed weights (Table 5).

TABLE 7. Summary of five models of the 63 tested for Pacific-slope Flycatcher with AICc values <2.0, including model terms, number of parameters (K), log likelihood value, AIC and AICc scores, change in AICc score (Δ_i AICc) between models, and AICc weight (W_i).

MODEL	K	log(L)	AIC	AIC _c	Δ_i AIC _c	W_i
%CGR + %CCA + %CWI	5	-184.385	378.770	379.437	0.000	0.165
%CGR + TSRI + %COA	5	-184.395	378.789	379.456	0.016	0.163
%CGR + TSRI + %COA + %CCA	6	-183.438	378.875	379.819	0.379	0.136
%CGR + TSRI + %COA + %CWI	6	-183.876	379.752	380.696	1.256	0.088
%CGR + TSRI + %CWI	5	-185.306	380.612	381.278	1.838	0.066

Song Sparrow: Candidate models included all possible combinations of: % Cover Blackberry, Elevation, % Cover Forb, Shrub Species Richness, and % Cover Poison Oak. I found no linear correlations exceeding the critical value of $r = 0.6$ between these variables (Appendix B, Table B1). Watershed was also included as a categorical predictor, resulting in the evaluation of 63 models using QAIC_c. I applied this criterion based on over dispersion being present in the response variable (Burnham and Anderson 2002). Table 8 provides a summary of the eleven highest ranked models. % Cover Blackberry was included in 5 of 11 models, while % Cover Forb and Shrub Species Richness were included in 4 models. Elevation was included in 3 of 11 models, % Cover Poison Oak was included in 2 models. Watershed was not included in any of the higher ranking models. Only % Cover Forb and % Cover Blackberry had positive correlation with the abundance indices (Table 4). The order of predictors ranked by their summed w_i was % Cover Blackberry, Elevation, % Cover Forb, Shrub Species Richness, and % Cover Poison Oak (Table 5).

TABLE 8. Summary of eleven models of the 63 tested for Song Sparrow, with AICc values <2.0, including model terms, number of parameters (K), log likelihood value, AIC and AICc scores, change in AICc score (Δ_i AICc) between models, and AICc weight (W_i).

MODEL	K	log(L)	AIC	QAIC _c	Δ_i QAIC _c	W_i
%CBB	4	-233.157	472.315	82.258	0.000	0.092
ELEV	4	-233.845	473.691	82.476	0.218	0.083
ELEV + %CFB	5	-228.345	464.691	82.962	0.704	0.065
%CFB	4	-235.544	477.088	83.014	0.756	0.063
SSRI	4	-235.648	477.297	83.047	0.789	0.062
%CBB + ELEV	5	-228.630	465.259	83.052	0.794	0.062
%CBB + %CPO	5	-230.778	469.556	83.732	1.474	0.044
%CPO	4	-237.927	481.853	83.768	1.510	0.043
%CBB + SSRI	5	-230.911	469.822	83.774	1.516	0.043
%CBB + %CFB	5	-230.927	469.854	83.779	1.521	0.043
%CFB + SSRI	5	-231.997	471.994	84.118	1.860	0.036

Spotted Towhee: Candidate models included all possible combinations of:

Elevation, Shrub Species Richness, % Cover Dogwood, % Cover Poison Oak, and % Cover Canopy. I found no linear correlations exceeding the critical value of $r = 0.6$ between these variables (Appendix B, Table B1). Watershed was also included as a categorical predictor, resulting in the evaluation of 63 models using AIC_c. Table 9 provides a summary of the 2 highest ranking models. Watershed and Shrub Species Richness were included in both selected models, and % Cover Dogwood was included in 1 of 2 models. Shrub Species Richness had positive a correlation and % Cover Dogwood had negative a correlation with the abundance indices (Table 4). The order of predictors ranked by their summed w_i was Watershed, Shrub Species Richness, % Cover Dogwood, (Table 5).

TABLE 9. Summary of two models of the 63 tested for Spotted Towhee, with AICc values <2.0, including model terms, number of parameters (K), log likelihood value, AIC and AICc scores, change in AICc score (Δ_i AICc) between models, and AICc weight (W_i).

MODEL	K	log(L)	AIC	AIC _c	Δ_i AIC _c	W_i
SSRI + %CDO + WSHD	11	-184.385	142.128	145.271	0.000	0.207
SSRI + WSHD	10	-184.395	143.887	146.475	1.205	0.114

Swainson's Thrush: Candidate models included all possible combinations of: Elevation, % Cover Shrub, % Cover Willow, % Cover Grass, and Tree Species Richness. I found no linear correlations exceeding the critical value of $r = 0.6$ between these variables (Appendix B, Table B1). Watershed was also included as a categorical predictor, resulting in the evaluation of 63 models using AIC_c . Table 10 provides a summary of the 6 highest ranked models. Watershed was included in all final models. % Cover Shrub was included in 4 of the selected models, and was positively correlated with the index of abundance. Elevation was included in 3 of the selected models, and was negatively correlated with the index of abundance. % Cover Grass was included in 2 selected models, and was negatively correlated with the index of abundance (Table 4). The order of predictors ranked by their summed w_i was Watershed, % Cover Shrub, Elevation, and % Cover Grass (Table 5).

TABLE 10. Summary of six models of those the 63 for Swainson's Thrush, with AIC_c values <2.0 , including model terms, number of parameters (K), log likelihood value, AIC and AIC_c scores, change in AIC_c score ($\Delta_i AIC_c$) between models, and AIC_c weight (W_i).

MODEL	K	$\log(\mathcal{L})$	AIC	AIC_c	$\Delta_i AIC_c$	W_i
ELEV + %CSH + WSHD	11	-160.611	343.222	343.222	0.000	0.150
%CSH + WSHD	10	-161.948	343.897	343.897	0.120	0.141
ELEV + %CSH + %CGR + WSHD	12	-160.064	344.128	344.128	1.522	0.070
ELEV + WSHD	10	-162.814	345.627	345.627	1.851	0.059
%CSH + %CGR + WSHD	11	-161.542	345.085	345.085	1.863	0.059
WSHD	9	-164.113	346.225	346.225	1.953	0.056

Warbling Vireo: Candidate models included all possible combinations of: % Cover Blackberry, DBH Index, Tree Species Richness, Tree Height, and % Cover Forb. I found no linear correlations exceeding the critical value of $r = 0.6$ between these variables (Appendix B, Table B1). Watershed was also included

as a categorical predictor, resulting in the evaluation of 63 models using AIC_c .

Table 11 provides a summary of the 7 highest ranked models. Watershed was included in all seven selected models, while % Cover Blackberry was included in 4 selected models. DBH Index and Tree Height Index were included in 2 models, and Tree Species Richness was included in only one selected model. All variables were positively correlated with the index of abundance for Warbling Vireo (Table 4). The order of predictors ranked by their summed w_i was Watershed, % Cover Blackberry, DBH Index, Tree Height, Tree Species Richness, and % Cover Forb (Table 5).

TABLE 11. Summary of six models of the 63 tested for Warbling Vireo with AIC_c values <2.0 , including model terms, number of parameters (K), log likelihood value, AIC and AIC_c scores, change in AIC_c score (ΔAIC_c) between models, and AIC_c weight (W_i).

MODEL	K	$\log(\mathcal{L})$	AIC	AIC_c	ΔAIC_c	W_i
%CBB + WSHD	10	-78.606	177.211	179.799	0.000	0.127
%CBB + DBHI + WSHD	11	-77.669	177.337	180.480	0.681	0.090
%CBB + TRHI + WSHD	11	-77.744	177.488	180.630	0.831	0.083
WSHD	9	-80.461	178.923	181.016	1.216	0.069
DBHI + WSHD	10	-79.214	178.428	181.016	1.217	0.069
%CBB + TSRI	11	-78.130	178.261	181.404	1.604	0.057
TRHI + WSHD	10	-79.445	178.891	181.479	1.680	0.055

Wilson's Warbler: Candidate models included all possible combinations of: % Cover Dogwood (1), % Cover Willow (2), % Cover Shrub (3), % Cover Canopy (4), and % Cover Bay (5). I found no linear correlations exceeding the critical value of $r = 0.6$ between these variables (Appendix B, B1). Watershed (6) was also included as a categorical predictor, resulting in the evaluation of 63 models using AIC_c . Table 12 provides a summary of the 4 highest ranked models. % Cover Dogwood and % Cover Canopy were included in all selected models, and were positively associated with Wilson's Warbler abundance indices (Table 4).

% Cover Bay was included in 3 selected models, and had a negative correlation with the abundance indices (Table 4). % Cover Willow, % Cover Shrub, and Watershed were each included in only one of the selected models, and the latter two were positively correlated with Wilson's Warbler abundance indices (Table 4). The order of predictors ranked by their summed w_i was % Cover Dogwood, % Cover Canopy, % Cover Bay, Watershed, % Cover Shrub, and % Cover Willow (Table 5).

TABLE 12. Summary of six models of the 63 tested for Wilson's Warbler with AICc values <2.0, including model terms, number of parameters (K), log likelihood value, AIC and AICc scores, change in AICc score (Δ_i AICc) between models, and AICc weight (W_i).

MODEL	K	log(L)	AIC	AIC _c	Δ_i AIC _c	W_i
%CDO + %CCA + %CBA	5	-191.590	393.181	393.848	0.000	0.155
%CDO + %CSH + %CCA + %CBA	6	-190.510	393.020	393.964	0.116	0.146
%CDO + %CCA + WSHD	11	-185.084	392.167	395.310	1.463	0.074
%CDO + %CWI + %CCA + %CBA	6	-191.436	394.872	395.816	1.969	0.058

5. DISCUSSION

During May and June of 2006-2009, I conducted bird and habitat surveys (n = 96) within riparian habitat at 8 field sites along the central California coast between Cambria and Pismo Beach. Using these data, I developed species-specific correlative (simple linear) models for 8 bird species using fine-scale habitat characteristics, and evaluated these models using an information theoretic approach. I also assessed the direction of effect and importance of each habitat variable in describing bird response to these fine scale habitat characters.

Implications to Land Management and Restoration Efforts: Despite their high quality habitat features, and the continued persistence of breeding populations of

bird species which are suffering decline and extirpation in other areas of the coast, the study region's riparian vegetation communities have received little attention from conservation directives with respect to landbirds (e.g. RHJV 2004, CWC 2002, Cooper 2004, TNC 2006). This is concerning in light of the fact that less than 7% of riparian habitat in the central coast bioregion is managed for conservation (Davis et al. 1998). Heightened recognition of the riparian resources present within the study region is needed. In the interest of riparian landbird conservation, land managers and conservation practitioners should address the protection and restoration of habitats for a broad suite of species using region specific criteria (Nur et al. 2008). My study indicates that for 8 species of landbirds in central coast California, efforts should be directed at protecting and restoring the presence of and/or processes that create: diverse tree and shrub communities; dense tree, shrub and forb structure; extensive distribution of native blackberry, mixed distributions of red and arroyo willow and red-stem dogwood; a range of age classes of trees. Smaller creeks within the region (Morro Bay tributaries, Los Osos Valley, Guadalupe Valley) offer significant opportunities for enhancement of the vegetation communities currently limited by agriculture. Larger watersheds such as the Big Sur, Salinas, Nacimiento, and Carmel Rivers also require protection and offer significant restoration potential (RHJV 2004).

Regional variation: What is the overlap in explanatory variables across studies that have investigated habitat predictors of abundance in California's riparian bird communities? In comparison to Nur et al. (2008), the overlap is poor at best.

There are two fundamental differences: the avian communities and the useful predictors of abundance. The 8 most common species in this data set are not the 8 most common species in Nur et al. (2008). In fact, there is a subset of species that do not even occur in both data sets. For species that do co-occur and are analyzed in both studies, the predictive variables differ. For example, for Black-headed Grosbeak, only one variable is recovered as predictive by both studies (% Cover Herb Cover). I found 4 explanatory variables that they do not, and conversely they find 2 explanatory variables. Some of this is due to a lack of the same variables being included in both studies but, it is not the entire explanation since 10 variables are shared between the two studies (17 variables in their study and 20 in this one). Another possibility, for which I do not know the effect, is that I have assessed the detection probability, and used species that all have probabilities that are consistently high and close to 1, whereas, Nur et al. (2008) have simply used an index of abundance. Therefore, there may be bias inherent in trying to predict the number of detections when the detections differ in their probabilities. Therefore adjusting for, or at least assessing detection probability, makes the results of these types of studies more directly comparable because abundances would be a metric of the same phenomenon (abundance, rather than detection probability x abundance). I find it informative that the second species that is analyzed by both of these studies, Spotted Towhee, shows no overlap in the explanatory variables identified. This seems to show that just as scientists should accept regional variation in the composition of riparian avifaunas, they should probably expect regional variation in the

relationship between habitat variables and avian abundance.

Conservation Implications and Future Research Needs: Several of the species treated in my analyses are experiencing population decline or have been extirpated regionally within California riparian habitats. Wilson's Warbler, once a common breeder in coastal riparian habitats in southern California, has suffered range contractions and extirpation along the coast south of the study area (Dawson 1923, Grinnell and Miller 1944, Small 1994, Dunn and Garrett 1997, Sauer et al. 2008). Populations of Warbling Vireo have been reduced and extirpated throughout southern California and the Central Valley (Sibley 1940, Grinnell and Miller 1944, Gaines 1974, Garrett and Dunn 1981, Unitt 1984), and are suffering poor productivity in coastal habitats and the Sierra Nevada (Lindgren 2006, Purcell 2006, Smith et al. 2005). Swainson's Thrush has suffered similar range contractions and extirpation in southern California and throughout the Central Valley due to riparian habitat loss (Grinnell and Miller 1944, Sauer et al. 2008, Bent 1949, Verner and Boss 1980). Multiple subspecies of Song Sparrow associated with wetland and riparian habitats have declined significantly throughout the Central Valley and Sacramento-San Joaquin Delta (Shuford and Gardali 2008).

An understanding of ecological requirements is a critical information need for effective conservation and recovery of species within a managed landscape (Shuford and Gardali 2008). Previous studies of bird response to fine scale habitat features in California have occurred in systems that have been significantly degraded by urban and water resource development, agriculture,

and non-native species invasions (Nur et al. 2008, Heath and Ballard 2003). The watersheds within the study area may harbor important source populations for the region, and could be of critical importance as restoration activities are implemented in areas such as the Salinas Valley or the San Francisco Bay Area. The watersheds have also provided an opportunity to investigate the regional ecological requirements of these bird species where they are common breeders and present in high quality riparian habitat. That said, information on presence and abundance does not directly translate to an understanding of population viability (Robertson and Hutto 2007). Continued annual point count surveys will provide long-term population trajectory information, and aid in identifying regional declines. The implementation of methods allowing the estimation of demographic parameters such as nesting success, recruitment, and survival is needed, however, to effectively understand the demographic role and source population potential of these populations (Martin and Geupel 1993, Desante and Rosenberg 1998).

Implications and limitations of analytical approach: Recent studies have resulted in a better understanding of the effects of measurement error-induced bias resulting from the use of aural survey methods, and the resulting inaccuracies when these methods are used to estimate avian abundance metrics (Johnson 2008). This issue has implications for every study incorporating aural survey methods and corrections for imperfect detection. Despite these challenges, there may be a large suite of important species for which detection probability may be

high (i.e. close to 1), and where the bird response signal to environmental covariates outweighs the effects of imperfect detection.

Also, a more robust assessment of detection probability could be undertaken with the addition of sampling periods during a point count survey (i.e. additional 2 minute time periods added on to the point count). As analyzed, this method uses only a two-sample (2 time period) framework, and requires the assumption that detection probability remains constant between the two time periods. Even with adjustments to the equations to account for asymmetry in the time periods, this assumption may not be fully met. Finally, linear regression tests only for linear relationships between the response variable and covariates. Cases where birds do not respond monotonically across the entire distribution of covariates can be problematic for this analytical approach (Meents et al. 1983, Young 1996).

Implications and Limitations of Habitat Analyses: Bird species response to fine scale habitat features can vary by region within riparian habitats (Nur et al. 2008, Heath and Ballard 2003). My findings fill an information gap by providing the first regional data for this part of California and by offering a summary of the regional habitat associations of riparian birds within riparian habitats in a previously unstudied region of California.

Watershed was included in the models for 6 of the 8 species, suggesting that there may be either unmeasured variables having an effect on the bird abundance indices in some models or even sub-region scale variation. The importance of spatial scale in habitat association modeling has been

demonstrated by various investigations, and Saab (1999) found landscape scale effects to be more important than fine scale features in predicting bird response. Importantly, I allowed for landscape level effects, though I did not try to model them empirically. But, above and beyond significant small-scale effects, this work suggests that future efforts incorporate the larger scale attributes in evaluation of potential covariates of bird abundance within the study area. Also, with greater sampling effort, the presence of interactions between watershed, or possibly sub-regions, and habitat characters could be explored.

The assumption that a simplistic relationship exists between population densities and higher quality habitat has little empirical support, and has thus been heavily disputed (Van Horne 1983, Marzluff and Ewing 2001, Smallwood 2001, Maurer 1986). Source-sink theory (Pulliam 1988) supports this argument because non-viable populations can be maintained by immigration from outside source populations. Understanding habitat quality, therefore, requires the use of population measures outside of simple inventory data and should include the use of demographic data (Van Horne 1983, Marzluff and Ewing 2001, Smallwood 2001). Demographic measures such as reproductive success, productivity, survivorship, recruitment and dispersal can all aid in a better understanding of ecosystem function and health.

Despite these previously described limitations of bird habitat models (Rotenberry 1986), and the uncertainty associated with the use of indices in developing habitat preference models, (Van Horne 1983, Wiens and Rotenberry 1981, Knopf and Samson 1994), this study finds evidence for fine scale habitat

associations of several riparian songbirds in part by addressing potential limitations.

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7. APPENDICES

Appendix A. Geographic coordinates and maps for avian and vegetation sampling plots.

TABLE A1. Summary of site, site acronym, point count name, and GPS coordinates for all sampling plots. Data were recorded in UTM, Zone 10 S, WGS84.

Arroyo Grande (AG)			Reservoir Canyon (RC)			Santa Rosa Creek (SR) cont.		
AG01	726328	3895764	RC01	715611	3907918	SR08	673524	3937123
AG02	726070	3895796	RC02	715821	3907680	SR09	673920	3937099
AG03	725935	3895519	RC03	715994	3907489	SR10	673980	3937353
AG04	725737	3895329	RC04	716291	3907380	SR11	674226	3937451
AG05	725478	3895255	RC05	716528	3907295	SR12	674483	3937588
AG06	725209	3895224	RC06	716666	3907080	SR13	674664	3937771
Cerro Alto (CA)			RC07	716859	3906928	SR14	674900	3937560
CA01	704119	3922825	RC08	717050	3906756	SR15	675169	3937633
CA02	704342	3922681	Santa Rita (SC)			SR16	675357	3937898
CA03	704503	3922461	SC01	701231	3933037	SR17	675605	3937994
CA04	704773	3922403	SC02	700981	3933288	SR18	675877	3938010
CA05	705038	3922421	SC03	700744	3933348	SR19	676132	3937969
CA06	703873	3922780	SC04	700490	3933347	SR20	676380	3937926
CA07	704093	3923078	SC05	700248	3933533	SR21	676649	3937864
CA08	703990	3923497	SC06	700014	3933529	SR22	676920	3937934
CA09	703931	3923739	SC07	699753	3933726	SR23	677240	3937972
Coon Creek (CC)			SC08	699516	3933630	SR24	677393	3938193
CC01	692202	3903452	SC09	699271	3933565	SR25	677654	3938308
CC02	692410	3903307	SC10	699245	3933327			
CC03	692595	3903138	SC11	699426	3933094			
CC04	692787	3903297	SC12	699129	3932510			
CC05	693049	3903252	SC13	699342	3932376			
CC06	693286	3903168	SC14	699294	3932048			
CC07	693514	3903069	San Luis Obispo Creek (SL)					
CC08	693749	3902982	SL01	709153	3895958			
CC09	693881	3902770	SL02	708891	3895903			
CC10	694081	3902619	SL03	708720	3896085			
CC11	694337	3902594	SL04	708500	3896216			
Pismo Creek (PC)			SL05	708239	3896214			
PC01	716792	3895426	SL06	707977	3896201			
PC02	716661	3895225	SL07	707741	3896287			
PC03	716643	3894977	SL08	707483	3896327			
PC04	716468	3894766	SL09	707153	3896303			
PC05	716338	3894606	Santa Rosa Creek (SR)					
PC06	716238	3894380	SR01	671948	3937660			
PC07	716057	3894206	SR02	672116	3937485			
PC08	715975	3893982	SR04	672400	3937094			
PC09	715771	3893841	SR05	672787	3936972			
PC10	715588	3893662	SR06	673039	3936952			
PC11	715706	3893386	SR07	673283	3937041			

FIGURE A1. Map of the Arroyo Grande field site including point count locations and vegetation sampling plots over CA Department of Fish and Game 2009 summer aerial imagery in natural color.

