Pilgrim Creek Restoration Project: Bird Community and Vegetation Structure

2000 Annual Report

Prepared for

State of California
Department of Transportation
District 11
San Diego, California

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Interagency Agreement # 55964141

June 2001

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I. INTRODUCTION

This report summarizes the results of bird and vegetation monitoring conducted in 2000 as part of a continuing project assessing the Pilgrim Creek Habitat Mitigation Site in San Diego County, California. The Mitigation Site supports natural stands of riparian and coastal sage scrub habitat, as well as planted vegetation intended to restore former expanses of these two habitat types in areas converted by agriculture. Protection of the existing habitats through acquisition, and the restoration of natural communities at the site, were undertaken as mitigation for impacts to riparian and coastal sage scrub habitat produced by a nearby highway expansion project (CalTrans 1995). The objective of the current monitoring is threefold: (1) monitor the status and productivity of least Bell's vireo (*Vireo bellii pusillus*), a State and Federally endangered riparian obligate, (2) evaluate the structural development of planted vegetation in the riparian restoration site with regard to its suitability for nesting vireos and other birds, and (3) quantitatively compare bird use of the restoration site to that of natural reference habitat along Pilgrim Creek with regard to species composition and abundance. This report represents the third of five annual evaluations planned by CalTrans to track progress towards the goal of creating habitat with the structural and functional attributes of natural riparian habitat (Kus 1997).

II. STUDY SITE AND METHODS

A. STUDY SITE

The study site is located along Pilgrim Creek, a tributary to the San Luis Rey River in northern San Diego County. The site is bordered to the west by Marine Corps Base Camp Pendleton, to the south by a golf course, and on the remaining sides by Douglas Drive and residential developments. The stretch of Pilgrim Creek on the site supports approximately 7 ha of willow-dominated riparian habitat along a narrow channel. Coastal sage scrub, including 14 ha of restored habitat, covers the slopes bordering the site to the west, and the center of the site supports riparian vegetation planted in 1996 within a 17-ha restoration area, as well as a 0.6-ha freshwater marsh. An additional small cell of planted riparian vegetation lies between Pilgrim Creek and Douglas Drive on the east side of the river.

B. METHODS

1. Least Bell's Vireo Monitoring

Least Bell's vireos were monitored between 15 March and 31 August 2000. Surveys were initiated early in the spring to determine the number, location and breeding status (paired or unpaired) of all singing males within the study area. Once pairs were located, they were observed for evidence of nesting. Nest locations were determined, and nests monitored

throughout the period that they were active. Nests were checked during afternoon hours, and their contents observed using mirrors suspended over the nest from distances of 1-2 m. Any cowbird eggs or young discovered in vireo nests were removed. Nests were visited as infrequently as possible to minimize disturbance to the vireos, and the potential for attracting predators or cowbirds to nest sites. Typically, the first visit to a nest was timed to determine the number of eggs laid, the second visit to determine the number and ages of nestlings present, and the third visit to band nestlings. Territories were visited throughout the season, and an attempt made to determine the number and fate of all nests produced.

Characteristics of nest sites were measured following abandonment of nests. Nest height to the nearest cm was recorded as the distance between the ground and the nest rim. The species of plant supporting the nest was also recorded.

Nestlings were banded when they were between six and eight days of age. Each bird received a metal USGS-BRD numbered band on one leg, and a black plastic band specifying Pilgrim Creek as the natal drainage on the other. Selected adults, mostly males, were captured in mist nets placed in the bird's territory, using song playbacks to draw the bird into the net. Any birds banded previously as nestlings at Pilgrim Creek or elsewhere were captured to determine identity, age, and natal history, and to re-band with a unique combination. In addition, as many as possible of the unbanded males at the study site were captured and banded with identifying combinations to monitor site fidelity, population turnover, and use of the restoration site.

2. Vegetation Structure

Vegetation data were collected at points along permanently marked transects running perpendicular to Pilgrim Creek and arrayed to provide uniform coverage of the restoration site (Figure 1). Twenty-four transects were established in 1997 in habitat to the west of the river, and measured annually. An additional four transects were established in the restored habitat east of the creek in 1998 and measured that year as well as in 1999 and 2000. A total of 506 quads spaced at 10-m intervals along the transects were measured, yielding a sampling density of 30 quads per hectare (12 per acre). Foliage volume at 1-m height intervals was estimated using the "stacked cube" method, developed specifically to characterize canopy architecture in structurally diverse riparian habitat. By this method, field workers record percent cover of vegetation, by species, within 2- by 2- by 1-m high sampling volumes "stacked" vertically between the ground and the top of the canopy above the point. Four 2-m lengths of PVC pipe are placed on the ground to define the quadrat boundaries, and connectible lengths of PVC, marked at 1-m intervals, are used to determine height within the canopy. Percent cover is scored in the field using a modified Daubenmire (1959) scale with cover classes < 1, 1-10, 11-25, 26-50, 51-75, 76-90, and >90 percent. For analysis, cover codes were converted to class midpoints, which were then used to quantify vegetation structure at each sampling point, within each planting cell, and for the site as a whole.

Figure 2. Least Bell's Vireo Territory Locations at Pilgrim Creek, 2000.

In addition, vegetation structure data were collected at 54 points along 16 transects within the mature riparian habitat along Pilgrim Creek to provide a reference for the restored habitat, and to facilitate analyses examining relationships between habitat structure and bird densities in both sites.

Because the least Bell's vireo is the primary target of the mitigation project, habitat within the restoration site was assessed with regard to its suitability as vireo nesting habitat by comparing it to a model quantifying vireo habitat at major breeding populations in San Diego County (Kus 1998). The model was developed as a tool for evaluating whether sites unoccupied by vireos supported habitat suitable for nesting; that is, does the site fall within the range of habitat structure found within vireo nesting territories? The criteria established for making this determination requires that average cover at each height in the site under consideration fall within two standard deviations of the corresponding averages for known vireo nesting habitat, a range representing the 95 percent confidence interval of each mean (Snedecor and Cochran 1976). Sites failing to meet these criteria are considered unsuitable as nest sites for vireos.

3. Bird Surveys

Bi-weekly bird surveys of Pilgrim Creek were initiated in 1995 to provide baseline data on the riparian bird community at the site. Beginning in 1998, data collection was expanded to include the restored habitat, which by then was in its second growing season. Data collected along the creek in 2000 served as reference data with which to evaluate bird use of the restored habitat in the current year.

Birds were surveyed by observers following established routes designed to provide coverage of the entire sites. Species, age, sex, and behavior were recorded for every bird encountered, as were plant species and bird height for birds perched in vegetation. Any nests or nesting behavior observed during surveys were noted. Surveys were conducted during early morning hours, and typically lasted 2-3 hours in each habitat, which were surveyed on sequential days.

In addition to surveys of mature habitat along Pilgrim Creek and the restored riparian habitat, surveys of the coastal sage scrub uplands were conducted in the same manner and according to the same schedule. Although not systematically surveyed, birds using the freshwater marsh/pond were noted as well.

