

Summary of Avian Resources of the Puente-Chino Hills Corridor

Los Angeles, Orange, San Bernardino,
and Riverside counties, California

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January 1999

Executive Summary

During spring and summer of 1997 and 1998, we conducted a distribution survey of birds and associated habitats of the Puente-Chino Hills for the Mountains Recreation and Conservation Authority. From over 300 stationary points and nearly 50 walking transects, we recorded evidence of breeding for nearly 100 bird species, including such localized and declining taxa as Northern Harrier, Golden Eagle, Prairie Falcon, White-tailed Kite, Cactus Wren, Least Bell's Vireo, Loggerhead Shrike, Homed Lark, California Gnatcatcher, Yellow Warbler, Yellow-breasted Chat, Grasshopper, Bell's Sage and Rufous-crowned sparrows, and Tricolored Blackbird (see Appendix B for Latin names). We documented widespread nesting of Say's Phoebe, a species recently rediscovered as breeding in Southwestern California (see Gallagher 1997). Our surveys essentially confirm the recent extirpation of Burrowing Owl in the region, a species common in the early 1980s (D. Cooper, pers. obs.) last recorded in 1993 (C. Schlotterbeck, pers. comm.).

The exotic and semi-native grasslands of the Puente-Chino Hills may represent their greatest contribution to the breeding bird community of coastal Southern California, as so much of this habitat has been permanently lost to urbanization. Species restricted to grasslands were probably the most restricted in distribution, occurring in three main areas, the Shell Property east to Brea Canyon/57 Freeway, Upper Tonner Canyon (vic. of San Bernardino/Los Angeles Co. line), and in and around Chino Hills State Park. Grasslands in the western portion of the study area were generally lacking several species, as were smaller patches and many of those isolated by development. Land purchases that augment these regions (i.e. vic. Shell property, land south of Los Serranos) would maximize protection for species like Grasshopper Sparrow, whose breeding populations have been drastically reduced in Southern California. Unlike woodland and chaparral species which are widespread in appropriate habitats throughout the study area, several grassland species, particularly wide-ranging raptors, were mainly confined to the largest expanses of grassland in San Bernardino County.

The most extensive and least disturbed examples of another important habitat, Coastal Sage Scrub (CSS), was found along the southern Rank of the Puente and Chino Hills, mainly in and adjacent to oil property land in northeast Brea and northwestern Yorba Linda. One of the most "significant" bird species of the study area, Federally-Threatened California Gnatcatcher, is essentially restricted to this area, absent from less extensive Coastal Sage Scrub in nearby Chino Hills State Park. Other CSS species, including Cactus Wren and Rufous-crowned Sparrow, were found scattered throughout the study area from Yorba Linda to Whittier, including in the case of the wren, narrow portions of the corridor and in isolated patches of habitat on the urban edge.

Riparian species were largely confined to wooded drainages within Chino Hills State Park, Tonner Canyon, Carbon Canyon Regional Park, and the Santa Ana River from Prado Dam west through Featherly Regional Park. Least Bell's Vireo, a Federally Endangered species, was found primarily along the Santa Ana River in Riverside County and in Carbon Canyon Regional Park. Other riparian-obligate species were found to be widespread but patchily distributed, occasionally persisting in small, isolated willow thickets not overrun by exotic species (e.g. Sycamore Canyon, Whittier).

Woodland species were found to be most diverse in the north-central portion of the study area, from the northern flank of the hills in Rowland Heights east to Diamond Bar. Though it was not surveyed, the Firestone Boy Scout Reserve may protect the least disturbed and most extensive examples of oak and oak-walnut woodland in the

study area. Since the woodland species of the Puente-Chino Hills are generally widespread in the mountains of Southern California, their preservation in the lowlands is primarily of local, rather than regional, conservation importance. Similarly, most of the chaparral-restricted birds are not only common and widespread within the study area, but also in the San Gabriel and Santa Ana Mountains to the north and south. *This is in contrast to species dependent upon Coastal Sage Scrub and extensive grasslands, many of which occur exclusively in cismontane lowlands.*

Study Area and Background

The eastern portion of the Los Angeles Basin features three roughly parallel ranges of low (elev. 100-500 m) hills—the San Jose, Puente, and Chino hills. The latter two, the focus of this study, preserve the largest amount of open space (c. 100 km²), with a heterogeneous mix of habitats that includes Coastal Sage Scrub (esp. California Sagebrush, Black Sage), sumac chaparral (esp. Laurel Sumac, Toyon), semi-native grassland, and Coast Live Oak/Black Walnut woodland. As is typical in California, these habitat types tend to occur together in a rich mosaic. Smaller areas of riparian habitat (incl. several willows, Mulefat and Western Sycamore) and "foothill chaparral" (esp. Chamise, Scrub Oak) are scattered along the length of the hills, the latter primarily in the north-central portion of the hills (e.g. Diamond Bar, Sleepy Hollow).