FIGURE A2. Map of the Cerro Alto field site including point count locations and vegetation sampling plots over CA Department of Fish and Game 2009 summer aerial imagery in natural color.

FIGURE A3. Map of the Coon Creek field site including point count locations and vegetation sampling plots over CA Department of Fish and Game 2009 summer aerial imagery in natural color.

FIGURE A4. Map of the Pismo Creek field site including point count locations and vegetation sampling plots over CA Department of Fish and Game 2009 summer aerial imagery in natural color.

FIGURE A5. Map of the Reservoir Canyon field site including point count locations and vegetation sampling plots over CA Department of Fish and Game 2009 summer aerial imagery in natural color.

FIGURE A6. Map of the Santa Rita field site including point count locations and vegetation sampling plots over CA Department of Fish and Game 2009 summer aerial imagery in natural color.

FIGURE A7. Map of the western segment of the Santa Rosa field site including point count locations and vegetation sampling plots over CA Department of Fish and Game 2009 summer aerial imagery in natural color.

FIGURE A8. Map of the eastern segment of the Santa Rosa field site including point count locations and vegetation sampling plots over CA Department of Fish and Game 2009 summer aerial imagery in natural color.

FIGURE A9. Map of the San Luis Obispo Creek field site including point count locations and vegetation sampling plots over CA Department of Fish and Game 2009 summer aerial imagery in natural color.

Appendix B. Tests of assumptions for linear models.

TABLE B1. Pearson's Correlation Coefficients and corresponding p-values for habitat variables. The null hypothesis for this test is that there is no linear correlation between the habitat variables being evaluated (x vs. y). Correlations were assessed at critical value of 0.60, and pairwise comparison's that exceeded $r = 0.60$ are shown in bold.

	CORRIDOR WIDTH	ELEVATION	% COVER FORB	% COVER GRASS	% COVER SHRUB	% COVER CANOPY	TREE HEIGHT	DBH INDEX	TREE SPP RICHNESS	SHRUB SPP RICHNESS	% COVER BLACKBERRY	% COVER POISON OAK	% COVER DOGWOOD	% COVER BACCHARIS	% COVER WILLOW	% COVER SYCAMORE	% COVER COTTONWOOD	% COVER OAK
ELEVATION	-0.09 0.435																	
% COVER FORB	0.05 0.850	-0.03																
% COVER GRASS	-0.17 0.145	0.08	-0.08															
% COVER SHRUB	0.10 0.426	0.44	-0.27	-0.17														
% COVER CANOPY	0.09 0.449	0.25	0.05	-0.21	0.16													
TREE HEIGHT	0.23 0.049	0.10	0.17	-0.26	-0.06	0.09												
DBH INDEX	0.34 0.004	0.45	0.24	-0.06	-0.30	0.00	0.34											
TREE SPP RICHNESS	0.12 0.085	0.56	0.22	-0.25	-0.16	0.20	0.51	0.29										
SHRUB SPP RICHNESS	-0.24 0.042	-0.26	-0.26	0.00	0.18	0.37	-0.02	-0.20	0.20									
% COVER BLACKBERRY	0.09 0.462	-0.26	0.39	-0.16	-0.05	0.02	0.06	0.31	0.06	-0.33								
% COVER POISON OAK	0.35 0.002	0.34	-0.35	-0.05	0.23	0.19	0.17	0.02	0.20	0.22	-0.17							
% COVER DOGWOOD	0.12 0.334	0.43	-0.07	-0.11	0.35	0.27	0.15	-0.15	0.03	0.35	-0.23	0.29						
% COVER BACCHARIS	-0.23 0.055	-0.10	0.16	0.29	0.00	-0.05	-0.08	-0.04	-0.17	0.05	0.10	0.04	-0.04					
% COVER WILLOW	0.18 0.132	-0.48	-0.09	-0.09	0.41	0.16	-0.27	-0.14	-0.37	-0.12	0.23	-0.02	0.09	0.15				
% COVER SYCAMORE	0.29 0.012	0.05	0.19	-0.12	0.01	-0.06	0.45	0.26	0.34	-0.15	0.16	0.22	0.03	-0.09	-0.12			
% COVER COTTONWOOD	0.18 0.138	-0.03	-0.14	-0.08	0.12	-0.10	0.04	0.05	0.00	-0.09	-0.15	-0.15	0.10	-0.05	0.01	0.26		
% COVER OAK	-0.12 0.319	0.70	-0.05	0.00	-0.23	0.50	0.19	0.12	0.17	0.39	-0.20	0.18	0.16	-0.08	-0.46	-0.07	-0.09	
% COVER BAY	-0.16 0.179	0.73	-0.08	0.17	-0.12	0.28	0.15	0.09	0.31	0.38	-0.34	0.25	0.16	-0.07	-0.52	0.09	-0.09	0.54

TABLE B2. Summary of Levene's test statistics (W) and p-values.

	BHGR		LNOCWA		PSFL		SOSP		LNSPTO		SWTH		LNWAVI		WIWA	
	W	p-value	W	p-value	W	p-value	W	p-value	W	p-value	W	p-value	W	p-value	W	p-value
<i>Elevation</i>	1.43	0.235	1.21	0.346	1.31	0.292	3.96	0.004	0.46	0.914	1.04	0.456	1.90	0.101	1.84	0.113
<i>Corridor Width</i>	8.24	0.000	0.99	0.497	11.10	0.000	2.05	0.119	4.91	0.006	5.55	0.003	1.55	0.234	3.33	0.026
<i>% Cover Forb</i>	0.48	0.873	0.32	0.027	1.56	0.222	2.98	0.034	0.63	0.001	0.86	0.586	0.63	0.762	1.79	0.161
<i>% Cover Grass</i>	2.19	0.103	0.51	0.676	3.22	0.032	0.20	0.899	1.31	0.282	5.69	0.002	0.94	0.428	1.27	0.296
<i>% Cover Shrub</i>	1.85	0.072	0.46	0.918	1.46	0.178	1.21	0.303	1.03	0.436	1.59	0.133	0.89	0.560	0.97	0.486
<i>% Cover Canopy</i>	0.60	0.833	0.50	0.907	0.58	0.850	1.49	0.158	0.54	0.875	1.40	0.001	1.52	0.149	0.81	0.640
<i>Tree Height Index</i>	1.03	0.430	0.63	0.770	1.61	0.132	0.66	0.743	1.49	0.172	1.46	0.182	0.36	0.948	0.59	0.802
<i>DBH Index</i>	2.19	0.033	1.54	0.151	1.00	0.480	0.78	0.687	1.03	0.457	1.26	0.286	0.62	0.837	0.63	0.829
<i>Tree Species Richness</i>	1.00	0.436	1.04	0.407	1.24	0.296	0.98	0.445	1.01	0.429	0.76	0.605	0.13	0.277	1.12	0.360
<i>Shrub Species Richness</i>	0.63	0.750	1.28	0.273	0.33	0.953	0.58	0.793	0.02	0.508	1.40	0.215	0.46	0.880	0.74	0.652
<i>% Cover Blackberry</i>	0.57	0.880	0.70	0.771	1.05	0.436	1.38	0.218	0.69	0.782	0.54	0.906	0.51	0.923	1.08	0.414
<i>% Cover Poison Oak</i>	0.75	0.720	0.69	0.784	1.42	0.201	1.74	0.095	1.92	0.062	0.91	0.564	0.18	0.077	0.52	0.916
<i>% Cover Dogwood</i>	0.84	0.575	1.10	0.380	0.71	0.683	1.40	0.221	0.68	0.710	1.00	0.448	0.95	0.482	0.49	0.855
<i>% Cover Baccharis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>% Cover Willow</i>	1.02	0.464	0.63	0.821	0.63	0.825	0.89	0.586			0.67	0.792	0.35	0.982	0.76	0.706
<i>% Cover Sycamore</i>	1.55	0.145	1.99	0.052	1.10	0.380	1.19	0.318	0.49	0.927	2.16	0.034	0.60	0.819	0.57	0.840
<i>% Cover Cottonwood</i>	0.58	0.768	1.70	0.133	0.85	0.554	1.19	0.328	0.86	0.581	0.55	0.790	1.85	0.100	1.23	0.305
<i>% Cover Oak</i>	1.87	0.081	0.90	0.539	0.65	0.765	0.34	0.965	0.99	0.467	1.26	0.284	0.99	0.471	1.61	0.141
<i>% Cover Bay</i>	0.52	0.812	0.42	0.886	1.33	0.259	0.88	0.531	1.14	0.357	5.10	0.000	2.26	0.045	0.38	0.908

FIGURE B1. Scatterplot of % Cover Oak vs. Elevation, exhibiting linear correlation above the critical value of $r = 0.60$.

FIGURE B2. Scatterplot of % Cover Bay vs. Elevation, exhibiting linear correlation above the critical value of $r = 0.60$.

FIGURE B3. Normality plots of residuals and summary statistics for the Ryan Joiner test of normality for the global model of Orange-crowned Warbler.

FIGURE B4. Normality plot of residuals and summary statistics for the Ryan Joiner test of normality for the global model of Swainson's Thrush.

FIGURE B5. Normality plot of residuals and summary statistics for the Ryan Joiner test of normality for the global model of Song Sparrow.

FIGURE B6. Normality plot of residuals and summary statistics for the Ryan Joiner test of normality for the global model of Warbling Vireo.

FIGURE B7. Normality plot of residuals and summary statistics for the Ryan Joiner test of normality for the global model of Wilson's Warbler.

FIGURE B8. Normality plot of residuals and summary statistics for the Ryan Joiner test of normality for the global model of Black-headed Grosbeak.

FIGURE B9. Normality plot of residuals and summary statistics for the Ryan Joiner test of normality for the global model of Spotted Towhee.

FIGURE B10. Normality plot of residuals and summary statistics for the Ryan Joiner test of normality for the global model of Pacific-slope Flycatcher.

FIGURE B11. Scatter Plots of the residual values vs. the fitted values for the global model of Orange-crowned Warbler.

FIGURE B12. Scatter Plots of the residual values vs. the fitted values for the global model of Song Sparrow.

FIGURE B13. Scatter Plots of the residual values vs. the fitted values for the global model of Warbling Vireo.

FIGURE B14. Scatter Plots of the residual values vs. the fitted values for the global model of Wilson's Warbler.

FIGURE B15. Scatter Plots of the residual values vs. the fitted values for the global model of Black-headed Grosbeak.

FIGURE B16. Scatter Plots of the residual values vs. the fitted values for the global model of Spotted Towhee.

FIGURE B17. Scatter Plots of the residual values vs. the fitted values for the global model of Pacific Slope Flycatcher.

FIGURE B18. Scatter Plots of the residual values vs. the fitted values for the global model of Swainson's Thrush.

Appendix C. Summary of bird and plant species detected during the study duration

TABLE C1. The common name, scientific name, and summary detections of bird species at sampling plots (n = 96) throughout the study period.

COMMON NAME	SCIENTIFIC NAME	BANDING CODE	TOTAL DETECTIONS	DETECTIONS WITHIN 50 M
Acorn Woodpecker	<i>Melanerpes formicivorus</i>	ACWO	72	24
Allen's Hummingbird	<i>Selasphorus sasin</i>	ALHU	7	5
American Bittern	<i>Botaurus lentiginosus</i>	AMBI	1	
American Crow	<i>Corvus brachyrhynchos</i>	AMCR	157	29
American Goldfinch	<i>Spinus tristis</i>	AMGO	44	11
American Kestrel	<i>Falco sparverius</i>	AMKE	7	1
American Robin	<i>Turdus migratorius</i>	AMRO	62	29
Anna's Hummingbird	<i>Calypte anna</i>	ANHU	48	44
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	ATFL	172	16
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BAEA	1	
Band-tailed Pigeon	<i>Columba fasciata</i>	BTPI	36	10
Barn Owl	<i>Tyto alba</i>	BANO	1	
Barn Swallow	<i>Hirundo rustica</i>	BARS	25	
Belted Kingfisher	<i>Ceryle alcyon</i>	BEKI	4	1
Bewick's Wren	<i>Thryomanes bewickii</i>	BEWR	217	125
Black Phoebe	<i>Sayornis nigricans</i>	BLPH	20	13
Black-chinned Hummingbird	<i>Archilochus alexandri</i>	BCHU	25	24
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	BCNH	1	
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	BHGR	394	219
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>	BTYW	5	5
Blue Grosbeak	<i>Passerina caerulea</i>	BLGR	4	2
Blue-gray Gnatcatcher	<i>Poliophtila caerulea</i>	BGGN	2	2
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	BRBB	44	23
Brown Creeper	<i>Certhia americana</i>	BRCR	33	26
Brown-headed Cowbird	<i>Molothrus ater</i>	BHCO	85	33
Bullock's Oriole	<i>Icterus bullockii</i>	BUOR	33	16
Bushtit	<i>Psaltiriparus minimus</i>	BUSH	233	173
California Quail	<i>Callipepla californica</i>	CAQU	109	15
California Thrasher	<i>Toxostoma redivivum</i>	CATH	11	6
California Towhee	<i>Pipilo crissalis</i>	CALT	104	61
Canada Goose	<i>Branta canadensis</i>	CANG	3	
Canyon Wren	<i>Catherpes mexicanus</i>	CAWR	6	3
Cassin's Kingbird	<i>Tyrannus vociferans</i>	CAKI	1	
Cassin's Vireo	<i>Vireo cassinii</i>	CAVI	13	10
Cedar Waxwing	<i>Bombycilla cedrorum</i>	CEDW	217	94
Chestnut-backed Chickadee	<i>Poecile rufescens</i>	CBCH	452	416
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	CLSW	261	
Common Goldeneye	<i>Bucephala clangula</i>	COGO	1	1
Common Peafowl	<i>Pavo cristatus</i>	COPE	1	
Common Raven	<i>Corvus corax</i>	CORA	4	
Common Yellowthroat	<i>Geothlypis trichas</i>	COYE	16	12
Cooper's Hawk	<i>Accipiter cooperii</i>	COHA	7	1
Costa's Hummingbird	<i>Calypte costae</i>	COHU	2	2

TABLE C1 continued. The common name, scientific name, and summary detections of bird species at sampling plots (n = 96) throughout the study period.

COMMON NAME	SCIENTIFIC NAME	BANDING CODE	TOTAL DETECTIONS	DETECTIONS WITHIN 50 M
Dark-eyed Junco	<i>Junco hyemalis</i>	DEJU	153	99
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	DCCO	8	
Downy Woodpecker	<i>Picoides pubescens</i>	DOWO	48	24
Eurasian Collared Dove	<i>Streptopelia decaocto</i>	EUCD	88	28
European Starling	<i>Sturnus vulgaris</i>	EUST	228	75
Golden Eagle	<i>Aquila chrysaetos</i>	GOEA	1	
Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>	GCSP	1	1
Great Blue Heron	<i>Ardea herodias</i>	GBHE	8	
Great Egret	<i>Ardea alba</i>	GREG	2	2
Great Horned Owl	<i>Bubo virginianus</i>	GHOW	10	1
Greater Roadrunner	<i>Geococcyx californianus</i>	GRRO	1	
Greater Yellowlegs	<i>Tringa melanoleuca</i>	GRYE	1	
Green Heron	<i>Butorides virescens</i>	GRHE	3	1
Hairy Woodpecker	<i>Picoides villosus</i>	HAWO	38	22
Hermit Thrush	<i>Catharus guttatus</i>	HETH	2	2
Hermit Warbler	<i>Dendroica occidentalis</i>	HEWA	4	3
Hooded Oriole	<i>Icterus cucullatus</i>	HOOR	1	1
House Finch	<i>Carpodacus mexicanus</i>	HOFI	196	30
House Sparrow	<i>Passer domesticus</i>	HOSP	19	19
House Wren	<i>Troglodytes aedon</i>	HOWR	308	144
Hutton's Vireo	<i>Vireo huttoni</i>	HUVI	53	42
Killdeer	<i>Charadrius vociferus</i>	KILL	10	4
Lark Sparrow	<i>Chondestes grammacus</i>	LASP	3	
Lawrence's Goldfinch	<i>Spinus lawrencei</i>	LAGO	10	
Lazuli Bunting	<i>Passerina amoena</i>	LAZB	66	33
Lesser Goldfinch	<i>Spinus psaltria</i>	LEGO	101	30
MacGillivray's Warbler	<i>Oporornis tolmiei</i>	MGWA	24	17
Mallard	<i>Anas platyrhynchos</i>	MALL	29	15
Mountain Quail	<i>Oreortyx pictus</i>	MOQU	5	
Mourning Dove	<i>Zenaida macroura</i>	MODO	130	24
Nashville Warbler	<i>Vermivora ruficapilla</i>	NAWA	2	1
Northern Flicker	<i>Colaptes auratus</i>	NOFL	60	14
Northern Mockingbird	<i>Mimus polyglottos</i>	NOMO	9	2
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	NRWS	23	
Nuttall's Woodpecker	<i>Picoides nuttallii</i>	NUWO	124	38
Oak Titmouse	<i>Baeolophus inornatus</i>	OATI	110	42
Olive-sided Flycatcher	<i>Contopus cooperi</i>	OSFL	8	4
Orange-crowned Warbler	<i>Vermivora celata</i>	OCWA	344	255
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>	PSFL	335	268
Phainopepla	<i>Phainopepla nitens</i>	PHAI	1	
Pine Siskin	<i>Spinus pinus</i>	PISI	1	
Purple Finch	<i>Carpodacus purpureus</i>	PUFI	118	51
Pygmy Nuthatch	<i>Sitta pygmaea</i>	PYNU	13	12

TABLE C1 continued. The common name, scientific name, and summary detections of bird species at sampling plots (n = 96) throughout the study period.