Building upon previous years' analyses, we assessed development of the restored riparian habitat by comparing bird communities in the restored and reference habitats. We expanded our analysis beyond comparisons of the sites in 2000 to include data from 1998, allowing temporal comparisons of the bird communities. Specifically, we compared changes in

species richness and abundance of several guilds using the restored and reference sites, seeking to identify a subset of riparian species that best reflect changes in habitat structure of the developing restoration site. Birds were categorized relative to seasonal occurrence (year-round resident, migratory breeding species, migratory wintering species, and migrant/transient) based upon the species' use of the Pilgrim Creek site, not necessarily their occurrence in the region as a whole. Only breeding species, both resident and migratory, were included in the analysis presented here, excluding raptors and waterbirds whose association with the vegetative component of the habitats of interest here are weak. Birds were grouped for analysis into guilds describing (1) habitat preference, (2) vegetation structure association, and (3) foraging style, using Ehrlich *et al.* (1988), Unitt (1984), and our own experience to assign species to guilds. Habitat preference was defined to reflect a spectrum of habitat use from open country species to willow riparian specialists, and included five categories: open habitat and grasslands, shrublands, multiple habitats (e.g. habitat generalists), woodlands, and willow riparian habitat. Habitat structural association was categorized as "no structure", describing species that inhabit open areas lacking vegetation, "variable" or generalists with regard to structure, "low" for species characteristically associated with low shrub cover independent of habitat type, "high" for species requiring a tall canopy associated with woodlands, and "high and low" describing those species dependent upon woodlands with a highly stratified canopy structure. Foraging style was assigned based upon the species' primary feeding mode (Ehrlich *et al.* 1988) and condensed to four categories: hawk and/or hover-glean, bark glean, ground glean, and foliage glean.

Species richness was determined for the restoration and reference sites in each year, using only data for the breeding season (April-July). Species densities were calculated and expressed as the average number of individuals per survey per ha, using site areas calculated from coordinates obtained in the field using a Global Positioning System. Richness and density, both overall and by guild, were compared between the two sites using the ratio of each variable in the restoration site to the reference site, allowing us to control for any inter-annual variability in the reference habitat. The percent change in these ratios between 1998 and 2000 was compared across guilds to identify which of them most strongly responded to changes in vegetation structure at the restoration site, predicting that the greatest increases would occur in guilds most closely associated with the particular habitat feature undergoing change.

III. RESULTS AND DISCUSSION

A. Least Bell's Vireo Monitoring

1. Population Size and Composition

The least Bell's vireo population within the study site numbered 18 territorial males in 2000, including 17 pairs and one unpaired male (Figure 2, Table 1). The population declined by 28 percent from 1999 when 25 territories were present (Kus *et al.* 2000), and is the smallest it

Figure 1. Vegetation transects and irrigation cells, Pilgrim Creek restoration site.

has been since monitoring began in 1996 (Kus *et al.* 1999). Although fewer territories were established at the site, all of the habitat along Pilgrim Creek supporting territories in past years was occupied in 2000, with territory size expanding to include all available habitat.

Eight territories were established within the restored riparian habitat (Figure 2), twice the number in restored habitat in 1999 (Kus *et al.* 2000). Three of these were situated entirely within restored vegetation, including territories 1 and 6, both occupied in 1999, and territory 9, established along the western edge of cell 10. Two territories were located primarily in restored habitat, but also incorporated sections of mature habitat along Pilgrim Creek. These two territories (3 and 4), only one of which was occupied in 1999, encompassed all of the restored habitat in cell 16 on the east side of the river. The remaining three territories (7, 8, and 10), included roughly equal extents of mature and restored habitat within their boundaries. The restored vegetation occupied by territory 8 in 2000 was defended as a separate territory by a pair in 1999. All but one (territory 6) of the territories in restored habitat were occupied by pairs, all of which nested.

Table 1.
Status and Territory ID of Least Bell's Vireos, Pilgrim Creek, 2000

Map Code	Status	Comments	Map Code	Status	Comments
1	P	M=2140-39354	10	P	M=2140-39235
2	P	M=2070-14818; F=Mdb	11	P	M=2140-39233
3	P	M=1890-35259; F=2140-39305	12	P	M=2070-14885
4	P		13	P	M=2070-14823
5	P		14	P	
6	S	M=2190-52233	15	P	
7	P	M=2070-14869	16	P	M=1960-42415
8	P		17	P	
9	P	M=2140-39236	18	P	

[a] *P=pair, S=single male.*
[B] *M=male, F=female. Number is USGS band number. "Mdb"=dark blue anodized USGS band.*

Seven of the 18 males, and two of the 17 females, breeding at Pilgrim Creek in 2000 were birds banded in previous years (Table 1). The majority of these birds were banded at the site as adults of unknown age; however, five were banded as nestlings in territories along Pilgrim Creek (1) and the San Luis Rey River (4), and their precise ages thus known (Table 2). The eldest of these is a male eight years old, one of four banded males present at Pilgrim Creek at the onset of the study in 1996. A second male was five years old in 2000 and had been present in the same territory since 1997. The other three birds were one year old and included a male and female from the San Luis Rey River, and a female fledged from the Pilgrim Creek study area.in 1999. Four additional males in the study area were banded for the first time as adults in 2000.

Table 2.
Histories of Banded Least Bell's Vireo Males at Pilgrim Creek, 1996-2000

1996			1997			1998			1999			2000		
Band Number	***Age (yrs)***	***Natal Site***	**Band Number**	**Age (yrs)**	**Natal Site**	**Band Number**	**Age (yrs)**	**Natal Site**	**Band Number**	**Age (yrs)**	**Natal Site**	**Band Number**	**Age (yrs)**	**Natal Site**
1890-35259	4	SLR[c]	—>	5		—>	6		–>	7		->	8	
1650-30078	2	?												
2080-53440[a]	AHY[b]	?	—>	AHY+1										
2080-53444	AHY	?	—>	AHY+1		—>	AHY+							
			1960-42415	2	SLR	—>	3		–>	4		->	5	
			2080-53428	1	PIL	—>	2		–>	3				
			2070-14812	AHY	?	—>	AHY+		–>	AHY+2				
			2070-14813	AHY	?	—>	AHY+							
			2070-14814	AHY	?	—>	AHY+		–>	AHY+2				
			2070-14815	AHY	?	—>	AHY+		–>	AHY+2				
			2070-14816	AHY	?									
			2070-14817	AHY	?	—>	AHY+							
			2070-14818	AHY	?	—>	AHY+		–>	AHY+2		->	AHY	
			2070-14819	AHY	?									
			2070-14820	AHY	?	—>	AHY+							
			2070-14821	AHY	?									
			1650-60041	AHY	?									
						2070-14823	AHY	?	–>	AHY+1		->	AHY	
						2070-14824	AHY	?						
						2070-14825	AHY	?						
						2070-14826	AHY	?						
						2070-14836	AHY	?						
						2070-14837	AHY	?	–>	AHY+1				
						2070-14838	AHY	?						
						2070-14840[d]	AHY	?						
						2070-14868	AHY	?	–>	AHY+1				
						2070-14869	AHY	?	–>	AHY+1		->	AHY	
									2070-14885	AHY	?	->	AHY	
									2070-14900	AHY	?			
									2140-39231[d]	AHY	?			
												2190-52233	1	SLR
												"Mdb"[d]	1	SLR
												2140-39305[d]	1	PIL
												2140-39354	AHY	?
												2140-39233	AHY	?
												2140-39235	AHY	?
												2140-39236	AHY	?