Although the study area is often referred to as an open space "corridor", it is more accurately a "peninsula". It does not connect core reserve areas, but rather extends the habitats of the eastern Chino Hills over 20 miles west into the Los Angeles Basin. While some residential communities near the study area date back to the late 1800s (e.g. Whittier), most of the tract home development that now surrounds the peninsula began in the 1950s and continues today. Generally, the western portion of the study area was urbanized first, and most current development is occurring in the east in Diamond Bar, City of Chino Hills, and Yorba Linda. The vegetation of these urban tracts is strikingly different from that of the open space, structurally resembling an open woodland but dominated by planted exotic species, particularly palms, eucalyptus, and Mediterranean conifers. In a few areas, particularly La Habra Heights and Hacienda Heights, fragments of native habitat remain on steep slopes and occasional canyon bottoms within residential development.

Historical bird distribution data (Grinnell 1898, Grinnell and Miller 1944) suggest that the study area, with the possible exception of the lower Santa Ana River in the extreme southeast, has seen a limited amount of species turnover in its breeding avifauna, during the 20th Century. A few of the species lost (e.g. Burrowing Owl) have been nearly extirpated as breeders from southwestern California (see Gallagher 1997). However, even with declines and increases in certain species' abundance, the total number of breeding species in the study area is probably not drastically different from that during historical (pre-1950) times.

Although geographic gaps were noted in the ranges of several species, the Puente-Chino Hills as a whole was found to support a largely intact coastal California bird community, even in the heavily-urbanized western portion. Diversity of wildland (non-urban) species was found to increase from west to east, with a notable inflection point occurring in the vicinity Powder Canyon. While only a rough correlation was noted between species diversity and amount of open space along the corridor, a stronger pattern involved distribution in the most narrow and fragmented sections of the corridor, such as that through La Habra Heights. These were found to support many fewer species than habitats within the main body of the open space (e.g. Tonner Cyn., Chino Hills State Park). More field investigation must be done to determine whether the species absences detected are due to amount of open space alone, or whether habitat diversity, habitat contiguity, or other factors are involved.

Methods and Data Analysis

During the spring and early summer of 1997 and 1998, we conducted bird and vegetation surveys in and around the Puente-Chino Hills corridor. Single-visit, fixed-radius point counts (adapted from Ralph et al. 1995) were conducted between 5:00 and 9:30 am, from mid-April to early June, at 331 points in the undeveloped portions of the Puente-Chino Hills. In conjunction with this study, we conducted over 100 point counts in the urban development surrounding the open space, typically within the hills themselves. Points were considered "wildland" if more than half the area within 60 meters featured vegetation comprised of native plants (excluding naturalized grasses). Eight minutes were spent at each point recording all birds heard or seen. Vegetation characteristics were recorded within a 60-meter radius of each survey point, and included maximum vegetation height presence of water or seep, major floristic communities, and presence of representative shrub and tree species. To detect rare and localized bird species, 46 linear transect surveys (see Emlen 1971) were conducted on foot throughout the study area, mainly along canyon bottoms and riparian strips. Transect data was generally not analyzed with point count data, but served to "truth" our assertions in this study.

Birds were analyzed as "present" only if they were observed within 60 meters of the point or transect. Flyover observations of species were not counted, with the exception of American Crow, Common Raven, and raptors, which were generally recorded in flight only. Sedentary species or very early migrants (e.g. House Wren) were recorded as present if any vocal or visual observation was noted. For later migrants (i.e. those that were largely on migration in mid-April) and species that tend to wander widely during the breeding season (e.g. House Finch), we counted only observations of singing or obviously paired individuals. Five species, migratory and lacking (or rarely-delivering) a territorial song (Ash-throated Flycatcher, Phainopepla, Brown-headed Cowbird, Black-chinned Hummingbird, and Western Kingbird) were difficult to categorize, so any vocal or visual observation was judged enough to count as present at point, which assumed the risk of overestimating the occurrence of these species in the study area. Finally, we did not record as present the migratory species that were obviously in transit, even if they were singing (e.g. Willow Flycatcher singing from wild mustard grassland in May).

We did not analyze the distribution of several birds that were poorly detected by our survey methods, including water birds, nocturnal birds, swallows, and swifts. Only two areas were found to support water birds, the Santa Ana River and the freshwater marsh and stock pond in upper Tonner Canyon at Grand Avenue. Because surveys were conducted during daylight hours only, owls and nightjars were only rarely recorded. Barn, Cliff, Northern Rough-winged, and Violet-green swallows and White-throated Swift were observed foraging in large mixed flocks during the study, but were not recorded on point count data sheets.