COMMON NAME	SCIENTIFIC NAME	BANDING CODE	TOTAL DETECTIONS	DETECTIONS WITHIN 50 M
Red Junglefowl	<i>Gallus gallus</i>	REJU	1	
Red-shouldered Hawk	<i>Buteo lineatus</i>	RSHA	24	6
Red-tailed Hawk	<i>Buteo jamaicensis</i>	RTHA	29	2
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	RWBL	69	6
Rock Pigeon	<i>Columba livia</i>	ROPI	29	
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	RBGR	1	1
Ruby-crowned Kinglet	<i>Regulus calendula</i>	RCKI	2	2
Rufous/Allen's Hummingbird	<i>Selasphorus spp.</i>	SESP	29	19
Sharp-shinned Hawk	<i>Accipiter striatus</i>	SSHA	1	
Song Sparrow	<i>Melospiza melodia</i>	SOSP	670	457
Spotted Sandpiper	<i>Actitis macularia</i>	SPSA	1	1
Spotted Towhee	<i>Pipilo maculatus</i>	SPTO	360	234
Steller's Jay	<i>Cyanocitta stelleri</i>	STJA	186	94
Swainson's Thrush	<i>Catharus ustulatus</i>	SWTH	273	210
Townsend's Warbler	<i>Dendroica townsendi</i>	TOWA	5	5
Tree Swallow	<i>Tachycineta bicolor</i>	TRES	193	1
Tricolored Blackbird	<i>Agelaius tricolor</i>	TRBL	30	
Turkey Vulture	<i>Cathartes aura</i>	TUVU	25	2
Violet-green Swallow	<i>Tachycineta thalassina</i>	VGSW	94	3
Warbling Vireo	<i>Vireo gilvus</i>	WAVI	385	281
Western Bluebird	<i>Sialia mexicana</i>	WEBL	45	6
Western Gull	<i>Larus occidentalis</i>	WEGU	1	
Western Kingbird	<i>Tyrannus verticalis</i>	WEKI	9	2
Western Meadowlark	<i>Sturnella neglecta</i>	WEME	11	
Western Scrub-Jay	<i>Aphelocoma californica</i>	WESJ	180	76
Western Tanager	<i>Piranga ludoviciana</i>	WETA	42	14
Western Wood-Pewee	<i>Contopus sordidulus</i>	WWPE	63	34
White-breasted Nuthatch	<i>Sitta carolinensis</i>	WBNU	55	1
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	WCSP	4	1
White-tailed Kite	<i>Elanus leucurus</i>	WTKI	5	
White-throated Swift	<i>Aeronautes saxatalis</i>	WTSW	2	
Wild Turkey	<i>Meleagris gallopavo</i>	WITU	3	1
Wilson's Warbler	<i>Wilsonia pusilla</i>	WIWA	436	344
Pacific Wren	<i>Troglodytes pacificus</i>	PAWR	13	12
Wood Duck	<i>Aix sponsa</i>	WODU	4	
Wrentit	<i>Chamaea fasciata</i>	WREN	269	55
Yellow Warbler	<i>Dendroica petechia</i>	YWAR	61	49
Yellow-breasted Chat	<i>Icteria virens</i>	YBCH	5	2
Yellow-rumped Warbler	<i>Dendroica coronata</i>	YRWA	2	2

TABLE C2. The family, scientific name, common name and origin status of plant species identified during relevé surveys within 50 m radius (0.785 ha) sampling plots (n = 96) within the canopy height strata (> 5.0 m).

FAMILY	TAXON	STATUS	COMMON NAME
<i>Aceraceae</i>	<i>Acer macrophyllum</i>	Native	big leaf maple
<i>Aceraceae</i>	<i>Acer negundo</i>	Native	California Box Elder
<i>Anacardiaceae</i>	<i>Toxicodendron diversilobum</i>	Native	poison oak
<i>Betulaceae</i>	<i>Alnus rhombifolia</i>	Native	white alder
<i>Betulaceae</i>	<i>Alnus rhombifolia</i>	Native	white alder
<i>Caprifoliaceae</i>	<i>Lonicera involucrata</i>	Native	coast twinberry
<i>Caprifoliaceae</i>	<i>Sambucus mexicana</i>	Native	blue elderberry
<i>Cornaceae</i>	<i>Cornus sericea</i>	Native	red-stem dogwood
<i>Ericaceae</i>	<i>Arbutus menziesii</i>	Native	Pacific madrone
<i>Fagaceae</i>	<i>Lithocarpus densiflorus</i>	Native	tanbark oak
<i>Fagaceae</i>	<i>Quercus agrifolia</i>	Native	coast live oak
<i>Fagaceae</i>	<i>Quercus lobata</i>	Native	valley oak
<i>Juglandaceae</i>	<i>Juglans californica</i>	Native	California black walnut
<i>Lauraceae</i>	<i>Umbellularia californica</i>	Native	California bay
<i>Lauraceae</i>	<i>Umbellularia californica</i>	Native	California bay
<i>Myrtaceae</i>	<i>Eucalyptus globulus</i>	Non-native	blue eucalyptus
<i>Myrtaceae</i>	<i>Eucalyptus tereticornis</i>	Non-native	forest red gum
<i>Oleaceae</i>	<i>Fraxinus latifolia</i>	Native	Oregon ash
<i>Pinaceae</i>	<i>Pinus coulteri</i>	Native	Coulter pine
<i>Pinaceae</i>	<i>Pinus radiata</i>	Native	Monterey pine
<i>Pinaceae</i>	<i>Pinus sabiniana</i>	Native	grey pine
<i>Pinaceae</i>	<i>Pseudotsuga menziesii</i>	Native	douglas fir
<i>Platanaceae</i>	<i>Platanus racemosa</i>	Native	western sycamore
<i>Rosaceae</i>	<i>Heteromeles arbutifolia</i>	Native	toyon
<i>Rosaceae</i>	<i>Prunus ilicifolia</i>	Native	holly leaf cherry
<i>Rosaceae</i>	<i>Prunus ilicifolia</i>	Native	holly leaf cherry
<i>Salicaceae</i>	<i>Populus balsamifera</i>	Native	black cottonwood
<i>Salicaceae</i>	<i>Populus fremontii</i>	Native	Fremont's cottonwood
<i>Salicaceae</i>	<i>Salix laevigata</i>	Native	red willow
<i>Salicaceae</i>	<i>Salix lasiolepus</i>	Native	arroyo willow
<i>Taxodiaceae</i>	<i>Sequoia sempervirens</i>	Non-native	redwood

TABLE C3. The family, scientific name, common name and origin status of plant species identified during relevé surveys within 50 m radius (0.785 ha) sampling plots (n = 96) within the shrub height strata (> 1.0-5.0 m).

FAMILY	TAXON	STATUS	SHRUB
Aceraceae	<i>Acer macrophyllum</i>	Native	big leaf maple
Aceraceae	<i>Acer negundo</i>	Native	California Box Elder
Anacardiaceae	<i>Toxicodendron diversilobum</i>	Native	poison oak
Asteraceae	<i>Artemesia californica</i>	Native	California sagebrush
Asteraceae	<i>Artemesia douglasiana</i>	Native	mugwort
Asteraceae	<i>Aster spp.</i>	Native	aster species
Asteraceae	<i>Baccharis pilularis</i>	Native	coyote brush
Asteraceae	<i>Baccharis salicifolia</i>	Native	mulefat
Betulaceae	<i>Alnus rhombifolia</i>	Native	white alder
Caprifoliaceae	<i>Lonicera involucrata</i>	Native	coast twinberry
Caprifoliaceae	<i>Sambucus mexicana</i>	Native	blue elderberry
Caprifoliaceae	<i>Symphoricarpos albus</i>	Native	common snowberry
Cornaceae	<i>Cornus sericea</i>	Native	red-stem dogwood
Cucurbitaceae	<i>Marah fabaceus</i>	Native	California manroot
Dennstaedtiaceae	<i>Pteridium aquilinum</i>	Native	western bracken fern
Dryopteridaceae	<i>Polystichum munitum</i>	Native	western sword fern
Fabaceae	<i>Genista monspessulana</i>	Non-native	French broom
Fagaceae	<i>Lithocarpus densiflorus</i>	Native	tanbark oak
Fagaceae	<i>Quercus agrifolia</i>	Native	coast live oak
Fagaceae	<i>Quercus durata</i>	Native	leather oak
Grossulariaceae	<i>Ribes speciosum</i>	Native	fuchsiaflower gooseberry
Juglandaceae	<i>Juglans californica</i>	Native	California black walnut
Lamiaceae	<i>Salvia mellifera</i>	Native	black sage
Lauraceae	<i>Umbellularia californica</i>	Native	California bay
Oleaceae	<i>Foresteria pubescens</i>	Native	desert olive
Pinaceae	<i>Pinus radiata</i>	Native	Monterey pine
Platanaceae	<i>Platanus racemosa</i>	Native	western sycamore
Poaceae	<i>Arundo donax</i>	Non-native	giant reed
Polygonaceae	<i>Eriogonum fasciculatum</i>	Native	California buckwheat
Pteridaceae	<i>Adiantum jordanii</i>	Native	California maiden hair fern
Rhamnaceae	<i>Ceanothus cuneatus</i>	Native	buckbrush
Rhamnaceae	<i>Rhamnus californica</i>	Native	coffee berry
Rhamnaceae	<i>Rhamnus crocea</i>	Native	redberry
Rhamnaceae	<i>Rhamnus ilicifolia</i>	Native	hollyleaf redberry
Rosaceae	<i>Cercocarpus betuloides</i>	Native	mountain mohogany
Rosaceae	<i>Heteromeles arbutifolia</i>	Native	toyon
Rosaceae	<i>Prunus ilicifolia</i>	Native	holly leaf cherry
Rosaceae	<i>Rosa californica</i>	Native	California wild rose
Rosaceae	<i>Rubus discolor</i>	Non-native	Himalayan blackberry
Rosaceae	<i>Rubus parviflorus</i>	Native	western thimbleberry
Rosaceae	<i>Rubus ursinus</i>	Native	California blackberry
Salicaceae	<i>Populus balsamifera</i>	Native	black cottonwood
Salicaceae	<i>Populus fremontii</i>	Native	Fremont's cottonwood
Salicaceae	<i>Salix breweri</i>	Native	serpentine willow
Salicaceae	<i>Salix exigua</i>	Native	sandbar willow
Salicaceae	<i>Salix laevigata</i>	Native	red willow
Salicaceae	<i>Salix lasiolepus</i>	Native	arroyo willow
Scrophulariaceae	<i>Mimulus aurantiacus</i>	Native	sticky monkeyflower
Solanaceae	<i>Nicotiana glauca</i>	Non-native	tree tobacco

TABLE C4. The family, scientific name, common name and origin status of plant species identified during relevé surveys within 50 m radius (0.785 ha) sampling plots (n = 96) within the herbaceous height strata (> 0.0-1.0 m).

FAMILY	TAXON	STATUS	COMMON NAME
Apiaceae	<i>Conium maculatum</i>	Non-native	poison hemlock
Apiaceae	<i>Foeniculum vulgare</i>	Non-native	sweet fennel
Apocynaceae	<i>Vinca major</i>	Non-native	periwinkle
Araliaceae	<i>Hedera helix</i>	Non-native	English Ivy
Asteraceae	<i>Artemesia douglasiana</i>	Native	mugwort
Asteraceae	<i>Artemesia dracunculus</i>	Native	wild tarragon
Asteraceae	<i>Carduus pycnocephalus</i>	Non-native	Italian thistle
Asteraceae	<i>Centaurea solstitialis</i>	Non-native	yellow star thistle
Asteraceae	<i>Delairea odorata</i>	Non-native	Cape ivy
Asteraceae	<i>Picris echioides</i>	Native	bristly oxtongue
Asteraceae	<i>Silybum marianum</i>	Non-native	milk thistle
Asteraceae	<i>Sonchus oleraceus</i>	Native	common sowthistle
Boraginaceae	<i>Amsinckia menziesii</i>	Native	fiddleneck
Brassicaceae	<i>Brassica nigra</i>	Non-native	black mustard
Brassicaceae	<i>Lepidium latifolia</i>	Non-native	pepperweed
Brassicaceae	<i>Raphanus raphanistrum</i>	Non-native	wild raddish
Cactaceae	<i>Opuntia littoralis</i>	Native	coastal prickly pear
Caprifoliaceae	<i>Lonicera involucrata</i>	Native	coast twinberry
Caprifoliaceae	<i>Symphoricarpos albus</i>	Native	common snowberry
Caprifoliaceae	<i>Symphoricarpos mollis</i>	Native	creeping snowberry
Convolvulaceae	<i>Calystegia macrostegia</i>	Native	island morning glory
Cucurbitaceae	<i>Marah fabaceus</i>	Native	California manroot
Cyperaceae	<i>Carex</i> spp.	Native	sedge spp
Cyperaceae	<i>Scirpus microcarpus</i>	Native	mountain bog bulrush
Dennstaedtiaceae	<i>Pteridium aquilinum</i>	Native	western bracken fern
Dryopteridaceae	<i>Polystichum munitum</i>	Native	western sword fern
Equisetaceae	<i>Equisetum</i> spp.	Native	horsetail species
Eupobiaceae	<i>Ricinis communis</i>	Native	castor bean
Fabaceae	<i>Lupin</i> spp.	Native	lupine species
Fabaceae	<i>Trifolium</i> spp.	Native	clover species
Fabaceae	<i>Vicia</i> spp.	Native/Non-native	vetch species
Juncaceae	<i>Juncus</i> spp.	Native	rush species
Lamiaceae	<i>Marrubium vulgare</i>	Non-native	common horehound
Lamiaceae	<i>Salvia spathacea</i>	Native	hummingbird sage
Lamiaceae	<i>Stachys bullata</i>	Native	California hedgenettle
Liliaceae	<i>Lilium</i> spp.	Native	lily species
Liliaceae	<i>Trilium chloropetalum</i>	Native	common trillium
Oxalidaceae	<i>Oxalis corniculata</i>	Non-native	yellow sorrel
Plantaginaceae	<i>Plantago major</i>	Non-native	common plantain
Poaceae	<i>Arundo donax</i>	Non-native	giant reed
Poaceae	<i>Avena fatua</i>	Non-native	wild oats
Poaceae	<i>Bromus diandrus</i>	Non-native	ripgut brome
Poaceae	<i>Bromus hordeaceus</i>	Non-native	soft brome
Poaceae	<i>Bromus madritensis</i>	Non-native	foxtail brome
Poaceae	<i>Bromus tectorum</i>	Non-native	cheatgrass
Poaceae	<i>Leymus condensatus</i>	Native	giant wild rye

TABLE C4 continued. Plant species detected within the herbaceous height strata (> 0.0-1.0 m).

FAMILY	TAXON	STATUS	COMMON NAME
<i>Polemoniaceae</i>	<i>Gilia tenuiflora</i>	Native	slender flowered gilia
<i>Polygonaceae</i>	<i>Rumex crispus</i>	Non-native	curly dock
<i>Polygonaceae</i>	<i>Rumex crispus</i>	Non-native	curly dock
<i>Portulacaceae</i>	<i>Claytonia perfoliata</i>	Native	miner's lettuce
<i>Pteridaceae</i>	<i>Adiantum jordanii</i>	Native	California maiden hair fern
<i>Ranunculaceae</i>	<i>Aquilegia formosa</i>	Native	columbine
<i>Rosaceae</i>	<i>Fragaria vesca</i>	Native	wild strawberry
<i>Rosaceae</i>	<i>Rubus parviflorus</i>	Native	western thimbleberry
<i>Rubiaceae</i>	<i>Galium aparine</i>	Native	common bedstraw
<i>Scrophulariaceae</i>	<i>Mimulus aurantiacus</i>	Native	sticky monkeyflower
<i>Scrophulariaceae</i>	<i>Mimulus guttatus</i>	Native	seep monkeyflower
<i>Solanaceae</i>	<i>Solanum douglasii</i>	Native	greenspot nightshade
<i>Solanaceae</i>	<i>Solanum xanti</i>	Native	purple nightshade
<i>Tropaeolaceae</i>	<i>Tropaeolum majus</i>	Non-native	nasturtium
<i>Typhaceae</i>	<i>Typha spp.</i>	Native/Non-native	cattail species
<i>Urticaceae</i>	<i>Urtica dioica</i>	Native	hoary nettle
<i>Urticaceae</i>	<i>Urtica urens</i>	Native	dwarf nettle

Appendix D. Detection Probability Results.

TABLE D1. Detection probability estimates, standard error (SE) and 95% confidence intervals for all bird species analyzed.

SPECIES	DETECTION PROBABILITY ($\hat{p}$)	SE ($\hat{p}$)	95% CONFIDENCE INTERVALS	
			LOWER	UPPER
Black-headed Grosbeak	0.94	0.04	0.87	1.01
Orange-crowned Warbler	0.97	0.02	0.93	1.01
Pacific-slope Flycatcher	0.90	0.05	0.79	1.00
Song Sparrow	0.96	0.02	0.93	0.99
Spotted Towhee	0.94	0.04	0.86	1.01
Swainson's Thrush	0.95	0.03	0.89	1.01
Warbling Vireo	0.98	0.01	0.95	1.00
Wilson's Warbler	0.99	0.01	0.97	1.00

TABLE D2. Detection probability estimates by year, with standard error (SE) and 95% confidence intervals for all bird species analyzed.

SPECIES	YEAR	DETECTION PROBABILITY ($\hat{p}$)	SE ($\hat{p}$)	95% CONFIDENCE INTERVALS	
				LOWER	UPPER
Black-headed Grosbeak	2006	0.87	0.14	0.60	1.14
	2007	0.95	0.07	0.81	1.08
	2008	0.92	0.11	0.72	1.13
	2009	0.98	0.02	0.94	1.03
Orange-crowned Warbler	2006	* Low Sample Size			
	2007	1.00	0.01	0.98	1.01
	2008	0.89	0.13	0.64	1.14
	2009	1.00	0.00	0.99	1.01
Pacific-slope Flycatcher	2006	0.96	0.05	0.87	1.05
	2007	0.85	0.17	0.51	1.18
	2008	0.85	0.16	0.53	1.16
	2009	0.89	0.10	0.69	1.09
Song Sparrow	2006	0.97	0.03	0.92	1.02
	2007	0.91	0.08	0.75	1.07
	2008	0.99	0.01	0.97	1.01
	2009	0.95	0.04	0.87	1.03
Spotted Towhee	2006	0.79	0.23	0.33	1.25
	2007	0.90	0.11	0.67	1.12
	2008	0.96	0.04	0.88	1.05
	2009	0.99	0.02	0.94	1.03
Swainson's Thrush	2006	0.89	0.14	0.61	1.17
	2007	1.00	0.00	0.99	1.01
	2008	0.97	0.04	0.88	1.06
	2009	0.78	0.23	0.33	1.24
Warbling Vireo	2006	0.98	0.02	0.95	1.02
	2007	0.99	0.01	0.97	1.01
	2008	0.95	0.06	0.83	1.06
	2009	0.97	0.03	0.92	1.03
Wilson's Warbler	2006	0.95	0.05	0.86	1.05
	2007	0.99	0.01	0.98	1.01
	2008	0.99	0.01	0.98	1.01
	2009	0.99	0.01	0.96	1.01

Appendix E. AIC Summary

TABLE E1. Summary of all 63 models tested for Black-headed Grosbeak, including model terms, number of parameters (K), log likelihood value, AIC and AICc scores, change in AICc score (Δ AICc) between models, likelihood value (L) and AICc weight (W_i).