[a]*Band numbers in italics indicate adults banded that year at Pilgrim Creek.*
[b]*AHY=adult of unknown age.*
[c]*SLR=San Luis Rey River, PIL = Pilgrim Creek study area.*
[d]*Sex=female.*

2. Nesting Activity

a. *Type and Number of Nests*

A total of 25 nests were documented, including 23 that were monitored, and two that were not located but known to have existed by the appearance of fledglings with pairs suspected of nesting. One monitored nest (Pair 11) located in a dense patch of *Rosa californica* was not approached closely enough to observe nest contents in order to avoid creating a trail to the nest. Pairs averaged 1.5 completed nests per season, as in 1999 (Kus *et al.* 2000).

b. *Nest Initiation*

Nesting commenced during the second week of April, considerably earlier than in 1999, when initiation of the nesting season was exceptionally late (Kus et al. 2000). Thirty-one percent of pairs (5/16) had initiated nesting by 30 April, and 81 percent (13/16) by 15 May. Three pairs (19 percent) initiated first nests as late as June; otherwise, all nests after mid-May were re-nesting attempts.

c. *Nesting Effort by Pairs*

The majority of nests observed in 2000 represented first nesting attempts, and only 47 percent of the population attempted more than one nest (Table 3). Nesting effort of pairs was consistent with the pattern observed in 1999, when 41 percent of pairs nesting more than once (Kus *et al.* 2000). Two pairs in 2000 double-brooded (fledged young from more than one nest), in contrast to 1999 when none did so.

Table 3.
Number of Completed Nests Produced by Least Bell's Vireo Pairs, Pilgrim Creek, 2000

Number of Completed Nests	Number of Pairs
0	1 (0.06)[a]
1	8 (0.47)
2	7 (0.41)
3	1 (0.06)
TOTAL	17

[a]*Numbers in parentheses are proportions of total pairs.*

d. *Nesting Success*

Fifty-two percent of monitored nests (12/23) successfully fledged young, considerable higher than the all-time low rate documented in 1999 (Kus *et al.* 2000) and consistent with success rates observed in previous years (Kus *et al.* 1998). As in the past, the majority of nest failures were attributed to predation (91 percent of failed nests; Table 4). Only one nest failed for reasons other than predation; this nest was found on the ground along a game trail and is believed to have been knocked down by a passing deer. Nest failures occurred in roughly equal proportions during the egg and nestling stages (Table 5), similar to 1999.

Table 4.
Cause of Failure of Unsuccessful Least Bell's Vireo Nests,
Pilgrim Creek, 2000

Cause of Failure	Number of Nests
Predation	10
Parasitism	0
Other[a]	1
Total Failed Nests	11
Total Monitored Nests	23

[a]*See text for explanation.*

Table 5.
Stage of Failure of Unsuccessful Least Bell's Vireo Nests,
Pilgrim Creek, 2000

Stage of Failure	Number of Nests
Eggs	5 (0.45)[a]
Nestlings	6 (0.55)
Total Failed Nests	11

[a]*Numbers in parentheses are proportions of total number of failed nests.*

e. *Parasitism by Brown-headed Cowbirds*

No instances of cowbird parasitism were observed.

f. *Reproductive Success and Productivity*

Clutch size (based on 20 nests observed with full clutches) averaged 3.6 ± 0.5 eggs per nest (Table 6), slightly higher than the average (3.4 ± 0.7) observed in 1999 (Kus *et al.* 2000). Hatching rate was higher than in 1999 (63 percent of eggs, 66 percent of nests with eggs), a reflection of lower predation in 2000. Fledging rate was also higher than that in 1999 (57 percent of nestlings, 58 percent of nests with nestlings). Overall, pairs produced 0.49 fledglings per egg, higher than the 0.35 produced by pairs in 1999, but lower than the 0.53-0.62 fledglings per egg produced prior to 1999 (Kus *et al.* 1999).

Table 6.
Reproductive Success and Productivity of Least Bell's Vireos,
Pilgrim Creek, 2000

Parameter	Total Number
Nests with eggs	21
Eggs laid	72
Average clutch size[a]	3.6 ± 0.5
Hatchlings	55
Nests with hatchlings	17
Hatching success:	
Eggs[b]	76%
Nests[c]	81%
Fledglings	35
Nests with fledglings	11
Fledging success:	
Hatchlings[d]	64%
Nests[e]	65%
Fledglings per egg	0.49
Fledglings per nest[f]	1.7
Fledglings per pair	2.47
Fledglings per nesting pair	2.63
Pairs fledging ≥ one young	12

[a]*Based upon 20 non-parasitized nests seen with full clutches.*
[b]*Percentage of all eggs that hatched.*
[c]*Percentage of all nests in which at least one egg hatched.*
[d]*Percentage of all hatchlings that fledged.*
[e]*Percentage of all nests with hatchlings in which at least one young fledged.*
[f]*Includes seven fledglings from two nests not seen.*

Seasonal productivity of vireos averaged 2.47 fledglings per pair, higher than in 1999 (1.59 fledglings per pair) but consistent with productivity documented in previous years when pairs produced from 2.1 to 2.9 young per season (Kus *et al.* 1999). Seventy-one percent of pairs (12/17) fledged one or more vireo young, higher than in 1999 (55 percent) but again consistent with previous years.

3. Banding

Thirty-eight nestlings in 12 nests were banded, representing 89 percent of the nestlings fledged from monitored nests. Of these nestlings, 31 are believed to have fledged, while the other seven were in nests depredated (including one partially depredated nest) before fledging.

4. Nest Site Characteristics

The average height of vireo nests in the study area in 2000 was 0.9 $\pm$ 0.2 m (Table 7), comparable to previous years (Kus *et al.* 1999; Kus *et al.* 2000). Vireos placed nests in a total of eight different species, with the majority of nests placed in *Salix lasiolepis* (Arroyo Willow) and *Baccharis glutinosa* (Mule Fat).

Table 7.
Plant Species Used as Nest Support by Least Bell's Vireos, Pilgrim Creek, 2000

Species	Number of Nests
Salix lasiolepis	9
Salix gooddingii	1
Salix exigua	1
Baccharis glutinosa	4
Sambucus mexicana	2
Platanus racemosa	2
Populus fremontii	1
Unidentified herbaceous	1
Total	21

B. Vegetation Structure

Canopy cover in the reference habitat along Pilgrim Creek changed little between 1999 and 2000 with the exception of the understory in the 0-1 m height class, which increased by roughly 30 percent (Figure 3). In contrast, vegetation cover in the restored habitat increased substantially at all heights, achieving a maximum canopy height of up to 8 m in some areas (Figure 4). Canopy development in the restoration site differed markedly relative to the preceding year when the only change documented was a slight increase in cover in the 2-5 m height range.

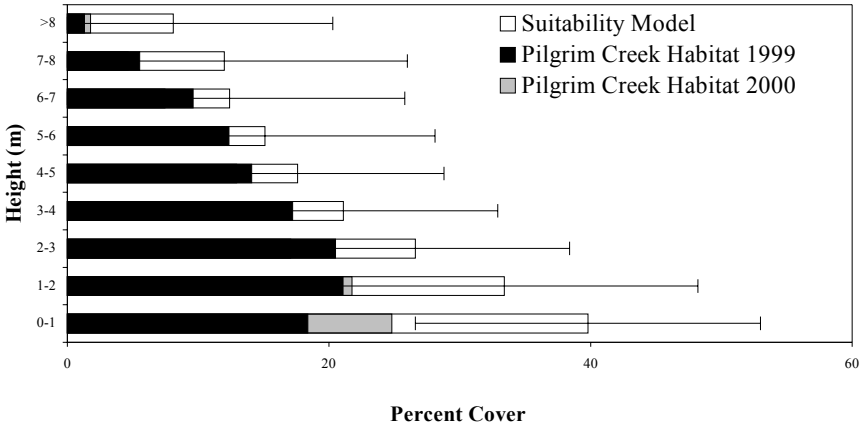

Figure 3. Average percent cover by height: Pilgrim Creek, 1999-2000.

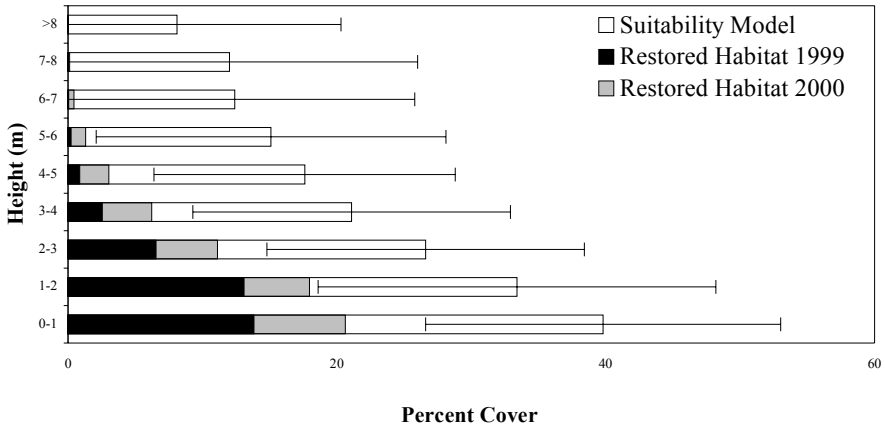

Figure 4. Average percent cover by height: restored habitat, 1999-2000.

Increases in canopy cover occurred throughout the restoration site, although habitat structure continues to be non-uniform across cells (Figures 5,6). Canopy development has progressed more rapidly in the northern cells (1-9, 16) than in the southern cells (10-15), and most of the northern cells meet or are close to meeting the vireo habitat suitability criteria. Two of these cells (1 and 16) meet the model's criteria at all heights; these cells supported one and two vireo territories, respectively, in 2000.

Figure 5
Average Percent Cover by Height of Restored Habitat: Cell-by-cell Assessment

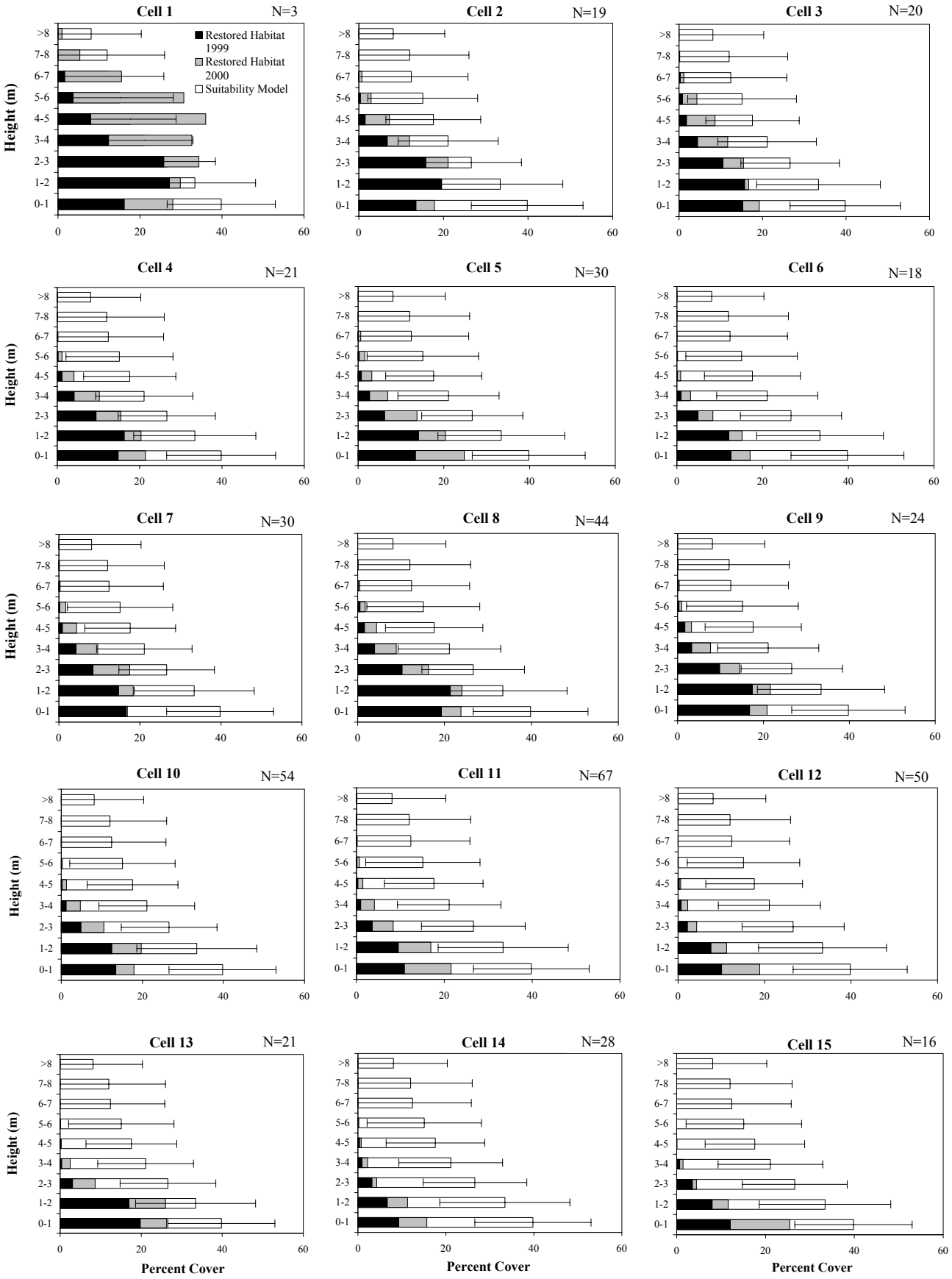

Figure 5 (Continued)
Average Percent Cover by Height of Restored Habitat: Cell-by-cell Assessment

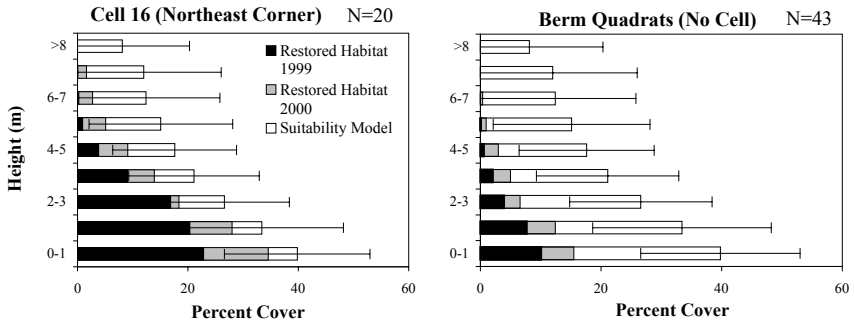

Figure 6. Pilgrim Creek Study Area, March 2000.

C. Bird Community

1. 2000 Overview

The Pilgrim Creek study area is used by a large and diverse group of birds, including landbirds, shorebirds, waterfowl, and raptors. One hundred and five species were detected at the site in 2000 (Table 8), including two new species canvasback (*Aythya valisineria*) and pine siskin (*Carduelis pinus*)), bringing the total number documented since 1995 to 134 (Appendix 1). Of these 105 species, 69 (excluding flyovers) occurred in the riparian habitat along Pilgrim Creek, and 68 occurred in the restored riparian vegetation. Although the two sites were nearly identical with regard to species richness, the proportion of shared species was low, with only 54 percent of species occurring in both habitats.