MODEL	CONSTANT	TREE SPP RICHNESS	% COVER BLACKBERRY	% COVER FORB	% COVER CANOPY	% COVER DOGWOOD	CA	CC	PC	RC	SC	SL	SR	LOG(L)	AIC	K	AIC _c	Δ AICc	L	W_i
57	-0.180	0.132	0.799	0.410	0.720	-1.480	NA	NA	NA	NA	NA	NA	NA	-80.878	175.756	7	177.029	0.000	1.000	0.147
45	-0.134	0.142	0.985	NA	0.696	-1.513	NA	NA	NA	NA	NA	NA	NA	-82.056	176.113	6	177.057	0.028	0.986	0.145
62	0.726	NA	0.825	0.829	0.801	-1.969	-0.483	-0.844	-0.767	-0.793	-0.081	-0.884	-0.369	-73.738	173.477	13	177.916	0.887	0.642	0.094
53	0.485	NA	0.819	0.780	0.756	NA	-0.553	-0.900	-0.495	-0.544	-0.001	-0.581	-0.112	-75.675	175.350	12	179.109	2.080	0.353	0.052
42	-0.217	0.132	0.951	0.428	0.553	NA	NA	NA	NA	NA	NA	NA	NA	-83.210	178.419	6	179.363	2.334	0.311	0.046
24	0.185	0.153	1.068	NA	NA	-1.141	NA	NA	NA	NA	NA	NA	NA	-84.422	178.844	5	179.510	2.481	0.289	0.042
23	-0.169	0.142	1.149	NA	0.524	NA	NA	NA	NA	NA	NA	NA	NA	-84.435	178.871	5	179.537	2.508	0.285	0.042
63	0.529	0.049	0.833	0.818	0.793	-2.003	-0.517	-0.726	-0.740	-0.756	-0.154	-0.886	-0.370	-73.185	174.370	14	179.555	2.526	0.283	0.042
48	-0.085	0.133	NA	0.613	0.805	-1.779	NA	NA	NA	NA	NA	NA	NA	-83.347	178.694	6	179.638	2.609	0.271	0.040
56	0.832	NA	NA	0.854	0.913	-1.952	-0.483	-0.931	-0.677	-0.936	-0.132	-0.701	-0.333	-76.040	176.080	12	179.839	2.810	0.245	0.036
43	0.152	0.144	0.898	0.380	NA	-1.099	NA	NA	NA	NA	NA	NA	NA	-83.458	178.916	6	179.860	2.831	0.243	0.036
7	0.093	0.151	1.183	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-85.808	179.615	4	180.055	3.026	0.220	0.032
22	0.062	0.141	1.000	0.400	NA	NA	NA	NA	NA	NA	NA	NA	NA	-84.767	179.535	5	180.201	3.172	0.205	0.030
58	0.297	0.046	0.826	0.769	0.749	NA	-0.586	-0.791	-0.465	-0.505	-0.068	-0.578	-0.108	-75.209	176.418	13	180.857	3.828	0.148	0.022
39	0.593	NA	NA	0.805	0.868	NA	-0.553	-0.986	-0.409	-0.688	-0.052	-0.401	-0.078	-77.857	177.715	11	180.858	3.829	0.147	0.022
54	1.057	NA	0.983	0.756	NA	-1.790	-0.327	-0.721	-0.672	-0.691	0.155	-0.779	-0.324	-76.859	177.717	12	181.476	4.447	0.108	0.016
61	0.645	0.047	NA	0.843	0.907	-1.985	-0.516	-0.819	-0.651	-0.902	-0.203	-0.701	-0.333	-75.555	177.110	13	181.549	4.520	0.104	0.015
55	0.803	NA	0.859	NA	0.729	-1.776	-0.192	-0.829	-0.554	-0.719	0.075	-0.349	-0.231	-76.901	177.802	12	181.561	4.532	0.104	0.015
34	0.820	NA	0.970	0.715	NA	NA	-0.399	-0.778	-0.428	-0.468	0.216	-0.507	-0.091	-78.374	178.748	11	181.891	4.862	0.088	0.013
36	0.580	NA	0.852	NA	0.693	NA	-0.272	-0.880	-0.319	-0.497	0.139	-0.103	-0.005	-78.393	178.786	11	181.929	4.900	0.086	0.013
49	0.414	0.044	NA	0.794	0.862	NA	-0.585	-0.882	-0.379	-0.652	-0.117	-0.397	-0.074	-77.449	178.899	12	182.658	5.629	0.060	0.009
29	0.030	0.150	NA	NA	0.798	-1.953	NA	NA	NA	NA	NA	NA	NA	-86.127	182.254	5	182.921	5.892	0.053	0.008
59	0.846	0.052	0.990	0.745	NA	-1.828	-0.365	-0.598	-0.644	-0.653	0.075	-0.781	-0.325	-76.282	178.563	13	183.002	5.973	0.050	0.007
60	0.590	0.053	0.867	NA	0.722	-1.816	-0.234	-0.701	-0.528	-0.681	-0.006	-0.359	-0.234	-76.298	178.595	13	183.034	6.005	0.050	0.007
46	0.375	0.050	0.859	NA	0.685	NA	-0.312	-0.761	-0.289	-0.456	0.064	-0.106	-0.002	-77.873	179.747	12	183.506	6.477	0.039	0.006
44	0.617	0.049	0.976	0.704	NA	NA	-0.436	-0.663	-0.397	-0.428	0.142	-0.504	-0.087	-77.878	179.755	12	183.514	6.485	0.039	0.006
27	0.305	0.146	NA	0.608	NA	-1.388	NA	NA	NA	NA	NA	NA	NA	-86.441	182.882	5	183.549	6.520	0.038	0.006
41	0.916	NA	NA	NA	0.844	-1.753	-0.184	-0.919	-0.454	-0.866	0.026	-0.142	-0.189	-79.238	180.475	11	183.618	6.589	0.037	0.005
15	0.882	NA	0.988	NA	NA	NA	-0.152	-0.769	-0.270	-0.431	0.328	-0.071	0.006	-80.560	181.119	10	183.707	6.678	0.035	0.005
20	0.696	NA	NA	NA	0.807	NA	-0.263	-0.969	-0.223	-0.646	0.090	0.100	0.034	-80.624	181.247	10	183.836	6.807	0.033	0.005
37	1.101	NA	1.001	NA	NA	-1.628	-0.073	-0.717	-0.484	-0.632	0.278	-0.295	-0.201	-79.360	180.720	11	183.862	6.833	0.033	0.005
26	-0.109	0.132	NA	0.684	0.616	NA	NA	NA	NA	NA	NA	NA	NA	-86.642	183.284	5	183.950	6.921	0.031	0.005
40	1.244	NA	NA	0.773	NA	-1.739	-0.301	-0.806	-0.546	-0.849	0.132	-0.536	-0.271	-79.979	181.958	11	185.101	8.072	0.018	0.003
51	0.712	0.051	NA	NA	0.838	-1.791	-0.224	-0.797	-0.428	-0.830	-0.052	-0.149	-0.191	-78.705	181.410	12	185.169	8.140	0.017	0.003
25	0.664	0.052	0.994	NA	NA	NA	-0.195	-0.646	-0.240	-0.389	0.248	-0.075	0.008	-80.016	182.032	11	185.175	8.146	0.017	0.002
18	1.012	NA	NA	0.733	NA	NA	-0.371	-0.861	-0.311	-0.630	0.192	-0.275	-0.046	-81.322	182.645	10	185.233	8.204	0.017	0.002
47	0.876	0.055	1.008	NA	NA	-1.671	-0.117	-0.585	-0.457	-0.592	0.192	-0.306	-0.204	-78.739	181.478	12	185.237	8.208	0.017	0.002

TABLE E1 continued. Summary of all 63 models tested for Black-headed Grosbeak, including model terms, number of parameters (K), log likelihood value, AIC and AIC_c scores, change in AIC_c score (ΔAIC_c) between models, likelihood value (L) and AIC_c weight (W_i).

MODEL	CONSTANT	TREE SPP RICHNESS	% COVER BLACKBERRY	% COVER FORB	% COVER CANOPY	% COVER DOGWOOD	CA	CC	PC	RC	SC	SL	SR	LOG(L)	AIC	K	AIC _c	ΔAIC_c	L	W _i
8	0.210	0.143	NA	0.667	NA	NA	NA	NA	NA	NA	NA	NA	NA	-88.451	184.903	4	185.342	8.313	0.016	0.002
30	0.499	0.048	NA	NA	0.801	NA	-0.301	-0.856	-0.194	-0.607	0.018	0.098	0.037	-80.165	182.330	11	185.473	8.444	0.015	0.002
52	0.220	NA	0.809	0.571	0.867	-1.471	NA	NA	NA	NA	NA	NA	NA	-86.618	185.235	6	186.179	9.150	0.010	0.002
10	0.416	0.163	NA	NA	NA	-1.564	NA	NA	NA	NA	NA	NA	NA	-89.007	186.013	4	186.453	9.424	0.009	0.001
50	1.043	0.050	NA	0.763	NA	-1.775	-0.337	-0.688	-0.518	-0.813	0.056	-0.537	-0.272	-79.479	182.959	12	186.718	9.689	0.008	0.001
28	0.817	0.047	NA	0.723	NA	NA	-0.407	-0.751	-0.280	-0.593	0.121	-0.271	-0.042	-80.891	183.782	11	186.925	9.896	0.007	0.001
6	1.079	NA	NA	NA	NA	NA	-0.117	-0.853	-0.147	-0.595	0.307	0.177	0.055	-83.486	184.972	9	187.065	10.036	0.007	0.001
21	1.293	NA	NA	NA	NA	-1.573	-0.040	-0.803	-0.351	-0.791	0.258	-0.037	-0.144	-82.434	184.868	10	187.456	10.427	0.005	0.001
32	0.182	NA	0.960	0.589	0.701	NA	NA	NA	NA	NA	NA	NA	NA	-88.666	187.332	5	187.998	10.969	0.004	0.001
35	0.330	NA	1.077	NA	0.849	-1.517	NA	NA	NA	NA	NA	NA	NA	-88.690	187.380	5	188.047	11.018	0.004	0.001
9	0.018	0.152	NA	NA	0.588	NA	NA	NA	NA	NA	NA	NA	NA	-89.896	187.793	4	188.232	11.203	0.004	0.001
38	0.317	NA	NA	0.778	0.954	-1.773	NA	NA	NA	NA	NA	NA	NA	-88.868	187.737	5	188.403	11.374	0.003	0.000
11	0.869	0.050	NA	NA	NA	NA	-0.159	-0.735	-0.117	-0.555	0.229	0.174	0.057	-83.010	186.019	10	188.607	11.578	0.003	0.000
31	1.077	0.053	NA	NA	NA	-1.614	-0.083	-0.677	-0.325	-0.754	0.175	-0.045	-0.147	-81.892	185.784	11	188.927	11.898	0.003	0.000
1	0.321	0.162	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-91.442	188.885	3	189.146	12.117	0.002	0.000
13	0.295	NA	1.242	NA	0.677	NA	NA	NA	NA	NA	NA	NA	NA	-90.779	189.557	4	189.997	12.968	0.002	0.000
12	0.581	NA	1.024	0.568	NA	NA	NA	NA	NA	NA	NA	NA	NA	-90.930	189.860	4	190.300	13.271	0.001	0.000
33	0.671	NA	0.931	0.552	NA	-1.001	NA	NA	NA	NA	NA	NA	NA	-89.976	189.952	5	190.618	13.589	0.001	0.000
2	0.677	NA	1.294	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-92.809	191.618	3	191.879	14.850	0.001	0.000
14	0.769	NA	1.188	NA	NA	-1.056	NA	NA	NA	NA	NA	NA	NA	-91.787	191.574	4	192.013	14.984	0.001	0.000
16	0.293	NA	NA	0.848	0.766	NA	NA	NA	NA	NA	NA	NA	NA	-91.796	191.593	4	192.033	15.004	0.001	0.000
17	0.839	NA	NA	0.791	NA	-1.300	NA	NA	NA	NA	NA	NA	NA	-92.785	193.569	4	194.009	16.980	0.000	0.000
19	0.538	NA	NA	NA	0.971	-2.000	NA	NA	NA	NA	NA	NA	NA	-92.944	193.888	4	194.328	17.299	0.000	0.000
3	0.740	NA	NA	0.844	NA	NA	NA	NA	NA	NA	NA	NA	NA	-94.339	194.678	3	194.939	17.910	0.000	0.000
4	0.534	NA	NA	NA	0.758	NA	NA	NA	NA	NA	NA	NA	NA	-96.388	198.777	3	199.038	22.009	0.000	0.000
5	1.073	NA	NA	NA	NA	-1.523	NA	NA	NA	NA	NA	NA	NA	-96.681	199.362	3	199.622	22.593	0.000	0.000

TABLE E2. Summary of all 63 models tested for Orange-crowned Warbler, including model terms, number of parameters (K), log likelihood value, AIC and AICc scores, change in AICc score (Δ AICc) between models, likelihood value (L) and AICc weight (W_i).

MODEL	CONSTANT	SHRUB		SPECIES RICHNESS	CORRIDOR		CA	CC	PC	RC	SC	SL	SR	LOG(L)	AIC	K	AIC _c	Δ AICc	L	W_i
		% COVER SHRUB	WIDTH		% COVER DOGWOOD	% COVER COTTONWOOD														
6	0.665	NA	NA	NA	NA	NA	0.111	1.158	0.510	-0.181	0.888	0.553	0.154	-75.539	169.079	9	171.172	0.000	1.000	0.137
21	0.804	NA	NA	NA	NA	-0.068	-0.022	1.019	0.376	-0.320	0.750	0.414	0.021	-74.556	169.112	10	171.700	0.528	0.768	0.105
11	0.374	0.372	NA	NA	NA	NA	0.241	1.119	0.654	-0.071	0.973	0.673	0.229	-74.748	169.496	10	172.084	0.912	0.634	0.087
31	0.508	0.382	NA	NA	NA	-0.069	0.109	0.975	0.521	-0.210	0.834	0.535	0.095	-73.701	169.401	11	172.544	1.372	0.504	0.069
15	0.328	NA	0.002	NA	NA	NA	0.254	1.383	0.711	0.007	1.145	0.749	0.352	-75.027	170.054	10	172.642	1.470	0.480	0.066
25	-0.093	0.433	0.002	NA	NA	NA	0.440	1.391	0.927	0.181	1.306	0.936	0.487	-73.966	169.931	11	173.074	1.902	0.386	0.053
18	0.752	NA	NA	-0.018	NA	NA	0.152	1.212	0.510	-0.152	0.956	0.547	0.166	-75.406	170.812	10	173.400	2.228	0.328	0.045
20	0.673	NA	NA	NA	-0.057	NA	0.114	1.160	0.503	-0.188	0.886	0.545	0.147	-75.538	171.075	10	173.664	2.492	0.288	0.039
37	0.532	NA	0.001	NA	NA	-0.061	0.102	1.206	0.544	-0.161	0.962	0.579	0.187	-74.261	170.522	11	173.665	2.493	0.287	0.039
40	0.889	NA	NA	-0.017	NA	-0.068	0.019	1.073	0.377	-0.292	0.818	0.409	0.032	-74.426	170.852	11	173.995	2.823	0.244	0.033
47	0.112	0.431	0.002	NA	NA	-0.060	0.288	1.216	0.760	0.012	1.123	0.766	0.322	-73.194	170.388	12	174.147	2.975	0.226	0.031
28	0.469	0.392	NA	-0.022	NA	NA	0.300	1.185	0.662	-0.029	1.064	0.672	0.247	-74.533	171.065	11	174.208	3.036	0.219	0.030
41	0.806	NA	NA	NA	-0.014	-0.068	-0.021	1.020	0.375	-0.322	0.750	0.413	0.019	-74.556	171.112	11	174.255	3.083	0.214	0.029
30	0.402	0.389	NA	NA	-0.308	NA	0.262	1.126	0.621	-0.104	0.967	0.637	0.194	-74.702	171.403	11	174.546	3.374	0.185	0.025
50	0.601	0.402	NA	-0.022	NA	-0.069	0.167	1.041	0.529	-0.169	0.925	0.534	0.113	-73.486	170.972	12	174.731	3.559	0.169	0.023
34	0.415	NA	0.002	-0.020	NA	NA	0.306	1.453	0.719	0.047	1.233	0.750	0.372	-74.854	171.708	11	174.851	3.679	0.159	0.022
51	0.532	0.398	NA	NA	-0.269	-0.069	0.128	0.983	0.493	-0.239	0.830	0.504	0.064	-73.664	171.329	12	175.088	3.916	0.141	0.019
44	-0.006	0.460	0.002	-0.026	NA	NA	0.519	1.483	0.951	0.243	1.431	0.949	0.522	-73.668	171.335	12	175.094	3.922	0.141	0.019
36	0.309	NA	0.002	NA	0.103	NA	0.251	1.384	0.728	0.023	1.152	0.766	0.368	-75.022	172.043	11	175.186	4.014	0.134	0.018
46	-0.072	0.441	0.002	NA	-0.149	NA	0.447	1.391	0.907	0.161	1.299	0.914	0.466	-73.955	171.909	12	175.668	4.496	0.106	0.014
39	0.759	NA	NA	-0.017	-0.053	NA	0.155	1.214	0.504	-0.159	0.955	0.540	0.159	-75.405	172.809	11	175.952	4.780	0.092	0.013
54	0.612	NA	0.001	-0.019	NA	-0.060	0.153	1.275	0.553	-0.122	1.048	0.581	0.208	-74.101	172.202	12	175.961	4.789	0.091	0.012
59	0.193	0.457	0.002	-0.025	NA	-0.060	0.366	1.307	0.785	0.075	1.246	0.781	0.358	-72.913	171.825	13	176.264	5.092	0.078	0.011
55	0.512	NA	0.001	NA	0.105	-0.061	0.099	1.206	0.561	-0.145	0.969	0.596	0.203	-74.256	172.511	12	176.270	5.098	0.078	0.011
56	0.890	NA	NA	-0.017	-0.010	-0.068	0.019	1.073	0.375	-0.293	0.818	0.408	0.031	-74.426	172.852	12	176.611	5.439	0.066	0.009
49	0.498	0.410	NA	-0.022	-0.316	NA	0.322	1.193	0.628	-0.063	1.059	0.635	0.211	-74.484	172.968	12	176.727	5.555	0.062	0.009
60	0.132	0.438	0.002	NA	-0.146	-0.060	0.295	1.215	0.740	-0.007	1.116	0.745	0.301	-73.184	172.367	13	176.806	5.634	0.060	0.008
61	0.626	0.418	NA	-0.022	-0.277	-0.069	0.187	1.049	0.500	-0.198	0.922	0.502	0.082	-73.448	172.895	13	177.334	6.162	0.046	0.006
53	0.393	NA	0.002	-0.020	0.114	NA	0.303	1.454	0.737	0.064	1.241	0.768	0.390	-74.848	173.695	12	177.454	6.282	0.043	0.006
58	0.015	0.468	0.002	-0.026	-0.150	NA	0.527	1.483	0.930	0.223	1.423	0.927	0.501	-73.657	173.313	13	177.752	6.580	0.037	0.005
62	0.591	NA	0.001	-0.019	0.115	-0.060	0.150	1.275	0.572	-0.104	1.056	0.600	0.226	-74.094	174.189	13	178.628	7.456	0.024	0.003
63	0.213	0.464	0.002	-0.025	-0.147	-0.059	0.373	1.307	0.765	0.055	1.239	0.760	0.337	-72.902	173.804	14	178.989	7.817	0.020	0.003
24	0.923	0.690	-0.002	NA	NA	-0.100	NA	NA	NA	NA	NA	NA	NA	-91.429	192.858	5	193.525	22.353	0.000	0.000
45	0.942	0.554	-0.002	NA	1.053	-0.104	NA	NA	NA	NA	NA	NA	NA	-90.478	192.955	6	193.899	22.727	0.000	0.000
10	0.705	0.713	NA	NA	NA	-0.112	NA	NA	NA	NA	NA	NA	NA	-92.940	193.880	4	194.319	23.147	0.000	0.000
43	0.724	0.628	-0.002	0.033	NA	-0.096	NA	NA	NA	NA	NA	NA	NA	-90.856	193.712	6	194.656	23.484	0.000	0.000
7	0.968	0.634	-0.003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-93.131	194.263	4	194.702	23.530	0.000	0.000
27	0.486	0.631	NA	0.041	NA	-0.106	NA	NA	NA	NA	NA	NA	NA	-92.024	194.048	5	194.714	23.542	0.000	0.000
29	0.714	0.587	NA	NA	0.977	-0.117	NA	NA	NA	NA	NA	NA	NA	-92.145	194.291	5	194.957	23.785	0.000	0.000
35	1.235	NA	-0.002	NA	1.555	-0.095	NA	NA	NA	NA	NA	NA	NA	-92.303	194.606	5	195.273	24.101	0.000	0.000
23	0.987	0.506	-0.003	NA	0.972	NA	NA	NA	NA	NA	NA	NA	NA	-92.348	194.696	5	195.362	24.190	0.000	0.000

TABLE E2 continued. Summary of all 63 models tested for Orange-crowned Warbler with AIC_c values <2.0 , including model terms, number of parameters (K), log likelihood value, AIC and AIC_c scores, change in AIC_c score (ΔAIC_c) between models, likelihood value (L) and AIC_c weight (W_i).