Table 8. Bird species detected at Pilgrim Creek, 2000

Common Name	Species Code	Habitat Affinity[a]	Seasonal Occurrence[b]	Detected Anywhere at Site[c]	Reference Habitat[d,e]	Riparian Reference Habitat[d,f]	Restored Riparian Habitat[d,f]	Restoration Pond[d,g]
Pied-billed grebe	PBGR	W	M/T	✓				✓
Mallard	MALL	W	R	✓	✓	✓	✓	✓
Gadwall	GADW	W	M/T	✓			✓	
Green-winged teal	AGWT	W	M/T	✓				✓
Cinnamon teal	CITE	W	M/T	✓	✓			✓
Northern shoveler	NSHO	W	M/T	✓				✓
Canvasback	CANV	W	M/T	✓				✓
Bufflehead	BUFF	W	M/T	✓				✓
Ruddy duck	RUDU	W	M/T	✓				✓
White-faced ibis	WFIB	W	M/T	✓			✓	
Great blue heron	GBHE	W	R	✓	✓	✓		
Great egret	GREG	W	R	✓	✓	✓		✓
Green Heron	GRHE	W	R	✓	✓	✓	✓	
Sora	SORA	W	W	✓			✓	
American coot	AMCO	W	W	✓			✓	✓
Black-necked stilt	BNST	W	M/T	✓				
Common snipe	COSN	W	W	✓			✓	
Least sandpiper	LESA	W	M/T	✓			✓	
Greater yellowlegs	GRYE	W	M/T	✓			✓	
Lesser yellowlegs	LEYE	W	M/T	✓			✓	
Killdeer	KILL	O	R	✓			✓	
Mourning dove	MODO	G	R	✓	✓	✓	✓	
Turkey vulture	TUVU	G	M/T	✓				
White-tailed kite	WTKI	G	R	✓	✓	✓		
Northern harrier	NOHA	G	R	✓	✓			
Sharp-shinned hawk	SSHA	G	W	✓	✓	✓		
Cooper's hawk	COHA	D	R	✓	✓	✓	✓	

Table 8 (*continued*). Bird species detected at Pilgrim Creek, 2000

Common Name	Species Code	Habitat Affinity[a]	Seasonal Occurrence[b]	Detected				
				Anywhere at Site[c]	Reference Habitat[d,e]	Riparian Reference Habitat[d,f]	Restored Riparian Habitat[d,f]	Restoration Pond[d,g]
Red-tailed hawk	RTHA	G	R	✓	✓	✓		
Red-shouldered hawk	RSHA	D	R	✓	✓	✓		
American kestrel	AMKE	G	R	✓	✓	✓		
Barn owl	BNOW	G	R	✓	✓			
California quail	CAQU	G	R	✓	✓		✓	
Greater roadrunner	GRRO	G	R	✓	✓		✓	
Belted kingfisher	BEKI	W	W	✓	✓	✓		
Downy woodpecker	DOWO	D	R	✓	✓	✓	✓	
Nuttall's woodpecker	NUWO	D	R	✓	✓	✓	✓	
Northern flicker	NOFL	D	R	✓	✓	✓	✓	
Vaux's swift	VASW	A	M/T	✓	✓		✓	
White-throated swift	WTSW	A	M/T	✓	✓	✓		
Black-chinned hummingbird	BCHU	D	B	✓	✓	✓	✓	
Anna's hummingbird	ANHU	G	R	✓	✓	✓	✓	
Western kingbird	WEKI	O	B	✓			✓	
Cassin's kingbird	CAKI	O	R	✓	✓			
Ash-throated flycatcher	ATFL	G	B	✓	✓	✓		
Say's phoebe	SAPH	O	W	✓	✓	✓	✓	
Black phoebe	BLPH	G	R	✓	✓	✓	✓	
Pacific-slope flycatcher	PSFL	D	B	✓	✓	✓	✓	
Willow flycatcher	WIFL	D	B	✓			✓	
Common raven	CORA	G	R	✓	✓	✓		
American crow	AMCR	G	R	✓	✓	✓		
European starling	EUST	H	R	✓	✓	✓	✓	
Brown-headed cowbird	BHCO	G	B	✓	✓	✓		
Red-winged blackbird	RWBL	G	R	✓	✓	✓	✓	
Western meadowlark	WEME	O	W	✓			✓	
Hooded oriole	HOOR	G	B	✓	✓	✓	✓	
Bullock's oriole	BUOR	G	B	✓	✓	✓	✓	
Great-tailed grackle	GTGR	G	R	✓	✓	✓		
House finch	HOFI	G	R	✓	✓	✓	✓	
American goldfinch	AMGO	D	R	✓	✓	✓	✓	
Lesser goldfinch	LEGO	G	R	✓	✓	✓	✓	
Lawrence's goldfinch	LAGO	G	R	✓	✓			
Pine Siskin	PISI	G	W	✓	✓	✓		
Savannah sparrow	SAVS	O	W	✓	✓	✓	✓	
White-crowned sparrow	WCSP	G	W	✓	✓	✓	✓	
Rufous-crowned sparrow	RCSP	G	R	✓	✓			
Song sparrow	SOSP	G	R	✓	✓	✓	✓	
Lincoln's sparrow	LISP	G	W	✓	✓	✓	✓	
				✓	✓	✓		

Table 8 (*continued*). Bird species detected at Pilgrim Creek, 2000

Common Name	Species Code	Habitat Affinity[a]	Seasonal Occurrence[b]	Detected				
				Anywhere at Site[c]	Reference Habitat[d,e]	Riparian Reference Habitat[d,f]	Restored Riparian Habitat[d,f]	Restoration Pond[d,g]
California towhee	CALT	G	R	✓	✓	✓	✓	
Black-headed grosbeak	BHGR	D	B	✓	✓	✓	✓	
Blue grosbeak	BLGR	G	B	✓	✓	✓	✓	
Lazuli bunting	LAZB	G	B	✓	✓		✓	
Western tanager	WETA	D	M/T	✓	✓			
Cliff swallow	CLSW	A	B	✓	✓	✓	✓	
Barn swallow	BARS	A	M/T	✓	✓	✓		
Tree swallow	TRES	D	B	✓	✓	✓	✓	
Violet-green swallow	VGSW	A	M/T	✓			✓	
Northern rough-winged swallow	NRWS	A	B	✓	✓	✓	✓	
Warbling vireo	WAVI	D	M/T	✓	✓	✓	✓	
Hutton's vireo	HUVI	D	R	✓	✓	✓	✓	
Least Bell's vireo	LBVI	D	B	✓	✓	✓	✓	
Nashville warbler	NAWA	D	M/T	✓	✓	✓		
Orange-crowned warbler	OCWA	D	R	✓	✓	✓	✓	
Yellow warbler	YWAR	D	B	✓	✓	✓	✓	
Yellow-rumped warbler	YRWA	G	W	✓	✓	✓	✓	
Black-throated gray warbler	BTYW	D	M/T	✓	✓	✓		
Townsend's warbler	TOWA	D	M/T	✓	✓	✓		
Hermit warbler	HEWA	D	M/T	✓	✓	✓		
Common yellowthroat	COYE	G	R	✓	✓	✓	✓	
Yellow-breasted chat	YBCH	D	B	✓	✓	✓	✓	
Wilson's warbler	WIWA	D	M/T	✓	✓	✓	✓	
American Pipit	AMPI	O	W	✓	✓		✓	
Northern mockingbird	NOMO	G	R	✓	✓			
California thrasher	CATH	G	R	✓	✓		✓	
Bewick's wren	BEWR	G	R	✓	✓	✓	✓	
House wren	HOWR	D	R	✓	✓	✓	✓	
Marsh wren	MAWR	W	R	✓	✓	✓	✓	
Wrentit	WREN	G	R	✓	✓	✓	✓	
Bushtit	BUSH	G	R	✓	✓	✓	✓	
Blue-gray gnatcatcher	BGGN	G	W	✓	✓	✓	✓	
California gnatcatcher	CAGN	G	R	✓	✓			
Swainson's thrush	SWTH	D	M/T	✓	✓	✓		
Hermit thrush	HETH	G	W	✓	✓	✓	✓	
American robin	AMRO	H	R	✓	✓	✓		
Total Species				105	84	69	68	10

[a] A = aerial, W = wetland, O = open habitat, G = scrub or habitat generalist, D = woodland

[b] R = resident (All year), B = breeding (Spring/Summer), W = winter (Fall/Winter), M/T = migrant/transient

[c] Includes flyovers and aerial foragers, all habitats

[d] Does not include flyovers or aerial foragers

[e] Includes all habitats (riparian, coastal sage scrub, wetland)

[f] Does not include coastal sage scrub

[g] Includes only wetland species

2. Development of Riparian Bird Community: 1998-2000

Of the 105 species using the study site in 2000, 41 breeders or potential breeders representing 39 percent of the total bird community were selected for further analysis and assigned to guilds (Table 9).

Table 9.
Guild Assignments of Breeding Birds at Riparian Restoration and Reference Sites, Pilgrim Creek

Common Name	Habitat Preference	Habitat Structure Association[1]	Foraging Mode
California quail	Shrubland	L	Ground glean
Killdeer	Open / Grassland	N	Ground glean
Mourning dove	Multiple	V	Ground glean
Common ground-dove	Multiple	L	Ground glean
Downy woodpecker	Willow Riparian	H/L	Bark glean
Nuttall's woodpecker	Woodland	H	Bark glean
Black-chinned hummingbird	Woodland	H/L	Hawk, hover glean
Anna's hummingbird	Multiple	H/L	Hawk, hover glean
Western kingbird	Open / Grassland	V	Hawk, hover glean
Ash-throated flycatcher	Multiple	H/L	Hawk, hover glean
Black phoebe	Multiple	V	Hawk, hover glean
Pacific-slope flycatcher	Woodland	H	Hawk, hover glean
Willow flycatcher	Willow Riparian	H/L	Hawk, hover glean
Common raven	Multiple	V	Ground glean
American crow	Multiple	V	Ground glean
Red-winged blackbird	Multiple	V	Ground glean
Hooded oriole	Multiple	H/L	Foliage glean
Bullock's oriole	Woodland	H	Foliage glean
Great-tailed grackle	Multiple	V	Ground glean
House finch	Multiple	V	Ground glean
American goldfinch	Willow Riparian	H/L	Foliage glean
Lesser goldfinch	Multiple	V	Foliage glean
Song sparrow	Multiple	L	Ground glean
Spotted towhee	Multiple	H/L	Ground glean
California towhee	Multiple	V	Ground glean
Black-headed grosbeak	Woodland	H	Foliage glean
Blue grosbeak	Multiple	H/L	Ground glean
Lazuli bunting	Multiple	H/L	Ground glean
Hutton's vireo	Woodland	H	Foliage glean
Least Bell's vireo	Willow Riparian	H/L	Foliage glean
Orange-crowned warbler	Woodland	H/L	Foliage glean
Yellow warbler	Willow Riparian	H	Foliage glean
Common yellowthroat	Multiple	L	Foliage glean
Yellow-breasted chat	Willow Riparian	H/L	Foliage glean
Wilson's warbler	Woodland	H/L	Foliage glean
California thrasher	Shrubland	L	Ground glean
Bewick's wren	Multiple	H/L	Ground glean
House wren	Woodland	H/L	Ground glean
Wrentit	Multiple	L	Foliage glean
Bushtit	Multiple	H/L	Foliage glean
Swainson's thrush	Willow Riparian	H/L	Foliage glean

[1]N = No structure; L = Low structure; H = High structure; H/L = High & Low; V = Variable

Species richness of breeders in the restored habitat was two-thirds that in the reference habitat in 1998 (Table 10), and the proportion of shared species was relatively low at 59 percent (22/37). Breeding bird richness in the restored habitat increased by 2000 to equal that in the reference site, although still only 74 percent (28/38) of the species were common to both habitats.

Table 10.
Species Richness, by Guild, of Breeding Birds in Restored and Reference Riparian Habitats

		Reference		Restoration		Rest./Ref.		% Change in Rest./Ref.
	Guild	1998	2000	1998	2000	1998	2000	
Habitat Preference	Open / Grassland	0	0	1	2	-	-	-
	Shrubland	1	0	1	2	1.00	-	-
	Multiple	19	18	16	15	0.84	0.83	-0.01
	Woodland	9	9	1	9	0.11	1.00	8.00
	Willow Riparian	6	6	5	6	0.83	1.00	0.20
Structural Preference	No structure	0	0	1	1	-	-	
	Variable	8	8	6	7	0.75	0.88	0.17
	Low	4	3	4	5	1.00	1.67	0.67
	High & Low	17	16	11	15	0.65	0.94	0.45
	High	6	6	2	6	0.33	1.00	2.00
Primary Foraging Mode	Hawk, Hover-glean	6	5	3	6	0.50	1.20	1.40
	Bark Glean	2	2	2	2	1.00	1.00	0.00
	Ground Glean	13	11	11	12	0.85	1.09	0.29
	Foliage Glean	14	15	8	14	0.57	0.93	0.63
Total	All Breeders	35	33	24	33	0.69	1.00	0.46

Guilds differed in richness between the two habitats, as well as in the degree to which richness in the restored habitat relative to the reference habitat changed over time (Table 10). Of the habitat preference guilds, open country and shrubland species were absent from the reference site in both years with the exception of a single shrub species in 1998. Habitat generalists, constituting the largest of the habitat preference guilds, made up the majority of breeding species in both the restored and reference sites, but changed little in terms of relative species richness between years. In contrast, woodland species, although fewer in number, increased in richness in the restored habitat by 8-fold during the three years such that by 2000, richness was equivalent to that in the reference habitat. Willow riparian specialists also exhibited equal species richness in both habitats by 2000, although the proportionate increase in the restored habitat between 1998 and 2000 was considerably lower than that of woodland species.

Of the structural association guilds, that comprising species occupying habitats with no cover and thus no vegetation structure was the smallest, represented by a single species (Killdeer, *Charadrius vociferus*) which occurred only in the restoration site. Species more generalized in

their use of habitats with regard to structure were well represented in both habitats in both years, and increased only slightly in the restored site between 1998 and 2000. Guilds reflecting stronger associations with particular habitat components showed the greatest change over time as richness in the restored habitat increased to match or exceed that in the reference habitat. The largest increase in similarity to the reference habitat was observed for species requiring high structure, which tripled over the three years to achieve the richness documented for the reference habitat. Low canopy specialists, equivalent in richness in the two habitats as early as 1998, increased in the restoration site and by 2000 exceeded the richness in the reference habitat. Species associated with vertically stratified habitats possessing both high and low canopy elements made up the largest of the structural guilds and displayed substantial increase in similarity between the restored and reference habitats over the three years.