MODEL	CONSTANT	% COVER		CORRIDOR WIDTH	SHRUB SPECIES RICHNESS		% COVER DOGWOOD	% COVER COTTONWOOD		CA	CC	PC	RC	SC	SL	SR	LOG(L)	AIC	K	AIC_c	ΔAIC_c	L	W_i
		SHRUB																					
22	0.744	0.567	-0.002	0.036	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-92.441	194.881	5	195.548	24.376	0.000	0.000
57	0.814	0.538	-0.002	0.020	0.873	-0.100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-90.278	194.557	7	195.829	24.657	0.000	0.000
13	1.253	NA	-0.003	NA	1.440	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-93.827	195.654	4	196.094	24.922	0.000	0.000
48	0.541	0.559	NA	0.032	0.705	-0.110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-91.652	195.303	6	196.247	25.075	0.000	0.000
8	0.470	0.563	NA	0.047	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-93.934	195.868	4	196.307	25.135	0.000	0.000
1	0.721	0.651	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-95.075	196.150	3	196.411	25.239	0.000	0.000
19	1.011	NA	NA	NA	1.505	-0.108	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-94.129	196.258	4	196.698	25.526	0.000	0.000
52	1.065	NA	-0.002	0.026	1.311	-0.091	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-91.999	195.997	6	196.941	25.769	0.000	0.000
42	0.822	0.488	-0.002	0.026	0.745	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-92.031	196.063	6	197.006	25.834	0.000	0.000
12	0.981	NA	-0.002	0.049	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-94.454	196.907	4	197.347	26.175	0.000	0.000
9	0.729	0.537	NA	NA	0.872	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-94.469	196.938	4	197.377	26.205	0.000	0.000
33	0.986	NA	-0.002	0.047	NA	-0.081	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-93.359	196.719	5	197.385	26.213	0.000	0.000
17	0.746	NA	NA	0.056	NA	-0.091	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-94.490	196.980	4	197.420	26.248	0.000	0.000
32	1.050	NA	-0.002	0.030	1.156	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-93.409	196.817	5	197.484	26.312	0.000	0.000
14	1.325	NA	-0.002	NA	NA	-0.084	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-94.534	197.069	4	197.508	26.336	0.000	0.000
38	0.789	NA	NA	0.038	1.152	-0.101	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-93.454	196.907	5	197.574	26.402	0.000	0.000
2	1.335	NA	-0.003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-95.703	197.406	3	197.667	26.495	0.000	0.000
3	0.708	NA	NA	0.059	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-95.859	197.717	3	197.978	26.806	0.000	0.000
26	0.512	0.505	NA	0.040	0.539	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-93.723	197.446	5	198.113	26.941	0.000	0.000
4	1.001	NA	NA	NA	1.365	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-96.067	198.133	3	198.394	27.222	0.000	0.000
5	1.106	NA	NA	NA	NA	-0.098	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-96.149	198.299	3	198.560	27.388	0.000	0.000
16	0.740	NA	NA	0.045	0.959	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-95.151	198.301	4	198.741	27.569	0.000	0.000

TABLE E3. Summary of all 63 models tested for Pacific-slope Flycatcher, including model terms, number of parameters (K), log likelihood value, AIC and AICc scores, change in AICc score (Δ AICc) between models, likelihood value (L) and AICc weight (W_i).

MODEL	CONSTANT	TREE			% COVER OAK	% COVER CANOPY	% COVER WILLOW	CA	CC	PC	RC	SC	SL	SR	LOG(L)	AIC	K	AIC _c	ΔAIC _c	L	W _i
		% COVER GRASS	SPECIES RICHNESS	% COVER OAK																	
29	2.924	-8.307	NA	NA	2.063	-3.094	NA	NA	NA	NA	NA	NA	NA	NA	-184.385	378.770	5	379.437	0.000	1.000	0.151
22	1.704	-7.598	0.271	2.570	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-184.395	378.789	5	379.456	0.019	0.991	0.150
45	2.197	-7.685	0.166	NA	1.807	-2.526	NA	NA	NA	NA	NA	NA	NA	NA	-183.438	378.875	6	379.819	0.382	0.826	0.125
43	2.331	-8.090	0.227	1.993	NA	-1.124	NA	NA	NA	NA	NA	NA	NA	NA	-183.876	379.752	6	380.696	1.259	0.533	0.081
24	2.925	-8.196	0.213	NA	NA	-2.030	NA	NA	NA	NA	NA	NA	NA	NA	-185.306	380.612	5	381.278	1.841	0.398	0.060
42	1.594	-7.485	0.270	2.459	0.213	NA	NA	NA	NA	NA	NA	NA	NA	NA	-184.373	380.745	6	381.689	2.252	0.324	0.049
48	2.927	-8.337	NA	0.165	1.978	-3.006	NA	NA	NA	NA	NA	NA	NA	NA	-184.380	380.759	6	381.703	2.266	0.322	0.049
57	2.134	-7.768	0.183	0.815	1.361	-2.033	NA	NA	NA	NA	NA	NA	NA	NA	-183.309	380.617	7	381.890	2.453	0.293	0.044
27	3.556	-9.084	NA	1.833	NA	-1.902	NA	NA	NA	NA	NA	NA	NA	NA	-185.684	381.367	5	382.034	2.597	0.273	0.041
10	4.033	-9.123	NA	NA	NA	-2.694	NA	NA	NA	NA	NA	NA	NA	NA	-186.857	381.714	4	382.154	2.717	0.257	0.039
8	2.800	-8.502	NA	2.901	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-187.319	382.638	4	383.078	3.641	0.162	0.025
7	1.854	-7.109	0.308	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-187.413	382.825	4	383.265	3.828	0.148	0.022
23	1.196	-6.592	0.292	NA	1.202	NA	NA	NA	NA	NA	NA	NA	NA	NA	-186.574	383.148	5	383.814	4.377	0.112	0.017
26	2.614	-8.314	NA	2.720	0.343	NA	NA	NA	NA	NA	NA	NA	NA	NA	-187.265	384.531	5	385.197	5.760	0.056	0.008
47	2.428	-6.784	0.255	NA	NA	-2.326	-0.604	1.295	0.470	-0.482	1.133	0.544	0.088	-179.004	382.008	12	385.767	6.330	0.042	0.006	
60	1.907	-5.931	0.255	NA	1.744	-3.198	-1.106	1.151	0.279	-0.867	0.462	0.330	0.028	-177.693	381.387	13	385.826	6.389	0.041	0.006	
31	3.531	-7.498	NA	NA	NA	-2.444	-0.356	0.735	0.392	-0.610	1.521	0.553	0.087	-180.586	383.172	11	386.314	6.877	0.032	0.005	
51	3.011	-6.646	NA	NA	1.744	-3.315	-0.858	0.591	0.201	-0.994	0.851	0.339	0.028	-179.319	382.638	12	386.397	6.960	0.031	0.005	
44	1.222	-5.418	0.330	2.703	NA	NA	-1.058	0.855	0.046	-0.676	0.683	0.557	0.125	-179.331	382.661	12	386.420	6.983	0.030	0.005	
59	1.996	-6.221	0.298	1.839	NA	-1.741	-1.022	1.137	0.271	-0.756	0.643	0.501	0.117	-178.174	382.349	13	386.788	7.351	0.025	0.004	
25	1.523	-5.929	0.274	NA	NA	NA	-0.350	0.966	0.261	-0.153	1.561	0.665	0.081	-181.381	384.763	11	387.905	8.468	0.014	0.002	
9	2.261	-7.392	NA	NA	1.458	NA	NA	NA	NA	NA	NA	NA	NA	NA	-189.813	387.627	4	388.066	8.629	0.013	0.002
1	3.139	-8.079	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-190.976	387.952	3	388.213	8.776	0.012	0.002
50	3.375	-7.218	NA	1.166	NA	-2.086	-0.595	0.574	0.257	-0.797	1.252	0.527	0.105	-180.247	384.493	12	388.252	8.815	0.012	0.002	
63	1.811	-5.840	0.275	0.844	1.401	-2.758	-1.199	1.107	0.226	-0.917	0.369	0.352	0.053	-177.566	383.133	14	388.318	8.881	0.012	0.002	
11	2.667	-6.655	NA	NA	NA	NA	-0.068	0.343	0.165	-0.272	2.004	0.681	0.080	-183.131	386.262	10	388.850	9.413	0.009	0.001	
28	2.613	-6.368	NA	2.134	NA	NA	-0.582	0.155	-0.021	-0.705	1.382	0.600	0.115	-181.863	385.726	11	388.869	9.432	0.009	0.001	
61	3.011	-6.646	NA	-0.008	1.747	-3.319	-0.857	0.592	0.202	-0.993	0.852	0.339	0.027	-179.319	384.638	13	389.077	9.640	0.008	0.001	
58	1.273	-5.485	0.331	2.742	-0.110	NA	-1.042	0.870	0.060	-0.667	0.703	0.567	0.130	-179.325	384.649	13	389.088	9.651	0.008	0.001	
34	0.945	NA	0.395	3.056	NA	NA	-1.590	0.821	-0.444	-1.418	0.342	0.528	0.048	-182.144	386.287	11	389.430	9.993	0.007	0.001	
55	1.302	NA	0.317	NA	2.376	-3.066	-1.688	1.016	-0.301	-1.629	0.072	0.260	-0.079	-180.928	385.856	12	389.615	10.178	0.006	0.001	
12	1.129	NA	0.344	2.210	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-190.736	389.471	4	389.911	10.474	0.005	0.001
35	1.019	NA	0.258	NA	2.223	-1.794	NA	NA	NA	NA	NA	NA	NA	NA	-189.630	389.259	5	389.926	10.489	0.005	0.001
46	1.324	-5.657	0.276	NA	0.405	NA	-0.444	0.904	0.198	-0.213	1.442	0.625	0.066	-181.297	386.595	12	390.354	10.917	0.004	0.001	
13	0.401	NA	0.342	NA	1.731	NA	NA	NA	NA	NA	NA	NA	NA	NA	-191.104	390.209	4	390.648	11.211	0.004	0.001
32	0.597	NA	0.332	1.656	1.114	NA	NA	NA	NA	NA	NA	NA	NA	NA	-190.171	390.342	5	391.009	11.572	0.003	0.000
54	1.377	NA	0.381	2.576	NA	-1.029	-1.615	0.985	-0.354	-1.530	0.289	0.493	0.036	-181.745	387.489	12	391.248	11.811	0.003	0.000	
30	2.500	-6.423	NA	NA	0.350	NA	-0.148	0.286	0.110	-0.325	1.904	0.648	0.067	-183.070	388.141	11	391.283	11.846	0.003	0.000	
49	2.643	-6.407	NA	2.156	-0.063	NA	-0.572	0.163	-0.013	-0.700	1.394	0.605	0.117	-181.861	387.722	12	391.481	12.044	0.002	0.000	
2	1.291	NA	0.371	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-192.730	391.460	3	391.721	12.284	0.002	0.000

TABLE E3 continued. Summary of all 63 models tested for Pacific-slope Flycatcher, including model terms, number of parameters (K), log likelihood value, AIC and AIC_c scores, change in AIC_c score (Δ AIC_c) between models, likelihood value (L) and AIC_c weight (W_i).

MODEL	CONSTANT	TREE					CA	CC	PC	RC	SC	SL	SR	LOG(L)	AIC	K	AIC _c	Δ AIC _c	L	W_i
		% COVER	SPECIES	% COVER	% COVER	% COVER														
		GRASS	RICHNESS	OAK	CANOPY	WILLOW														
37	1.924	NA	0.330	NA	NA	-1.786	-1.086	1.195	-0.147	-1.235	0.954	0.553	-0.015	-183.300	388.601	11	391.743	12.306	0.002	0.000
53	0.732	NA	0.390	2.860	0.503	NA	-1.631	0.754	-0.480	-1.418	0.272	0.488	0.032	-182.016	388.031	12	391.790	12.353	0.002	0.000
41	2.623	NA	NA	NA	2.473	-3.196	-1.460	0.277	-0.491	-1.911	0.509	0.262	-0.097	-183.332	388.663	11	391.806	12.369	0.002	0.000
62	1.180	NA	0.343	1.178	1.884	-2.455	-1.805	0.957	-0.364	-1.683	-0.050	0.293	-0.042	-180.695	387.391	13	391.830	12.393	0.002	0.000
15	1.259	NA	0.338	NA	NA	NA	-0.837	0.945	-0.251	-0.899	1.311	0.648	-0.011	-184.635	389.270	10	391.858	12.421	0.002	0.000
19	2.050	NA	NA	NA	2.696	-2.623	NA	NA	NA	NA	NA	NA	NA	-191.725	391.450	4	391.889	12.452	0.002	0.000
33	1.212	NA	0.338	2.125	NA	-0.159	NA	NA	NA	NA	NA	NA	NA	-190.726	391.452	5	392.119	12.682	0.002	0.000
52	0.985	NA	0.267	0.363	2.026	-1.570	NA	NA	NA	NA	NA	NA	NA	-189.607	391.214	6	392.158	12.721	0.002	0.000
14	1.830	NA	0.325	NA	NA	-1.112	NA	NA	NA	NA	NA	NA	NA	-192.137	392.274	4	392.714	13.277	0.001	0.000
36	0.768	NA	0.335	NA	1.061	NA	-1.026	0.785	-0.353	-0.968	1.030	0.547	-0.038	-184.047	390.094	11	393.237	13.800	0.001	0.000
18	2.606	NA	NA	2.428	NA	NA	-1.116	-0.053	-0.633	-1.615	1.134	0.574	0.018	-185.642	391.284	10	393.872	14.435	0.001	0.000
38	2.052	NA	NA	-0.665	3.029	-2.984	NA	NA	NA	NA	NA	NA	NA	-191.645	393.290	5	393.957	14.520	0.001	0.000
21	3.327	NA	NA	NA	NA	-1.867	-0.823	0.432	-0.339	-1.511	1.448	0.567	-0.031	-185.778	391.556	10	394.144	14.707	0.001	0.000
56	2.621	NA	NA	0.134	2.418	-3.128	-1.471	0.264	-0.500	-1.919	0.500	0.265	-0.093	-183.329	390.657	12	394.416	14.979	0.001	0.000
6	2.667	NA	NA	NA	NA	NA	-0.556	0.152	-0.452	-1.167	1.833	0.667	-0.027	-187.165	392.329	9	394.422	14.985	0.001	0.000
40	3.094	NA	NA	1.833	NA	-1.338	-1.170	0.198	-0.507	-1.752	1.030	0.526	0.004	-185.006	392.012	11	395.155	15.718	0.000	0.000
20	2.142	NA	NA	NA	1.105	NA	-0.755	-0.007	-0.557	-1.236	1.537	0.562	-0.055	-186.560	393.121	10	395.709	16.272	0.000	0.000
39	2.286	NA	NA	2.172	0.686	NA	-1.181	-0.130	-0.678	-1.611	1.024	0.519	-0.004	-185.419	392.839	11	395.981	16.544	0.000	0.000
3	2.473	NA	NA	2.587	NA	NA	NA	NA	NA	NA	NA	NA	NA	-194.932	395.864	3	396.124	16.687	0.000	0.000
16	1.744	NA	NA	1.873	1.403	NA	NA	NA	NA	NA	NA	NA	NA	-194.100	396.200	4	396.640	17.203	0.000	0.000
4	1.561	NA	NA	NA	2.115	NA	NA	NA	NA	NA	NA	NA	NA	-195.202	396.405	3	396.665	17.228	0.000	0.000
5	3.429	NA	NA	NA	NA	-2.022	NA	NA	NA	NA	NA	NA	NA	-195.414	396.828	3	397.089	17.652	0.000	0.000
17	2.938	NA	NA	1.896	NA	-1.206	NA	NA	NA	NA	NA	NA	NA	-194.364	396.728	4	397.167	17.730	0.000	0.000

TABLE E4. Summary of all 63 models tested for Song Sparrow, including model terms, number of parameters (K), log likelihood value, QAIC and QAICc scores, change in QAICc score (Δ QAICc) between models, likelihood value (L) and AICc weight (Wi).

MODEL	CONSTANT	% COVER		% COVER FORB	SHRUB SPECIES RICHNESS	% COVER		CA	CC	PC	RC	SC	SL	SR	LOG(L)	AIC	K	QAIC _c	ΔQAIC _c	L	W _i
		BLACKBERRY	ELEVATION			POISON OAK															
1	3.281	6.422	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-233.157	472.315	4	82.258	0.000	1.000	0.092
2	5.757	NA	-0.009	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-233.845	473.691	4	82.476	0.218	0.897	0.083
12	4.645	NA	-0.009	3.872	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-228.345	464.691	5	82.962	0.704	0.703	0.065
3	3.632	NA	NA	4.054	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-235.544	477.088	4	83.014	0.756	0.685	0.063
4	7.542	NA	NA	NA	-0.434	NA	NA	NA	NA	NA	NA	NA	NA	NA	-235.648	477.297	4	83.047	0.789	0.674	0.062
7	4.346	5.185	-0.007	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-228.630	465.259	5	83.052	0.794	0.672	0.062
10	4.142	6.089	NA	NA	NA	-3.715	NA	NA	NA	NA	NA	NA	NA	NA	-230.778	469.556	5	83.732	1.474	0.479	0.044
5	5.681	NA	NA	NA	NA	-4.356	NA	NA	NA	NA	NA	NA	NA	NA	-237.927	481.853	4	83.768	1.510	0.470	0.043
9	5.406	5.199	NA	NA	-0.287	NA	NA	NA	NA	NA	NA	NA	NA	NA	-230.911	469.822	5	83.774	1.516	0.469	0.043
8	2.831	5.155	NA	2.664	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-230.927	469.854	5	83.779	1.521	0.467	0.043
16	6.104	NA	NA	3.325	-0.354	NA	NA	NA	NA	NA	NA	NA	NA	NA	-231.997	471.994	5	84.118	1.860	0.395	0.036
13	7.026	NA	-0.007	NA	-0.236	NA	NA	NA	NA	NA	NA	NA	NA	NA	-232.623	473.247	5	84.316	2.058	0.357	0.033
14	6.170	NA	-0.008	NA	NA	-2.516	NA	NA	NA	NA	NA	NA	NA	NA	-232.880	473.760	5	84.397	2.139	0.343	0.032
22	3.905	3.758	-0.007	2.886	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-225.742	461.483	6	84.414	2.156	0.340	0.031
19	7.959	NA	NA	NA	-0.386	-3.405	NA	NA	NA	NA	NA	NA	NA	NA	-233.808	475.616	5	84.691	2.433	0.296	0.027
17	4.387	NA	NA	3.436	NA	-2.762	NA	NA	NA	NA	NA	NA	NA	NA	-234.426	476.852	5	84.887	2.629	0.269	0.025
24	4.753	5.145	-0.006	NA	NA	-2.413	NA	NA	NA	NA	NA	NA	NA	NA	-227.640	465.279	6	85.015	2.757	0.252	0.023
32	5.399	NA	-0.008	3.634	-0.128	NA	NA	NA	NA	NA	NA	NA	NA	NA	-227.972	465.943	6	85.121	2.863	0.239	0.022
33	4.798	NA	-0.008	3.726	NA	-0.676	NA	NA	NA	NA	NA	NA	NA	NA	-228.276	466.552	6	85.217	2.959	0.228	0.021
23	5.091	4.846	-0.006	NA	-0.122	NA	NA	NA	NA	NA	NA	NA	NA	NA	-228.296	466.592	6	85.223	2.965	0.227	0.021
26	4.788	4.183	NA	2.394	-0.258	NA	NA	NA	NA	NA	NA	NA	NA	NA	-229.055	468.109	6	85.463	3.205	0.201	0.019
29	5.846	5.087	NA	NA	-0.246	-3.215	NA	NA	NA	NA	NA	NA	NA	NA	-229.103	468.206	6	85.479	3.221	0.200	0.018
27	3.609	5.210	NA	2.006	NA	-2.877	NA	NA	NA	NA	NA	NA	NA	NA	-229.589	469.178	6	85.633	3.375	0.185	0.017
38	6.569	NA	NA	2.874	-0.334	-2.201	NA	NA	NA	NA	NA	NA	NA	NA	-231.247	472.494	6	86.158	3.900	0.142	0.013
35	7.401	NA	-0.006	NA	-0.231	-2.447	NA	NA	NA	NA	NA	NA	NA	NA	-231.688	473.375	6	86.297	4.039	0.133	0.012
43	4.142	3.877	-0.007	2.608	NA	-1.151	NA	NA	NA	NA	NA	NA	NA	NA	-225.532	463.064	7	86.677	4.419	0.110	0.010
42	4.329	3.615	-0.007	2.799	-0.067	NA	NA	NA	NA	NA	NA	NA	NA	NA	-225.637	463.274	7	86.710	4.452	0.108	0.010
45	5.467	4.819	-0.005	NA	-0.117	-2.385	NA	NA	NA	NA	NA	NA	NA	NA	-227.323	466.647	7	87.244	4.986	0.083	0.008
52	5.593	NA	-0.007	3.462	-0.131	-0.767	NA	NA	NA	NA	NA	NA	NA	NA	-227.882	467.764	7	87.421	5.163	0.076	0.007
48	5.264	4.326	NA	1.856	-0.233	-2.466	NA	NA	NA	NA	NA	NA	NA	NA	-228.055	468.109	7	87.476	5.218	0.074	0.007
57	4.594	3.729	-0.006	2.508	-0.070	-1.182	NA	NA	NA	NA	NA	NA	NA	NA	-225.416	464.832	8	89.023	6.765	0.034	0.003
6	3.833	NA	NA	NA	NA	NA	0.722	0.803	2.167	-3.333	-0.476	3.944	1.647	-220.233	458.466	10	92.315	10.057	0.007	0.001	
20	5.031	NA	NA	NA	-0.240	NA	1.281	1.543	2.167	-2.944	0.465	3.865	1.800	-218.994	457.988	11	94.477	12.219	0.002	0.000	
15	5.579	NA	-0.018	NA	NA	NA	4.245	0.245	0.833	-2.128	3.757	2.305	0.311	-219.321	458.643	11	94.581	12.323	0.002	0.000	
21	5.065	NA	NA	NA	NA	-2.353	0.035	-0.019	1.376	-4.151	-0.969	2.899	0.793	-219.472	458.944	11	94.629	12.371	0.002	0.000	
11	3.492	1.711	NA	NA	NA	NA	0.662	0.948	1.952	-3.049	-0.439	3.515	1.562	-219.737	459.474	11	94.713	12.455	0.002	0.000	
18	3.700	NA	NA	1.452	NA	NA	0.218	0.788	1.842	-3.403	-0.704	3.050	1.447	-219.750	459.500	11	94.717	12.459	0.002	0.000	
36	7.047	NA	-0.020	NA	-0.258	NA	5.207	0.986	0.697	-1.585	5.203	2.052	0.339	-217.863	457.726	12	96.735	14.477	0.001	0.000	
41	5.990	NA	NA	NA	-0.220	-2.019	0.646	0.777	1.488	-3.678	-0.036	2.974	1.055	-218.429	458.857	12	96.914	14.656	0.001	0.000	
37	6.667	NA	-0.018	NA	NA	-2.227	3.439	-0.508	0.144	-2.955	3.102	1.388	-0.438	-218.629	459.258	12	96.978	14.720	0.001	0.000	

TABLE E4 continued. Summary of all 63 models tested for Song Sparrow, including model terms, number of parameters (K), log likelihood value, QAIC and QAIC_c scores, change in QAIC_c score (Δ QAIC_c) between models, likelihood value (L) and AIC_c weight (W_i).

MODEL	% COVER			% COVER	SHRUB SPECIES	% COVER									LOG(L)	AIC	K	QAIC _c	Δ _i QAIC _c	L	W _i
	CONSTANT	BLACKBERRY	ELEVATION	FORB	RICHNESS	OAK	CA	CC	PC	RC	SC	SL	SR								
39	4.851	NA	NA	1.213	-0.226	NA	0.828	1.488	1.895	-3.024	0.221	3.122	1.625	-218.653	459.306	12	96.985	14.727	0.001	0.000	
30	4.675	1.355	NA	NA	-0.222	NA	1.193	1.605	1.997	-2.747	0.427	3.531	1.722	-218.682	459.364	12	96.995	14.737	0.001	0.000	
34	5.508	NA	-0.019	1.563	NA	NA	3.850	0.205	0.428	-2.152	3.689	1.274	0.040	-218.753	459.505	12	97.017	14.759	0.001	0.000	
25	5.255	1.760	-0.019	NA	NA	NA	4.239	0.386	0.592	-1.816	3.862	1.838	0.203	-218.787	459.574	12	97.028	14.770	0.001	0.000	
31	4.751	1.808	NA	NA	NA	-2.442	-0.054	0.103	1.119	-3.881	-0.949	2.406	0.672	-218.911	459.821	12	97.067	14.809	0.001	0.000	
40	4.794	NA	NA	1.086	NA	-2.025	-0.246	0.084	1.243	-4.089	-1.071	2.375	0.763	-219.213	460.426	12	97.163	14.905	0.001	0.000	
28	3.369	1.675	NA	1.421	NA	NA	0.170	0.930	1.639	-3.123	-0.662	2.649	1.369	-219.271	460.541	12	97.181	14.923	0.001	0.000	
55	7.844	NA	-0.019	NA	-0.239	-1.850	4.467	0.306	0.134	-2.312	4.554	1.308	-0.285	-217.379	458.758	13	99.262	17.004	0.000	0.000	
53	6.906	NA	-0.021	1.314	-0.244	NA	4.821	0.911	0.364	-1.636	5.065	1.199	0.111	-217.454	458.907	13	99.286	17.028	0.000	0.000	
46	6.695	1.379	-0.020	NA	-0.241	NA	5.137	1.046	0.517	-1.378	5.188	1.703	0.253	-217.532	459.065	13	99.311	17.053	0.000	0.000	
47	6.370	1.850	-0.018	NA	NA	-2.316	3.400	-0.390	-0.138	-2.661	3.187	0.861	-0.581	-218.031	460.062	13	99.469	17.211	0.000	0.000	
51	5.651	1.474	NA	NA	-0.200	-2.121	0.518	0.806	1.269	-3.500	-0.102	2.565	0.933	-218.056	460.112	13	99.476	17.218	0.000	0.000	
44	5.193	1.723	-0.019	1.532	NA	NA	3.852	0.344	0.200	-1.847	3.793	0.838	-0.060	-218.235	460.470	13	99.533	17.275	0.000	0.000	
56	5.730	NA	NA	0.910	-0.212	-1.756	0.389	0.835	1.373	-3.642	-0.154	2.533	1.020	-218.244	460.489	13	99.536	17.278	0.000	0.000	
54	6.429	NA	-0.018	1.223	NA	-1.853	3.265	-0.413	-0.057	-2.835	3.159	0.736	-0.524	-218.296	460.593	13	99.553	17.295	0.000	0.000	
49	4.499	1.346	NA	1.206	-0.209	NA	0.744	1.550	1.728	-2.828	0.185	2.795	1.549	-218.343	460.686	13	99.567	17.309	0.000	0.000	
50	4.499	1.769	NA	1.034	NA	-2.127	-0.320	0.199	0.998	-3.828	-1.046	1.918	0.646	-218.673	461.347	13	99.672	17.414	0.000	0.000	
60	7.509	1.488	-0.019	NA	-0.220	-1.953	4.351	0.333	-0.091	-2.128	4.502	0.891	-0.412	-216.992	459.983	14	101.886	19.628	0.000	0.000	
58	6.557	1.370	-0.021	1.307	-0.226	NA	4.754	0.971	0.187	-1.430	5.051	0.857	0.026	-217.125	460.249	14	101.928	19.670	0.000	0.000	
62	7.600	NA	-0.020	1.044	-0.231	-1.544	4.283	0.359	-0.037	-2.232	4.552	0.754	-0.363	-217.132	460.264	14	101.930	19.672	0.000	0.000	
59	6.149	1.807	-0.019	1.172	NA	-1.955	3.235	-0.301	-0.324	-2.552	3.239	0.248	-0.660	-217.722	461.445	14	102.117	19.859	0.000	0.000	
61	5.404	1.453	NA	0.883	-0.193	-1.865	0.271	0.862	1.160	-3.468	-0.216	2.143	0.901	-217.881	461.763	14	102.167	19.909	0.000	0.000	
63	7.276	1.464	-0.020	1.017	-0.212	-1.652	4.174	0.385	-0.255	-2.053	4.501	0.357	-0.487	-216.755	461.510 ¹⁵	15	104.626	22.368	0.000	0.000	

TABLE E5. Summary of all 63 models tested for Spotted Towhee, including model terms, number of parameters (K), log likelihood value, AIC and AICc scores, change in AICc score (Δ AICc) between models, likelihood value (L) and AICc weight (Wi).

MODEL	CONSTANT	ELEVATION	SHRUB		% COVER		CA	CC	PC	RC	SC	SL	SR	LOG(L)	AIC	K	AIC _c	ΔAICc	L	W _i
			SPECIES	% COVER	POISON	% COVER														
34	1.231	NA	0.063	-1.673	NA	NA	0.213	-0.251	-0.478	-0.832	0.061	-0.889	-0.943	-60.064	142.128	11	145.271	0.000	1.000	0.207
15	1.006	NA	0.062	NA	NA	NA	0.133	-0.302	-0.260	-0.623	0.115	-0.662	-0.730	-61.944	143.887	10	146.475	1.204	0.548	0.114
18	1.542	NA	NA	-1.657	NA	NA	0.358	-0.057	-0.476	-0.729	0.308	-0.908	-0.900	-62.361	144.721	10	147.310	2.039	0.361	0.075
44	1.392	-0.002	0.061	-1.727	NA	NA	0.515	-0.291	-0.597	-0.736	0.421	-1.035	-1.061	-59.887	143.775	12	147.534	2.263	0.323	0.067
53	1.174	NA	0.061	-1.672	0.119	NA	0.250	-0.206	-0.438	-0.789	0.091	-0.837	-0.899	-60.011	144.021	12	147.781	2.510	0.285	0.059
54	1.200	NA	0.063	-1.687	NA	0.064	0.201	-0.261	-0.486	-0.839	0.042	-0.897	-0.946	-60.035	144.071	12	147.830	2.559	0.278	0.058
6	1.317	NA	NA	NA	NA	NA	0.278	-0.110	-0.260	-0.522	0.359	-0.683	-0.691	-64.122	146.245	9	148.338	3.067	0.216	0.045
25	1.105	-0.001	0.061	NA	NA	NA	0.325	-0.329	-0.332	-0.557	0.347	-0.751	-0.802	-61.873	145.745	11	148.888	3.617	0.164	0.034
36	0.949	NA	0.061	NA	0.120	NA	0.171	-0.256	-0.220	-0.580	0.144	-0.609	-0.686	-61.891	145.782	11	148.925	3.654	0.161	0.033
37	0.992	NA	0.062	NA	NA	0.028	0.127	-0.307	-0.263	-0.625	0.106	-0.665	-0.731	-61.938	145.876	11	149.019	3.748	0.153	0.032
28	1.740	-0.002	NA	-1.727	NA	NA	0.743	-0.116	-0.629	-0.607	0.764	-1.095	-1.054	-62.079	146.158	11	149.301	4.030	0.133	0.028
39	1.431	NA	NA	-1.657	0.212	NA	0.420	0.017	-0.404	-0.655	0.352	-0.814	-0.823	-62.196	146.392	11	149.535	4.264	0.119	0.025
40	1.530	NA	NA	-1.663	NA	0.027	0.354	-0.061	-0.479	-0.731	0.300	-0.912	-0.902	-62.356	146.712	11	149.855	4.584	0.101	0.021
58	1.335	-0.002	0.060	-1.728	0.133	NA	0.568	-0.243	-0.557	-0.684	0.467	-0.982	-1.016	-59.821	145.642	13	150.081	4.810	0.090	0.019
59	1.361	-0.002	0.062	-1.742	NA	0.068	0.505	-0.303	-0.606	-0.741	0.404	-1.045	-1.066	-59.855	145.710	13	150.149	4.878	0.087	0.018
62	1.155	NA	0.062	-1.683	0.108	0.052	0.237	-0.218	-0.448	-0.799	0.072	-0.848	-0.906	-59.993	145.985	13	150.424	5.153	0.076	0.016
20	1.205	NA	NA	NA	0.213	NA	0.340	-0.035	-0.189	-0.448	0.403	-0.588	-0.613	-63.962	147.924	10	150.513	5.242	0.073	0.015
11	1.453	-0.001	NA	NA	NA	NA	0.554	-0.154	-0.365	-0.428	0.690	-0.811	-0.795	-63.979	147.958	10	150.546	5.275	0.072	0.015
21	1.321	NA	NA	NA	NA	-0.008	0.279	-0.109	-0.260	-0.522	0.361	-0.682	-0.690	-64.122	148.244	10	150.832	5.561	0.062	0.013
46	1.049	-0.001	0.060	NA	0.129	NA	0.377	-0.282	-0.293	-0.506	0.392	-0.699	-0.758	-61.812	147.624	12	151.383	6.112	0.047	0.010
47	1.090	-0.001	0.061	NA	NA	0.030	0.320	-0.334	-0.336	-0.559	0.339	-0.754	-0.803	-61.867	147.733	12	151.492	6.221	0.045	0.009
55	0.943	NA	0.061	NA	0.117	0.015	0.167	-0.260	-0.222	-0.582	0.139	-0.612	-0.688	-61.890	147.779	12	151.538	6.267	0.044	0.009
49	1.630	-0.002	NA	-1.729	0.227	NA	0.826	-0.039	-0.559	-0.523	0.831	-1.002	-0.978	-61.890	147.780	12	151.539	6.268	0.044	0.009
50	1.727	-0.002	NA	-1.735	NA	0.033	0.740	-0.120	-0.634	-0.609	0.757	-1.100	-1.056	-62.072	148.144	12	151.903	6.632	0.036	0.008
23	0.341	0.002	0.061	NA	0.526	NA	NA	NA	NA	NA	NA	NA	NA	-70.683	151.367	5	152.033	6.762	0.034	0.007
56	1.430	NA	NA	-1.658	0.211	0.004	0.419	0.016	-0.405	-0.656	0.351	-0.815	-0.824	-62.196	148.392	12	152.151	6.880	0.032	0.007
7	0.422	0.002	0.062	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-71.915	151.831	4	152.270	6.999	0.030	0.006
30	1.344	-0.002	NA	NA	0.224	NA	0.635	-0.078	-0.295	-0.345	0.756	-0.719	-0.720	-63.802	149.604	11	152.747	7.476	0.024	0.005
63	1.315	-0.002	0.060	-1.740	0.121	0.054	0.556	-0.256	-0.568	-0.693	0.450	-0.994	-1.024	-59.801	147.602	14	152.787	7.516	0.023	0.005
41	1.217	NA	NA	NA	0.219	-0.032	0.348	-0.029	-0.184	-0.444	0.413	-0.583	-0.610	-63.956	149.912	11	153.054	7.783	0.020	0.004
31	1.456	-0.001	NA	NA	NA	-0.005	0.554	-0.153	-0.364	-0.428	0.691	-0.811	-0.795	-63.979	149.958	11	153.101	7.830	0.020	0.004
60	1.043	-0.001	0.060	NA	0.126	0.016	0.373	-0.286	-0.296	-0.508	0.387	-0.702	-0.760	-61.810	149.621	13	154.060	8.789	0.012	0.003
22	0.427	0.002	0.059	0.432	NA	NA	NA	NA	NA	NA	NA	NA	NA	-71.707	153.413	5	154.080	8.809	0.012	0.003
42	0.348	0.002	0.059	0.307	0.506	NA	NA	NA	NA	NA	NA	NA	NA	-70.577	153.155	6	154.098	8.827	0.012	0.003
45	0.280	0.002	0.061	NA	0.518	0.124	NA	NA	NA	NA	NA	NA	NA	-70.591	153.182	6	154.126	8.855	0.012	0.002
61	1.627	-0.002	NA	-1.731	0.225	0.008	0.824	-0.041	-0.561	-0.524	0.829	-1.004	-0.979	-61.890	149.779	13	154.218	8.947	0.011	0.002
24	0.347	0.002	0.062	NA	NA	0.147	NA	NA	NA	NA	NA	NA	NA	-71.787	153.575	5	154.241	8.970	0.011	0.002
9	0.667	0.002	NA	NA	0.544	NA	NA	NA	NA	NA	NA	NA	NA	-73.042	154.084	4	154.523	9.252	0.010	0.002
1	0.756	0.003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-74.298	154.596	3	154.857	9.586	0.008	0.002
51	1.355	-0.002	NA	NA	0.230	-0.030	0.641	-0.071	-0.290	-0.341	0.764	-0.713	-0.717	-63.796	151.593	12	155.352	10.081	0.006	0.001

TABLE E5 continued. Summary of all 63 models tested for Spotted Towhee, including model terms, number of parameters (K), log likelihood value, AIC and AIC_c scores, change in AIC_c score (Δ AIC_c) between models, likelihood value (L) and AIC_c weight (W_i).

MODEL	CONSTANT	ELEVATION	SHRUB		% COVER		CA	CC	PC	RC	SC	SL	SR	LOG(L)	AIC	K	AIC _c	Δ AIC _c	L	W_i
			SPECIES	% COVER	POISON	% COVER														
8	0.738	0.002	NA	0.670	NA	NA	NA	NA	NA	NA	NA	NA	NA	-73.805	155.609	4	156.049	10.778	0.005	0.001
26	0.658	0.002	NA	0.543	0.508	NA	NA	NA	NA	NA	NA	NA	NA	-72.715	155.429	5	156.096	10.825	0.004	0.001
43	0.359	0.002	0.059	0.409	NA	0.134	NA	NA	NA	NA	NA	NA	NA	-71.601	155.202	6	156.146	10.875	0.004	0.001
57	0.290	0.002	0.059	0.288	0.500	0.115	NA	NA	NA	NA	NA	NA	NA	-70.498	154.995	7	156.268	10.997	0.004	0.001
29	0.597	0.002	NA	NA	0.535	0.137	NA	NA	NA	NA	NA	NA	NA	-72.934	155.868	5	156.535	11.264	0.004	0.001
10	0.673	0.003	NA	NA	NA	0.161	NA	NA	NA	NA	NA	NA	NA	-74.152	156.304	4	156.743	11.472	0.003	0.001
27	0.667	0.002	NA	0.645	NA	0.139	NA	NA	NA	NA	NA	NA	NA	-73.696	157.392	5	158.058	12.787	0.002	0.000
48	0.597	0.002	NA	0.523	0.502	0.120	NA	NA	NA	NA	NA	NA	NA	-72.632	157.263	6	158.207	12.936	0.002	0.000
13	0.156	NA	0.113	NA	0.843	NA	NA	NA	NA	NA	NA	NA	NA	-77.071	162.142	4	162.582	17.311	0.000	0.000
32	0.201	NA	0.099	0.985	0.741	NA	NA	NA	NA	NA	NA	NA	NA	-76.008	162.015	5	162.682	17.411	0.000	0.000
35	-0.022	NA	0.106	NA	0.785	0.398	NA	NA	NA	NA	NA	NA	NA	-76.160	162.320	5	162.987	17.716	0.000	0.000
52	0.043	NA	0.095	0.869	0.703	0.342	NA	NA	NA	NA	NA	NA	NA	-75.336	162.673	6	163.617	18.346	0.000	0.000
12	0.302	NA	0.105	1.273	NA	NA	NA	NA	NA	NA	NA	NA	NA	-78.242	164.483	4	164.923	19.652	0.000	0.000
33	0.111	NA	0.100	1.121	NA	0.398	NA	NA	NA	NA	NA	NA	NA	-77.361	164.721	5	165.388	20.117	0.000	0.000
14	0.035	NA	0.116	NA	NA	0.482	NA	NA	NA	NA	NA	NA	NA	-78.712	165.424	4	165.863	20.592	0.000	0.000
2	0.260	NA	0.124	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-79.995	165.990	3	166.251	20.980	0.000	0.000
38	0.509	NA	NA	1.622	0.811	0.467	NA	NA	NA	NA	NA	NA	NA	-81.139	172.279	5	172.945	27.674	0.000	0.000
16	0.756	NA	NA	1.824	0.870	NA	NA	NA	NA	NA	NA	NA	NA	-82.264	172.527	4	172.967	27.696	0.000	0.000
17	0.616	NA	NA	1.959	NA	0.541	NA	NA	NA	NA	NA	NA	NA	-83.533	175.066	4	175.505	30.234	0.000	0.000
3	0.914	NA	NA	2.224	NA	NA	NA	NA	NA	NA	NA	NA	NA	-84.976	175.953	3	176.214	30.943	0.000	0.000
19	0.487	NA	NA	NA	1.007	0.614	NA	NA	NA	NA	NA	NA	NA	-83.908	175.817	4	176.256	30.985	0.000	0.000
4	0.821	NA	NA	NA	1.121	NA	NA	NA	NA	NA	NA	NA	NA	-85.797	177.595	3	177.856	32.585	0.000	0.000
5	0.621	NA	NA	NA	NA	0.749	NA	NA	NA	NA	NA	NA	NA	-87.527	181.055	3	181.316	36.045	0.000	0.000

TABLE E6. Summary of all 63 models tested for Swainson's Thrush, including model terms, number of parameters (K), log likelihood value, AIC and AICc scores, change in AICc score (Δ AICc) between models, likelihood value (L) and AICc weight (Wi).