The two largest foraging guilds, ground gleaners and foliage gleaners, differed in the extent to which they changed over the three years of vegetation development. Ground gleaners were well-represented in both habitats from early on and thus showed little change in richness in the restored vegetation over time. In contrast, foliage gleaners nearly doubled in richness at the restored site to achieve a richness comparable to that in the reference habitat. Species foraging primarily by hawking or hovering were less numerous than the ground and foliage gleaners, but exhibited increased similarity in use of the two habitats. Bark gleaners, which included two species of woodpeckers, were identical in occurrence across sites and years.

Bird densities were significantly higher in the reference habitat than in the restored habitat for nearly all guilds in both years, differing generally by an order of magnitude across the two sites (Table 11). Nevertheless, densities in the restored habitat increased for many guilds over the study period, reflecting the patterns observed in species richness. Both woodland and willow riparian species doubled in abundance in the restoration site and exhibited larger relative increases than any other habitat preference guilds. Similarly, species associated with stratified canopies doubled in their ratio of similarity to the reference habitat. High structure species, which increased in similarity to the reference site as well, did so not through an absolute increase in bird densities, but rather through a relative increase created by a decline in density of this guild in the reference habitat in 2000. Densities of low canopy species, although more similar to the reference densities in both years than those of any other structure guilds, increased only slightly over the three years. Of the foraging guilds, foliage gleaners showed the greatest positive change in relative density, nearly doubling in three years; ground gleaners, while more abundant, changed little during this time. Both bark gleaners and hawk/hover foragers declined slightly in density and similarity to the reference habitat.

Table 11.
Density (ave. # individuals/survey/ha), by Guild, of Breeding Birds in Restored and Reference Riparian Habitats

Guild		Reference		Restoration		Rest./Ref.				% Change in Rest./Ref.
		1998	2000	1998	2000	1998	P	2000	P	
Habitat Preference	Open / Grassland	0.00	0.00	0.14	0.03	-	**	-	*	-
	Shrubland	0.02	0.00	0.03	0.03	1.62	NS	-	*	-
	Multiple	13.43	13.80	5.77	7.54	0.43	****	0.55	****	0.27
	Woodland	2.41	1.46	0.06	0.14	0.02	****	0.10	**	3.12
	Willow Riparian	5.35	4.50	0.46	0.90	0.09	****	0.20	****	1.35
Structural Preference	No structure	0.00	0.00	0.14	0.02	-	**	-	NS	-
	Variable	2.56	3.39	1.20	1.45	0.47	***	0.43	***	-0.09
	Low	7.36	7.52	3.72	4.88	0.51	****	0.65	****	0.28
	High & Low	8.33	6.73	1.27	2.17	0.15	****	0.32	****	1.12
	High	2.95	2.12	0.12	0.12	0.04	****	0.06	****	0.40
Primary Foraging Mode	Hawk, Hover-glean	1.40	1.25	0.43	0.33	0.31	****	0.26	****	-0.16
	Bark Glean	0.70	0.36	0.06	0.03	0.09	****	0.08	****	-0.12
	Ground Glean	7.97	6.50	3.40	3.68	0.43	****	0.57	****	0.33
	Foliage Glean	11.14	11.66	2.56	4.62	0.23	****	0.40	****	0.72
Total	All Breeders	21.20	19.76	6.46	8.65	0.30	****	0.44	****	0.44

* P < 0.05, ** P < 0.01, *** P < 0.001, **** P < 0.0001; one-tailed t-tests comparing density in the restored habitat to density in the reference habitat for a given year.

The six guilds exhibiting the greatest increases in species richness and bird densities in the restored habitat shared many species in common. Of the 26 species total in these six guilds, we extracted a group of 13 meeting three criteria: (1) they belonged to either the woodland or willow riparian guilds, (2) they were associated with high or high-and-low cover, and (3) they were foliage gleaners or aerial foragers (Table 12). Collectively, these 13 species exhibited increases in species richness and density of restoration site birds as great or greater than all but one (woodland) of the individual guilds analyzed.

Table 12.
Species Richness and Density (ave. # individuals/survey/ha) of Habitat Change Indicator Species in Restored and Reference Riparian Habitats

Component Species	Reference		Restoration		Rest./Ref.		% Change in Rest./Ref.
	1998	2000	1998	2000	1998	2000	
Black-chinned hummingbird	*Species Richness*						
Pacific-slope flycatcher	12	12	4	12	0.33	1.00	2.00
Willow flycatcher							
Bullock's oriole							
American goldfinch	*Density*						
Black-headed grosbeak	41.80	34.53	1.9	4.22	0.05	0.12	1.69
Hutton's vireo							
Least Bell's vireo							
Orange-crowned warbler							
Yellow warbler							
Yellow-breasted chat							
Wilson's warbler							
Swainson's thrush							

IV. CONCLUSIONS

The Pilgrim Creek study area continues to support a large and diverse community of riparian and upland birds, including several endangered and sensitive species. Least Bell's vireos, a species of particular management concern at the site, occupy virtually all of the riparian habitat along Pilgrim Creek, and have expanded in increasing numbers into the restoration site. Vireo reproductive success increased relative to 1999, and the production of young was consistent with the high rate documented for this population prior to that year.

Unlike in 1999, when little growth was detected in either the restored or reference habitat, planted vegetation increased substantially in cover and height during 2000. Although vegetation structure continues to be heterogenous across the restoration site, growth was documented in all cells, suggesting that vegetation throughout the site is progressing towards achievement of the structural attributes favored by least Bell's vireos and other riparian birds. Over half of the cells in the restoration site have met or are close to meeting the suitability criteria defined by the vireo suitability model, and the distribution of vireo territories within the restored habitat reflects this development.

We found large differences among guilds in their response to changing structure of the restored habitat, and consequently their usefulness as indicators of habitat change. Open country and shrubland species never or rarely occurred in the reference habitat, making negligible their contribution to evaluating restoration site performance. Least responsive of the guilds occurring in both sites were habitat generalists, which also were the most numerous and abundant species found there. Species richness of this guild was high in both the restored and reference habitats by 1998 and has changed little since then. Densities of habitat generalists in the restored habitat, at half those in the reference site, increased only slightly in comparison with increases exhibited by other guilds. The large proportion of ground feeders among the habitat generalists suggests that these species found suitable foraging habitat in the restoration site early on, and may explain the weak response to foliage development of the restored vegetation since then.

Not surprisingly, the guilds most responsive to restoration site development were those associated with woodlands and willow-dominated habitat - the very habitat type being created. We considered increases in bird densities to be particularly indicative of functional habitat change in that they avoided potentially spurious conclusions regarding trends in species richness where species can be represented by a single individual. Of the guilds we examined, foliage gleaners and willow/woodland species associated with high canopy complexity were those exhibiting the greatest increases in density during the time that restored vegetation increased in cover and height. While the densities of these guilds in the restoration site remain below those in the reference habitat, the degree of change exhibited suggests that the availability of habitat possessing the features required by these species has increased, allowing their population numbers to grow. Increases in species richness of these guilds suggests that increased habitat availability and complexity is allowing partitioning among a larger bird community.

Although low shrubby understory is a critical component of riparian habitat and supports many species of nesting birds, we found the low canopy guild by itself to be largely

uninformative regarding habitat development in the restoration site during the last three years. This is because low canopy species, particularly song sparrows (*Melospiza melodia*) and common yellowthroats (*Geothlypis trichas*), are the first to colonize restoration sites once an understory develops, which in southern California generally occurs within one or two growing seasons (Kus 1998). Thus, by 1998, the low canopy guild at the site was well-established in the restored habitat, and currently shows the highest degree of similarity to the reference community, both in terms of species richness and bird densities, of all guilds using the site. Low canopy species are thus more appropriate for evaluating restoration site performance in the earliest stages of development. However, we would caution that because this guild consists primarily of habitat generalists and ground feeders, early similarities to a reference habitat may not necessarily indicate that the restored vegetation is developing along a trajectory that will ultimately yield a multi-layered riparian woodland.