MODEL	CONSTANT	ELEVATION	% COVER			SPECIES RICHNESS	TREE							LOG(L)	AIC	K	AIC _c	Δ AICc	L	W _i
			SHRUB	WILLOW	GRASS		CA	CC	PC	RC	SC	SL	SR							
25	3.453	-0.012	1.527	NA	NA	NA	0.911	0.425	-3.287	-1.88	-0.22	-1.863	-0.313	-160.611	343.222	11	346.365	0.000	1.000	0.150
15	2.298	NA	1.535	NA	NA	NA	-1.407	0.791	-2.406	-2.671	-3.006	-0.781	0.569	-161.948	343.897	10	346.485	0.120	0.942	0.141
46	3.564	-0.013	1.459	NA	-1.906	NA	1.141	0.469	-3.18	-1.604	-0.049	-1.935	-0.34	-160.064	344.128	12	347.887	1.522	0.467	0.070
11	4.659	-0.012	NA	NA	NA	NA	0.395	0.584	-3.885	-2.324	-0.546	-2.366	-0.627	-162.814	345.627	10	348.216	1.851	0.396	0.059
36	2.344	NA	1.476	NA	-1.661	NA	-1.306	0.845	-2.275	-2.466	-2.977	-0.797	0.583	-161.542	345.085	11	348.228	1.863	0.394	0.059
6	3.5	NA	NA	NA	NA	NA	-1.944	0.955	-3	-3.125	-3.357	-1.278	0.26	-164.113	346.225	9	348.318	1.953	0.377	0.056
44	3.68	-0.014	1.671	-0.575	NA	NA	1.154	0.452	-3.301	-1.849	0.025	-1.976	-0.39	-160.425	344.849	12	348.609	2.244	0.326	0.049
47	3.447	-0.012	1.526	NA	NA	0.002	0.907	0.429	-3.286	-1.879	-0.224	-1.864	-0.313	-160.611	345.222	12	348.981	2.616	0.270	0.040
37	2.252	NA	1.52	NA	NA	0.014	-1.424	0.826	-2.404	-2.665	-3.031	-0.787	0.566	-161.942	345.883	11	349.026	2.661	0.264	0.040
34	2.309	NA	1.553	-0.07	NA	NA	-1.411	0.8	-2.395	-2.679	-3.017	-0.78	0.572	-161.945	345.891	11	349.034	2.669	0.263	0.039
30	4.725	-0.013	NA	NA	-2.242	NA	0.693	0.627	-3.728	-1.977	-0.328	-2.424	-0.642	-162.083	346.167	11	349.309	2.944	0.229	0.034
20	3.5	NA	NA	NA	-1.997	NA	-1.798	1.012	-2.815	-2.857	-3.306	-1.273	0.292	-163.546	347.093	10	349.681	3.316	0.191	0.029
58	3.884	-0.015	1.643	-0.771	-2.169	NA	1.5	0.512	-3.184	-1.525	0.304	-2.095	-0.446	-159.735	345.469	13	349.908	3.543	0.170	0.025
18	3.329	NA	NA	0.484	NA	NA	-1.875	0.882	-3.029	-3.036	-3.257	-1.252	0.261	-163.964	347.928	10	350.516	4.151	0.125	0.019
60	3.635	-0.013	1.478	NA	-1.953	-0.019	1.184	0.422	-3.186	-1.602	0.006	-1.936	-0.342	-160.051	346.103	13	350.542	4.177	0.124	0.019
21	3.262	NA	NA	NA	NA	0.057	-1.992	1.089	-2.966	-3.08	-3.446	-1.281	0.263	-163.999	347.997	10	350.585	4.220	0.121	0.018
31	4.454	-0.012	NA	NA	NA	0.045	0.322	0.695	-3.845	-2.301	-0.658	-2.352	-0.612	-162.741	347.482	11	350.625	4.260	0.119	0.018
28	4.615	-0.012	NA	0.074	NA	NA	0.37	0.579	-3.876	-2.323	-0.574	-2.346	-0.613	-162.81	347.621	11	350.764	4.399	0.111	0.017
53	2.376	NA	1.522	-0.191	-1.716	NA	-1.313	0.871	-2.241	-2.48	-3.005	-0.792	0.593	-161.521	347.041	12	350.801	4.436	0.109	0.016
55	2.353	NA	1.478	NA	-1.667	-0.003	-1.303	0.839	-2.275	-2.466	-2.972	-0.796	0.584	-161.542	347.084	12	350.843	4.478	0.107	0.016
59	3.708	-0.014	1.681	-0.581	NA	-0.007	1.171	0.435	-3.304	-1.85	0.047	-1.977	-0.391	-160.423	346.846	13	351.285	4.920	0.085	0.013
54	2.264	NA	1.536	-0.061	NA	0.013	-1.427	0.832	-2.394	-2.672	-3.039	-0.785	0.569	-161.939	347.879	12	351.638	5.273	0.072	0.011
51	4.629	-0.013	NA	NA	-2.185	0.021	0.652	0.678	-3.714	-1.975	-0.385	-2.416	-0.635	-162.068	348.136	12	351.895	5.530	0.063	0.009
49	4.814	-0.013	NA	-0.147	-2.3	NA	0.751	0.639	-3.742	-1.971	-0.267	-2.466	-0.67	-162.071	348.142	12	351.901	5.536	0.063	0.009
39	3.38	NA	NA	0.34	-1.879	NA	-1.758	0.957	-2.846	-2.81	-3.239	-1.256	0.291	-163.474	348.948	11	352.091	5.726	0.057	0.009
41	3.347	NA	NA	NA	-1.899	0.037	-1.836	1.096	-2.802	-2.841	-3.365	-1.276	0.292	-163.5	349	11	352.142	5.777	0.056	0.008
63	4.03	-0.015	1.686	-0.812	-2.267	-0.034	1.596	0.429	-3.195	-1.516	0.422	-2.105	-0.457	-159.694	347.389	14	352.574	6.209	0.045	0.007
40	3.076	NA	NA	0.499	NA	0.059	-1.922	1.019	-2.995	-2.986	-3.346	-1.255	0.264	-163.84	349.681	11	352.824	6.459	0.040	0.006
50	4.396	-0.012	NA	0.093	NA	0.046	0.29	0.69	-3.833	-2.299	-0.695	-2.326	-0.594	-162.736	349.472	12	353.231	6.866	0.032	0.005
62	2.396	NA	1.529	-0.196	-1.732	-0.006	-1.306	0.858	-2.239	-2.481	-2.995	-0.79	0.594	-161.52	349.039	13	353.478	7.113	0.029	0.004
61	4.716	-0.013	NA	-0.133	-2.242	0.019	0.707	0.685	-3.727	-1.97	-0.326	-2.454	-0.66	-162.058	350.116	13	354.555	8.190	0.017	0.002
56	3.207	NA	NA	0.358	-1.768	0.04	-1.797	1.045	-2.834	-2.79	-3.3	-1.257	0.291	-163.42	350.84	12	354.599	8.234	0.016	0.002
23	1.24	-0.007	3.417	NA	-4.621	NA	NA	NA	NA	NA	NA	NA	NA	-182.998	375.997	5	376.664	30.299	0.000	0.000
45	1.67	-0.007	3.322	NA	-5.065	-0.104	NA	NA	NA	NA	NA	NA	NA	-182.631	377.262	6	378.206	31.841	0.000	0.000
42	1.427	-0.008	3.6	-0.72	-4.732	NA	NA	NA	NA	NA	NA	NA	NA	-182.777	377.554	6	378.498	32.133	0.000	0.000
7	0.87	-0.007	3.757	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-185.483	378.965	4	379.405	33.040	0.000	0.000
57	1.98	-0.007	3.537	-0.91	-5.283	-0.122	NA	NA	NA	NA	NA	NA	NA	-182.285	378.571	7	379.843	33.478	0.000	0.000
22	0.997	-0.008	3.894	-0.515	NA	NA	NA	NA	NA	NA	NA	NA	NA	-185.374	380.749	5	381.415	35.050	0.000	0.000
24	0.992	-0.007	3.738	NA	NA	-0.032	NA	NA	NA	NA	NA	NA	NA	-185.447	380.894	5	381.561	35.196	0.000	0.000
43	1.168	-0.008	3.884	-0.572	NA	-0.041	NA	NA	NA	NA	NA	NA	NA	-185.317	382.633	6	383.577	37.212	0.000	0.000

TABLE E6 continued. Summary of all 63 models tested for Swainson's Thrush, including model terms, number of parameters (K), log likelihood value, AIC and AIC_c scores, change in AIC_c score (Δ AIC_c) between models, likelihood value (L) and AIC_c weight (W_i).

MODEL	CONSTANT	ELEVATION	% COVER			TREE		CA	CC	PC	RC	SC	SL	SR	LOG(L)	AIC	K	AIC _c	Δ AIC _c	L	W _i
			SHRUB	WILLOW	GRASS	SPECIES	RICHNESS														
35	1.943	NA	3.267	NA	-6.5	-0.328	NA	NA	NA	NA	NA	NA	NA	NA	-191.062	392.123	5	392.79	46.425	0.000	0.000
52	1.569	NA	3.032	1.018	-6.115	-0.286	NA	NA	NA	NA	NA	NA	NA	NA	-190.623	393.247	6	394.19	47.825	0.000	0.000
9	3.299	-0.007	NA	NA	-6.649	NA	NA	NA	NA	NA	NA	NA	NA	NA	-193.108	394.215	4	394.655	48.290	0.000	0.000
29	3.974	-0.006	NA	NA	-7.353	-0.188	NA	NA	NA	NA	NA	NA	NA	NA	-192.1	394.2	5	394.866	48.501	0.000	0.000
26	2.849	-0.007	NA	1.088	-6.316	NA	NA	NA	NA	NA	NA	NA	NA	NA	-192.637	395.274	5	395.94	49.575	0.000	0.000
48	3.58	-0.006	NA	0.782	-7.039	-0.168	NA	NA	NA	NA	NA	NA	NA	NA	-191.864	395.728	6	396.672	50.307	0.000	0.000
32	0.049	NA	3.1	1.882	-4.838	NA	NA	NA	NA	NA	NA	NA	NA	NA	-193.103	396.206	5	396.873	50.508	0.000	0.000
13	0.367	NA	3.618	NA	-5.255	NA	NA	NA	NA	NA	NA	NA	NA	NA	-194.709	397.418	4	397.857	51.492	0.000	0.000
14	1.082	NA	3.808	NA	NA	-0.26	NA	NA	NA	NA	NA	NA	NA	NA	-195.005	398.01	4	398.45	52.085	0.000	0.000
33	0.595	NA	3.405	1.535	NA	-0.202	NA	NA	NA	NA	NA	NA	NA	NA	-194.052	398.104	5	398.771	52.406	0.000	0.000
12	-0.398	NA	3.397	2.105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-195.302	398.604	4	399.043	52.678	0.000	0.000
2	-0.082	NA	4.012	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-197.234	400.468	3	400.729	54.364	0.000	0.000
1	3.05	-0.008	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-197.384	400.768	3	401.029	54.664	0.000	0.000
8	2.419	-0.007	NA	1.572	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-196.46	400.919	4	401.359	54.994	0.000	0.000
10	3.375	-0.007	NA	NA	NA	-0.094	NA	NA	NA	NA	NA	NA	NA	NA	-197.144	402.287	4	402.727	56.362	0.000	0.000
27	2.678	-0.006	NA	1.476	NA	-0.064	NA	NA	NA	NA	NA	NA	NA	NA	-196.35	402.701	5	403.367	57.002	0.000	0.000
38	3.033	NA	NA	2.222	-7.535	-0.303	NA	NA	NA	NA	NA	NA	NA	NA	-196.9	403.8	5	404.467	58.102	0.000	0.000
19	4.206	NA	NA	NA	-8.725	-0.407	NA	NA	NA	NA	NA	NA	NA	NA	-198.885	405.77	4	406.21	59.845	0.000	0.000
16	1.456	NA	NA	3.167	-6.215	NA	NA	NA	NA	NA	NA	NA	NA	NA	-199.345	406.69	4	407.129	60.764	0.000	0.000
3	1.044	NA	NA	3.624	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-202.584	411.168	3	411.429	65.064	0.000	0.000
17	2.027	NA	NA	3.065	NA	-0.2	NA	NA	NA	NA	NA	NA	NA	NA	-201.542	411.085	4	411.524	65.159	0.000	0.000
4	2.507	NA	NA	NA	-7.443	NA	NA	NA	NA	NA	NA	NA	NA	NA	-203.721	413.442	3	413.703	67.338	0.000	0.000
5	3.514	NA	NA	NA	NA	-0.328	NA	NA	NA	NA	NA	NA	NA	NA	-205.13	416.26	3	416.521	70.156	0.000	0.000

TABLE E7. Summary of all 63 models tested for Warbling Vireo, including model terms, number of parameters (K), log likelihood value, AIC and AICc scores, change in AICc score (Δ AICc) between models, likelihood value (L) and AICc weight (Wi).

MODEL	CONSTANT	% COVER	DBH INDEX	TREE SPECIES	TREE HEIGHT	% COVER	CA	CC	PC	RC	SC	SL	SR	LOG(L)	AIC	K	AIC _c	Δ _i AIC _c	L	W _i
		BLACKBERRY		RICHNESS	INDEX	FORB														
25	0.945	0.697	0.003	NA	NA	NA	-0.136	-0.601	0.295	-0.613	0.224	0.140	-0.731	-77.669	177.337	11	180.480	0.000	1.000	0.103
30	0.724	0.729	NA	NA	0.033	NA	-0.142	-0.578	0.398	-0.544	0.266	0.166	-0.656	-77.744	177.488	11	180.630	0.150	0.928	0.096
6	1.358	NA	NA	NA	NA	NA	-0.086	-0.780	0.393	-0.804	0.182	0.268	-0.717	-80.461	178.923	9	181.016	0.536	0.765	0.079
15	1.038	NA	0.004	NA	NA	NA	-0.116	-0.641	0.381	-0.716	0.213	0.323	-0.694	-79.214	178.428	10	181.016	0.536	0.765	0.079
28	1.005	0.772	NA	0.048	NA	NA	-0.153	-0.602	0.325	-0.638	0.125	0.071	-0.753	-78.130	178.261	11	181.404	0.924	0.630	0.065
20	0.819	NA	NA	NA	0.037	NA	-0.119	-0.625	0.499	-0.651	0.257	0.357	-0.610	-79.445	178.891	10	181.479	0.999	0.607	0.063
46	0.633	0.683	0.002	NA	0.025	NA	-0.153	-0.521	0.372	-0.525	0.269	0.196	-0.661	-77.203	178.406	12	182.165	1.685	0.431	0.044
31	1.214	0.769	NA	NA	NA	-0.099	-0.079	-0.714	0.319	-0.672	0.215	0.135	-0.741	-78.563	179.126	11	182.269	1.789	0.409	0.042
44	0.799	0.708	0.003	0.040	NA	NA	-0.168	-0.517	0.318	-0.585	0.161	0.132	-0.732	-77.342	178.683	12	182.442	1.962	0.375	0.039
36	0.704	NA	0.003	NA	0.027	NA	-0.134	-0.554	0.461	-0.620	0.262	0.378	-0.620	-78.699	179.399	11	182.542	2.062	0.357	0.037
18	1.165	NA	NA	0.046	NA	NA	-0.125	-0.671	0.421	-0.767	0.111	0.265	-0.715	-80.031	180.061	10	182.650	2.170	0.338	0.035
47	0.943	0.697	0.003	NA	NA	-0.181	-0.075	-0.592	0.335	-0.599	0.254	0.255	-0.705	-77.526	179.053	12	182.812	2.332	0.312	0.032
49	0.685	0.738	NA	0.028	0.028	NA	-0.160	-0.535	0.398	-0.543	0.212	0.149	-0.671	-77.604	179.208	12	182.967	2.487	0.288	0.030
34	0.904	NA	0.003	0.037	NA	NA	-0.145	-0.563	0.404	-0.692	0.154	0.318	-0.694	-78.940	179.881	11	183.023	2.543	0.280	0.029
51	0.735	0.731	NA	NA	0.033	-0.071	-0.117	-0.578	0.412	-0.542	0.276	0.209	-0.647	-77.721	179.443	12	183.202	2.722	0.256	0.026
37	1.037	NA	0.004	NA	NA	-0.181	-0.055	-0.631	0.421	-0.702	0.243	0.438	-0.668	-79.076	180.153	11	183.296	2.816	0.245	0.025
21	1.366	NA	NA	NA	NA	-0.084	-0.057	-0.779	0.412	-0.800	0.196	0.319	-0.705	-80.432	180.863	10	183.451	2.971	0.226	0.023
39	0.787	NA	NA	0.023	0.032	NA	-0.135	-0.590	0.500	-0.651	0.212	0.345	-0.622	-79.350	180.700	11	183.843	3.363	0.186	0.019
50	1.012	0.775	NA	0.048	NA	-0.110	-0.116	-0.600	0.349	-0.632	0.142	0.138	-0.738	-78.077	180.155	12	183.914	3.434	0.180	0.019
41	0.828	NA	NA	NA	0.036	-0.054	-0.100	-0.626	0.511	-0.649	0.265	0.390	-0.603	-79.433	180.865	11	184.008	3.528	0.171	0.018
58	0.598	0.693	0.002	0.026	0.020	NA	-0.171	-0.481	0.373	-0.524	0.219	0.179	-0.675	-77.076	180.153	13	184.592	4.112	0.128	0.013
60	0.648	0.684	0.003	NA	0.024	-0.145	-0.103	-0.517	0.400	-0.519	0.291	0.285	-0.644	-77.113	180.225	13	184.664	4.184	0.123	0.013
59	0.796	0.708	0.003	0.040	NA	-0.185	-0.106	-0.506	0.359	-0.571	0.191	0.249	-0.705	-77.194	180.387	13	184.826	4.346	0.114	0.012
53	0.675	NA	0.003	0.022	0.023	NA	-0.149	-0.521	0.463	-0.621	0.220	0.367	-0.631	-78.614	181.229	12	184.988	4.508	0.105	0.011
55	0.719	NA	0.003	NA	0.026	-0.142	-0.086	-0.551	0.489	-0.614	0.283	0.466	-0.603	-78.615	181.231	12	184.990	4.510	0.105	0.011
40	1.172	NA	NA	0.047	NA	-0.095	-0.093	-0.669	0.442	-0.763	0.125	0.323	-0.702	-79.993	181.986	11	185.128	4.648	0.098	0.010
54	0.902	NA	0.004	0.037	NA	-0.184	-0.083	-0.552	0.444	-0.678	0.184	0.434	-0.667	-78.798	181.595	12	185.354	4.874	0.087	0.009
61	0.697	0.741	NA	0.028	0.027	-0.082	-0.132	-0.534	0.415	-0.540	0.223	0.198	-0.661	-77.574	181.148	13	185.587	5.107	0.078	0.008
56	0.797	NA	NA	0.024	0.032	-0.064	-0.113	-0.589	0.513	-0.649	0.220	0.383	-0.614	-79.333	182.666	12	186.425	5.945	0.051	0.005
63	0.612	0.694	0.003	0.028	0.019	-0.155	-0.118	-0.475	0.402	-0.517	0.239	0.274	-0.657	-76.973	181.946	14	187.131	6.651	0.036	0.004
62	0.689	NA	0.003	0.023	0.021	-0.151	-0.098	-0.516	0.492	-0.614	0.240	0.459	-0.613	-78.520	183.040	13	187.479	6.999	0.030	0.003
22	0.150	1.231	0.004	0.092	NA	NA	NA	NA	NA	NA	NA	NA	NA	-96.881	203.761	5	204.428	23.948	0.000	0.000
8	0.351	1.359	NA	0.112	NA	NA	NA	NA	NA	NA	NA	NA	NA	-98.030	204.060	4	204.500	24.020	0.000	0.000
26	0.026	1.309	NA	0.083	0.037	NA	NA	NA	NA	NA	NA	NA	NA	-97.231	204.463	5	205.129	24.649	0.000	0.000
9	0.080	1.327	NA	NA	0.060	NA	NA	NA	NA	NA	NA	NA	NA	-98.631	205.263	4	205.703	25.223	0.000	0.000
27	0.327	1.213	NA	0.104	NA	0.318	NA	NA	NA	NA	NA	NA	NA	-97.523	205.046	5	205.713	25.233	0.000	0.000
43	0.140	1.114	0.004	0.087	NA	0.273	NA	NA	NA	NA	NA	NA	NA	-96.503	205.006	6	205.950	25.470	0.000	0.000
42	-0.043	1.219	0.003	0.075	0.026	NA	NA	NA	NA	NA	NA	NA	NA	-96.515	205.031	6	205.975	25.495	0.000	0.000
23	-0.005	1.220	0.004	NA	0.045	NA	NA	NA	NA	NA	NA	NA	NA	-97.675	205.350	5	206.017	25.537	0.000	0.000

TABLE E7 continued. Summary of all 63 models tested for Warbling Vireo, including model terms, number of parameters (K), log likelihood value, AIC and AIC_c scores, change in AIC_c score (Δ AIC_c) between models, likelihood value (L) and AIC_c weight (W_i).

MODEL	CONSTANT	% COVER	DBH INDEX	TREE	TREE	% COVER	CA	CC	PC	RC	SC	SL	SR	LOG(L)	AIC	K	AIC _c	Δ _i AICc	L	W _i
				SPECIES RICHNESS	HEIGHT INDEX															
29	0.031	1.136	NA	NA	0.058	0.408	NA	NA	NA	NA	NA	NA	NA	-97.785	205.569	5	206.236	25.756	0.000	0.000
7	0.403	1.246	0.005	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-98.899	205.799	4	206.238	25.758	0.000	0.000
48	-0.008	1.156	NA	0.074	0.038	0.331	NA	NA	NA	NA	NA	NA	NA	-96.673	205.346	6	206.290	25.810	0.000	0.000
45	-0.039	1.066	0.003	NA	0.045	0.356	NA	NA	NA	NA	NA	NA	NA	-97.029	206.058	6	207.002	26.522	0.000	0.000
24	0.372	1.093	0.005	NA	NA	0.353	NA	NA	NA	NA	NA	NA	NA	-98.281	206.562	5	207.229	26.749	0.000	0.000
57	-0.067	1.092	0.003	0.069	0.028	0.292	NA	NA	NA	NA	NA	NA	NA	-96.082	206.164	7	207.437	26.957	0.000	0.000
1	0.784	1.441	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-101.138	208.276	3	208.537	28.057	0.000	0.000
10	0.709	1.231	NA	NA	NA	0.442	NA	NA	NA	NA	NA	NA	NA	-100.191	208.382	4	208.822	28.342	0.000	0.000
33	0.242	NA	0.005	0.084	NA	0.548	NA	NA	NA	NA	NA	NA	NA	-99.990	209.980	5	210.647	30.167	0.000	0.000
35	0.024	NA	0.004	NA	0.048	0.616	NA	NA	NA	NA	NA	NA	NA	-100.195	210.389	5	211.056	30.576	0.000	0.000
19	0.121	NA	NA	NA	0.065	0.706	NA	NA	NA	NA	NA	NA	NA	-101.380	210.760	4	211.199	30.719	0.000	0.000
14	0.463	NA	0.006	NA	NA	0.620	NA	NA	NA	NA	NA	NA	NA	-101.526	211.052	4	211.492	31.012	0.000	0.000
12	0.288	NA	0.005	0.095	NA	NA	NA	NA	NA	NA	NA	NA	NA	-101.556	211.112	4	211.551	31.071	0.000	0.000
38	0.085	NA	NA	0.070	0.047	0.639	NA	NA	NA	NA	NA	NA	NA	-100.470	210.941	5	211.607	31.127	0.000	0.000
17	0.506	NA	NA	0.107	NA	0.642	NA	NA	NA	NA	NA	NA	NA	-101.661	211.322	4	211.762	31.282	0.000	0.000
52	-0.001	NA	0.004	0.062	0.032	0.564	NA	NA	NA	NA	NA	NA	NA	-99.460	210.920	6	211.864	31.384	0.000	0.000
13	0.106	NA	0.005	NA	0.048	NA	NA	NA	NA	NA	NA	NA	NA	-102.193	212.387	4	212.826	32.346	0.000	0.000
32	0.068	NA	0.005	0.076	0.030	NA	NA	NA	NA	NA	NA	NA	NA	-101.130	212.259	5	212.926	32.446	0.000	0.000
2	0.550	NA	0.007	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-103.494	212.988	3	213.249	32.769	0.000	0.000
16	0.187	NA	NA	0.088	0.047	NA	NA	NA	NA	NA	NA	NA	NA	-102.628	213.257	4	213.696	33.216	0.000	0.000
3	0.612	NA	NA	0.125	NA	NA	NA	NA	NA	NA	NA	NA	NA	-103.785	213.570	3	213.830	33.350	0.000	0.000
4	0.247	NA	NA	NA	0.071	NA	NA	NA	NA	NA	NA	NA	NA	-104.021	214.042	3	214.303	33.823	0.000	0.000
5	0.900	NA	NA	NA	NA	0.774	NA	NA	NA	NA	NA	NA	NA	-104.226	214.452	3	214.713	34.233	0.000	0.000
11	1.205	0.767	NA	NA	NA	NA	-0.113	-0.715	0.297	-0.677	0.199	0.075	-0.755	-78.606	177.211	3	401.029	220.549	0.000	0.000

TABLE E8. Summary of all 63 models tested for Wilson's Warbler, including model terms, number of parameters (K), log likelihood value, AIC and AICc scores, change in AICc score (Δ AICc) between models, likelihood value (L) and AICc weight (Wi).

MODEL	CONSTANT	% COVER DOGWOOD	% COVER WILLOW	% COVER SHRUB	% COVER CANOPY	% COVER BAY	CA	CC	PC	RC	SC	SL	SR	LOG(L)	AIC	K	AIC _c	Δ AICc	L	W _i
29	1.817	7.983	NA	NA	2.658	-9.584	NA	NA	NA	NA	NA	NA	NA	-191.590	393.181	5	393.848	0.000	1.000	0.155
48	1.174	6.738	NA	1.220	2.656	-8.925	NA	NA	NA	NA	NA	NA	NA	-190.510	393.020	6	393.964	0.116	0.944	0.146
30	1.194	5.904	NA	NA	2.113	NA	-0.669	2.692	0.925	-0.647	-0.028	1.379	0.454	-185.084	392.167	11	395.310	1.462	0.481	0.074
45	1.693	7.844	0.677	NA	2.431	-8.591	NA	NA	NA	NA	NA	NA	NA	-191.436	394.872	6	395.816	1.968	0.374	0.058
51	1.328	5.904	NA	NA	2.113	-5.070	-0.149	2.559	0.849	0.014	0.594	1.246	0.370	-184.114	392.228	12	395.987	2.139	0.343	0.053
20	1.937	NA	NA	NA	2.238	NA	-0.404	2.860	0.146	-1.390	-0.244	0.565	-0.297	-186.810	393.620	10	396.208	2.360	0.307	0.047
57	1.171	6.740	0.059	1.205	2.636	-8.846	NA	NA	NA	NA	NA	NA	NA	-190.509	395.018	7	396.291	2.443	0.295	0.046
41	2.070	NA	NA	NA	2.237	-5.070	0.115	2.727	0.070	-0.729	0.378	0.432	-0.381	-185.875	393.750	11	396.893	3.045	0.218	0.034
11	2.137	6.356	NA	NA	NA	NA	-0.309	2.981	1.183	-0.458	0.553	1.641	0.565	-187.316	394.632	10	397.220	3.372	0.185	0.029
49	0.906	5.629	NA	0.440	2.073	NA	-0.494	2.659	1.063	-0.548	0.074	1.488	0.509	-184.976	393.952	12	397.711	3.863	0.145	0.022
46	1.153	5.798	0.360	NA	1.961	NA	-0.584	2.663	0.904	-0.584	0.083	1.398	0.445	-185.043	394.087	12	397.846	3.998	0.135	0.021
31	2.270	6.356	NA	NA	NA	-5.075	0.211	2.848	1.107	0.203	1.176	1.508	0.480	-186.389	394.777	11	397.920	4.072	0.131	0.020
39	1.387	NA	NA	0.749	2.159	NA	-0.128	2.792	0.443	-1.164	-0.052	0.815	-0.144	-186.498	394.996	11	398.139	4.291	0.117	0.018
25	1.711	5.811	1.414	NA	NA	NA	-0.080	2.785	1.026	-0.265	0.828	1.642	0.499	-186.543	395.086	11	398.229	4.381	0.112	0.017
61	0.951	5.538	NA	0.585	2.059	-5.308	0.107	2.509	1.029	0.176	0.760	1.384	0.438	-183.922	393.844	13	398.283	4.435	0.109	0.017
36	1.842	NA	0.634	NA	1.966	NA	-0.264	2.804	0.133	-1.256	-0.040	0.625	-0.288	-186.688	395.376	11	398.519	4.671	0.097	0.015
6	3.000	NA	NA	NA	NA	NA	0.000	3.182	0.357	-1.250	0.357	0.778	-0.240	-189.231	396.462	9	398.555	4.707	0.095	0.015
10	3.233	9.065	NA	NA	NA	-8.406	NA	NA	NA	NA	NA	NA	NA	-195.062	398.123	4	398.563	4.715	0.095	0.015
24	2.604	8.473	1.733	NA	NA	-6.123	NA	NA	NA	NA	NA	NA	NA	-193.949	397.897	5	398.564	4.716	0.095	0.015
56	1.425	NA	NA	0.893	2.143	-5.432	0.482	2.636	0.419	-0.412	0.652	0.720	-0.205	-185.427	394.855	12	398.614	4.766	0.092	0.014
60	1.328	5.905	-0.001	NA	2.113	-5.071	-0.150	2.559	0.849	0.014	0.593	1.246	0.370	-184.114	394.228	13	398.667	4.819	0.090	0.014
27	2.587	7.817	NA	1.222	NA	-7.747	NA	NA	NA	NA	NA	NA	NA	-194.053	398.106	5	398.773	4.925	0.085	0.013
15	2.402	NA	1.691	NA	NA	NA	0.242	2.927	0.254	-0.938	0.706	0.868	-0.236	-188.145	396.290	10	398.878	5.030	0.081	0.012
21	3.133	NA	NA	NA	NA	-5.075	0.519	3.049	0.281	-0.589	0.980	0.645	-0.324	-188.340	396.681	10	399.269	5.421	0.066	0.010
28	1.710	5.960	NA	0.614	NA	NA	-0.075	2.928	1.369	-0.326	0.681	1.786	0.638	-187.115	396.229	11	399.372	5.524	0.063	0.010
55	2.022	NA	0.290	NA	2.113	-4.898	0.161	2.706	0.067	-0.690	0.450	0.464	-0.375	-185.850	395.700	12	399.459	5.611	0.060	0.009
47	1.898	5.905	1.172	NA	NA	-4.379	0.329	2.704	0.987	0.272	1.318	1.527	0.438	-185.867	395.733	12	399.492	5.644	0.059	0.009
43	2.271	7.688	1.338	0.901	NA	-6.157	NA	NA	NA	NA	NA	NA	NA	-193.449	398.899	6	399.843	5.995	0.050	0.008
50	1.750	5.866	NA	0.760	NA	-5.384	0.532	2.774	1.332	0.407	1.372	1.679	0.566	-186.077	396.155	12	399.914	6.066	0.048	0.007
18	2.256	NA	NA	0.950	NA	NA	0.332	3.081	0.725	-0.969	0.574	1.085	-0.049	-188.748	397.497	10	400.085	6.237	0.044	0.007
38	0.707	NA	NA	2.135	3.170	-7.314	NA	NA	NA	NA	NA	NA	NA	-194.754	399.508	5	400.175	6.327	0.042	0.007
37	2.593	NA	1.463	NA	NA	-4.206	0.640	2.851	0.205	-0.432	1.175	0.745	-0.307	-187.542	397.083	11	400.226	6.378	0.041	0.006
58	0.911	5.593	0.215	0.396	1.986	NA	-0.461	2.645	1.037	-0.521	0.131	1.488	0.498	-184.963	395.926	13	400.365	6.517	0.038	0.006
40	2.288	NA	NA	1.094	NA	-5.519	0.948	2.921	0.698	-0.208	1.284	0.987	-0.112	-187.694	397.388	11	400.531	6.683	0.035	0.005
53	1.390	NA	0.373	0.669	2.008	NA	-0.075	2.766	0.404	-1.109	0.048	0.823	-0.156	-186.459	396.918	12	400.677	6.829	0.033	0.005
44	1.532	5.656	1.314	0.300	NA	NA	0.018	2.773	1.128	-0.215	0.871	1.713	0.540	-186.498	396.997	12	400.756	6.908	0.032	0.005
7	1.945	7.188	3.064	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-196.213	400.426	4	400.866	7.018	0.030	0.005
63	0.947	5.580	-0.267	0.645	2.166	-5.491	0.087	2.522	1.061	0.167	0.713	1.380	0.449	-183.902	395.804	14	400.989	7.141	0.028	0.004
34	2.024	NA	1.485	0.575	NA	NA	0.414	2.897	0.489	-0.806	0.795	1.043	-0.121	-187.981	397.962	11	401.105	7.257	0.027	0.004
62	1.425	NA	-0.112	0.919	2.189	-5.509	0.474	2.642	0.430	-0.418	0.632	0.716	-0.203	-185.424	396.848	13	401.287	7.439	0.024	0.004

TABLE E8 continued. Summary of all 63 models tested for Wilson's Warbler, including model terms, number of parameters (K), log likelihood value, AIC and AIC_c scores, change in AIC_c score (Δ AIC_c) between models, likelihood value (L) and AIC_c weight (W_i).

MODEL	CONSTANT	% COVER DOGWOOD	% COVER WILLOW	% COVER SHRUB	% COVER CANOPY	% COVER BAY	CA	CC	PC	RC	SC	SL	SR	LOG(L)	AIC	K	AIC _c	Δ AIC _c	L	W_i
23	1.315	6.573	2.786	NA	1.302	NA	NA	NA	NA	NA	NA	NA	NA	-195.434	400.867	5	401.534	7.686	0.021	0.003
59	1.611	5.650	0.986	0.505	NA	-4.694	0.524	2.678	1.156	0.397	1.426	1.638	0.501	-185.741	397.481	13	401.920	8.072	0.018	0.003
22	1.618	6.416	2.687	0.877	NA	NA	NA	NA	NA	NA	NA	NA	NA	-195.761	401.523	5	402.190	8.342	0.015	0.002
54	2.102	NA	1.157	0.781	NA	-4.705	0.921	2.801	0.518	-0.193	1.352	0.968	-0.159	-187.243	398.486	12	402.245	8.397	0.015	0.002
52	0.709	NA	-0.028	2.141	3.179	-7.351	NA	NA	NA	NA	NA	NA	NA	-194.754	401.508	6	402.452	8.604	0.014	0.002
42	0.855	5.589	2.307	1.039	1.450	NA	NA	NA	NA	NA	NA	NA	NA	-194.799	401.597	6	402.541	8.693	0.013	0.002
26	0.889	4.841	NA	1.789	1.996	NA	NA	NA	NA	NA	NA	NA	NA	-196.974	403.947	5	404.614	10.766	0.005	0.001
19	1.839	NA	NA	NA	3.366	-8.047	NA	NA	NA	NA	NA	NA	NA	-198.186	404.372	4	404.812	10.964	0.004	0.001
32	0.506	NA	1.908	1.862	2.085	NA	NA	NA	NA	NA	NA	NA	NA	-197.590	405.179	5	405.846	11.998	0.002	0.000
8	2.016	5.874	NA	1.733	NA	NA	NA	NA	NA	NA	NA	NA	NA	-198.815	405.630	4	406.070	12.222	0.002	0.000
35	1.618	NA	1.199	NA	2.941	-6.336	NA	NA	NA	NA	NA	NA	NA	-197.757	405.513	5	406.180	12.332	0.002	0.000
16	0.574	NA	NA	2.404	2.475	NA	NA	NA	NA	NA	NA	NA	NA	-199.038	406.076	4	406.516	12.668	0.002	0.000
9	1.834	6.520	NA	NA	1.925	NA	NA	NA	NA	NA	NA	NA	NA	-199.057	406.114	4	406.554	12.706	0.002	0.000
17	2.355	NA	NA	2.318	NA	-5.545	NA	NA	NA	NA	NA	NA	NA	-199.461	406.923	4	407.363	13.515	0.001	0.000
12	1.599	NA	2.401	1.801	NA	NA	NA	NA	NA	NA	NA	NA	NA	-199.575	407.149	4	407.589	13.741	0.001	0.000
1	2.894	7.466	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-200.701	407.403	3	407.664	13.816	0.001	0.000
13	1.336	NA	2.758	NA	2.008	NA	NA	NA	NA	NA	NA	NA	NA	-199.789	407.577	4	408.017	14.169	0.001	0.000
33	1.995	NA	1.545	1.927	NA	-3.751	NA	NA	NA	NA	NA	NA	NA	-198.740	407.480	5	408.147	14.299	0.001	0.000
2	2.364	NA	3.206	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-201.554	409.109	3	409.370	15.522	0.000	0.000
3	1.960	NA	NA	2.502	NA	NA	NA	NA	NA	NA	NA	NA	NA	-201.866	409.731	3	409.992	16.144	0.000	0.000
14	2.732	NA	2.551	NA	NA	-3.074	NA	NA	NA	NA	NA	NA	NA	-201.012	410.023	4	410.463	16.615	0.000	0.000
4	1.850	NA	NA	NA	2.620	NA	NA	NA	NA	NA	NA	NA	NA	-203.046	412.091	3	412.352	18.504	0.000	0.000
5	3.703	NA	NA	NA	NA	-6.226	NA	NA	NA	NA	NA	NA	NA	-203.141	412.282	3	412.543	18.695	0.000	0.000