Our guilds were not mutually exclusive, and broad overlap exists in the component species of guilds found most useful in tracking habitat change. The 13 species we found most useful for evaluating habitat structure collectively form a group that better reflects habitat change in the restored vegetation than all but one of the individual guilds we examined. It is noteworthy that of these 13 species, over half are sensitive species threatened by habitat loss and degradation, affirming the potential of this group to track both positive and negative habitat change.

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Appendix 1. Common and Scientific Names of Birds Observed at Pilgrim Creek Study Area, 1995-2000

Common Name	Scientific Name	Common Name	Scientific Name
Allen's hummingbird	*Selasphorus sasin*	Cooper's hawk	*Accipiter cooperii*
American avocet	*Recurvirostra americana*	Costa's hummingbird	*Calypte costae*
American bittern	*Botaurus lentiginosus*	Dark-eyed junco	*Junco hyemalis*
American coot	*Fulica americana*	Downy woodpecker	*Picoides pubescens*
American crow	*Corvus brachyrhynchos*	Eared grebe	*Podiceps nigricollis*
American goldfinch	*Carduelis tristis*	European starling	*Sturnus vulgaris*
American kestrel	*Falco sparverius*	Gadwall	*Anas strepera*
American Pipit	*Anthus rubescens*	Golden-crowned sparrow	*Zonotrichia atricapilla*
American wigeon	*Anas americana*	Grasshopper sparrow	*Ammodramus savannarum*
Anna's hummingbird	*Calypte anna*	Great blue heron	*Ardea herodias*
Ash-throated flycatcher	*Myiarchus cinerascens*	Great egret	*Egretta alba*
Barn owl	*Tyto alba*	Greater roadrunner	*Geococcyx californianus*
Barn swallow	*Hirundo rustica*	Greater yellowlegs	*Tringa melanoleuca*
Belted kingfisher	*Ceryle alcyon*	Great-tailed grackle	*Quiscalus mexicanus*
Bewick's wren	*Thyromanes bewickii*	Green Heron	*Butorides virescens*
Black phoebe	*Sayornis nigricans*	Green-winged teal	*Anas crecca*
Black-chinned hummingbird	*Archilochus alexandri*	Hammond's flycatcher	*Empidonax hammondii*
Black-crowned night heron	*Nycticorax nycticorax*	Hermit thrush	*Catharus guttatus*
Black-headed grosbeak	*Pheucticus melanocephalus*	Hooded oriole	*Icterus cucullatus*
Black-necked stilt	*Himantopus mexicanus*	House finch	*Carpodacus mexicanus*
Black-throated gray warbler	*Dendroica nigrescens*	House wren	*Troglodytes aedon*
Blue grosbeak	*Guiraca caerulea*	Hutton's vireo	*Vireo huttoni*
Blue-gray gnatcatcher	*Polioptila caerulea*	Killdeer	*Charadrius vociferus*
Blue-winged teal	*Anas discors*	Lawrence's goldfinch	*Carduelis lawrencei*
Brown-headed cowbird	*Molothrus ater*	Lazuli bunting	*Passerina amoena*
Bufflehead	*Bucephala albeola*	Least Bell's vireo	*Vireo bellii pusillus*
Bullock's oriole	*Icterus bullockii*	Least sandpiper	*Calidris minutilla*
Bushtit	*Psaltriparus minimus*	Least tern	*Sterna antillarum*
California gnatcatcher	*Polioptila californica*	Lesser goldfinch	*Carduelis psaltria*
California quail	*Callipepla californica*	Lesser yellowlegs	*Tringa flavipes*
California thrasher	*Toxostoma redivivum*	Lincoln's sparrow	*Melospiza lincolnii*
California towhee	*Pipilo crissalis*	Long-billed curlew	*Numenius americanus*
Canvasback	*Aythya valisineria*	Long-billed dowitcher	*Limnodromus scolopaceus*
Caspian tern	*Sterna caspia*	Loggerhead shrike	*Lanius ludovicianus*
Cassin's kingbird	*Tyrannus vociferans*	MacGillivray's warbler	*Oporornis tolmiei*
Cattle egret	*Bubulcus ibis*	Mallard	*Anas platyrhynchos*
Chipping sparrow	*Spizella passerina*	Marsh wren	*Cistothorus palustris*
Cinnamon teal	*Anas cyanoptera*	Mourning dove	*Zenaida macroura*
Cliff swallow	*Petrochelidon pyrrhonota*	Nashville warbler	*Vermivora ruficapilla*
Common ground-dove	*Columbina passerina*	Northern flicker	*Colaptes auratus*
Common moorhen	*Gallinula chloropus*	Northern harrier	*Circus cyaneus*
Common raven	*Corvus corax*	Northern mockingbird	*Mimus polyglottos*
Common snipe	*Gallinago gallinago*	Northern pintail	*Anas acuta*
Common yellowthroat	*Geothlypis trichas*	Northern rough-winged swallow	*Stelgidopteryx serripennis*

Appendix 1. Common and Scientific Names of Birds Observed at Pilgrim Creek Study Area, 1995-2000
(continued)

Common Name	Scientific Name
Northern shoveler	*Anas clypeata*
Nuttall's woodpecker	*Picoides nuttallii*
Orange-crowned warbler	*Vermivora celata*
Pacific-slope flycatcher	*Empidonax difficilis*
Pied-billed grebe	*Podilymbus podiceps*
Pine siskin	*Carduelis pinus*
Red-shouldered hawk	*Buteo lineatus*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Rock dove	*Columba livia*
Ruby-crowned kinglet	*Regulus calendula*
Ruddy duck	*Oxyura jamaicensis*
Rufous-crowned sparrow	*Aimophila ruficeps*
Savannah sparrow	*Passerculus sandwichensis*
Say's phoebe	*Sayornis saya*
Sharp-shinned hawk	*Accipiter striatus*
Snowy egret	*Egretta thula*
Song sparrow	*Melospiza melodia*
Sora	*Porzana carolina*
Spotted sandpiper	*Actitis macularia*
Spotted towhee	*Pipilo maculatus*
Swainson's thrush	*Catharus ustulata*
Townsend's warbler	*Dendroica townsendi*
Tree swallow	*Tachycineta bicolor*
Turkey vulture	*Cathartes aura*
Vaux's swift	*Chaetura vauxi*
Vesper sparrow	*Pooecetes gramineus*
Violet-green swallow	*Tachycineta thalassina*
Virginia rail	*Rallus limicola*
Warbling vireo	*Vireo gilvus*
Western kingbird	*Tyrannus verticalis*
Western meadowlark	*Sturnella neglecta*
Western sandpiper	*Calidris mauri*
Western tanager	*Piranga ludoviciana*
Western wood-pewee	*Contopus sordidulus*
White-crowned sparrow	*Zonotrichia leucophrys*
White-faced ibis	*Plegadis chihi*
White-tailed kite	*Elanus leucurus*
White-throated swift	*Aeronautes saxatalis*
Willet	*Catoptrophorus semipalmatus*
Willow flycatcher	*Empidonax traillii*
Wilson's warbler	*Wilsonia pusilla*
Wrentit	*Chamaea fasciata*
Yellow warbler	*Dendroica petechia*
Yellow-breasted chat	*Icteria virens*
Yellow-rumped warbler	*Dendroica coronata*