To organize our observations, we divided the study area into 6 major areas based on both natural and political boundaries (see "Conservation Assessment of Surveyed Regions" below). Urban points were concentrated in the western portion of the study area, where older suburbs retained fragments of native vegetation (e.g. ancient Coast Live Oaks) as well as remnant orchards and eucalyptus groves. Early in the study, we noted a distinct change in the status and distribution of birds in the vicinity of Powder Canyon in Rowland Heights/La Habra Heights. Because several species of birds and shrubs approach the western limits of their ranges in the study area, we refer to the area to the west of Powder Canyon as the "western Puente-Chino Hills," and that to the east as the "eastern" portion. Microclimate may play some role in this barrier (see Malanson and O'Leary 1977), since frost-sensitive plants (e.g. Laurel Sumac) are found primarily west of Powder Canyon and on the south-facing slopes of the eastern Puente-Chino Hills, while frost-tolerant shrubs such as Scrub Oak are largely confined to north-facing slopes to the east of Powder Canyon. Several bird species conform to this distribution, and are discussed below.

Results and Discussion

Urban vs. Wildland Habitats

This study sought to assess the persistence of birds along the entire length of the Puente-Chino Hills and to identify patterns of species distribution. Because urban areas adjacent to the corridor were also surveyed during the same time period, we were able to discern urban-dependent from wildland-dependent species, and map the distributions of both. Several species recorded showed a definite preference for urban sites over the open space of the corridor (Table 1). These urban species tend to exploit the common features of suburban yards (pers. obs.), such as palms (Hooded Oriole), eucalyptus (Pacific-slope Flycatcher, Allen's Hummingbird), and lawn run-off (Black Phoebe).

Table 1. Species recorded more frequently at urban points than at wildland points

Species	Frequency at Urban Points	Frequency at Wildland Points	Species	Frequency at Urban Points	Frequency at Wildland Points
	n=102	n=331		n=102	n=331
Northern Mockingbird	0.91	0.28	Common Raven	0.20	0.17
House Finch	0.81	0.34	Pacific-slope Flycatcher	0.17	0.04
House Sparrow	0.73	0.02	Allerfs Hummingbird	0.14	0.03
American Crow	0.72	0.05	Black-ch. Hummingbird	0.11	0.07
Mourning Dove	0.69	0.25	American Kestrel	0.10	0.08
Anna's Hummingbird	0.68	0.32	Band-tailed Pigeon	0.08	0
European Starling	0.58	0.09	Rock Dove	0.08	0

Black Phoebe	0.51	0.16	American Robin	0.08	0.03
Bushtit	0.45	0.29	American Goldfinch	0.03	0.01
Hooded Oriole	0.42	0.07	Red-shouldered Hawk	0.03	0.02
Lesser Goldfinch	0.38	0.15			

The majority of species recorded in this study were found primarily in native (i.e. unplanted) vegetation, with most were virtually confined to non-urban environments (Table 2). A few of these, however, were also detected on more than 10% of urban points, including California Towhee, Spotted Towhee, Song Sparrow, House Wren, and Brown-headed Cowbird, these among the most abundant birds in the Puente-Chino Hills. Not listed in the tables, Western Scrub-Jay and Say's Phoebe were found with equal frequency at urban and wildland points (37% and 6%, resp.).

Table 2. Species recorded more frequently at wildland than urban points

Species	Frequency at Wildland Points n=331	Frequency at Urban Points n=102	Species	Frequency at Wildland Points n=331	Frequency at Urban Points n=102
Spotted Towhee	0.71	0.26	Lark Sparrow	0.04	0.02
Song Sparrow	0.69	0.20	Hutton's Vireo	0.04	0
California Towhee	0.64	0.52	Oak Titmouse	0.04	0
Wrentit	0.60	0.06	Turkey Vulture	0.03	0.01
Bewick's Wren	0.59	0.09	Cassin's Kingbird	0.03	0.02
House Wren	0.44	0.15	Red-winged Blackbird	0.02	0
Black-headed Grosbeak	0.41	0.03	Yellow Warbler	0.02	0
California Quail	0.34	0.08	Cooper's Hawk	0.02	0
California Thrasher	0.34	0.05	Western Kingbird	0.02	0
Ash-throated Flycatcher	0.24	0.07	White-tailed Kite	0.02	0
Nuttall's Woodpecker	0.21	0.08	Northern Flicker	0.02	0
Common Yellowthroat	0.18	0	Downy Woodpecker	0.02	0
Bullock's Oriole	0.17	0.02	Western Wood-Pewee	0.01	0
Rufous-crowned Sparrow	0.17	0.01	California Gnatcatcher	0.01	0
Brown-headed Cowbird	0.15	0.12	Loggerhead Shrike	0.01	0
Costa's Hummingbird	0.15	0.01	Warbling Vireo	0.01	0
Blue Grosbeak	0.14	0	Western Bluebird	0.01	0
Phainopepla	0.12	0.03	Bell's Vireo	0.01	0
Western Meadowlark	0.12	0.03	Northern Harrier	0.01	0
Red-tailed Hawk	0.11	0.04	Swainson's Thrush	0.01	0
Lazuli Bunting	0.09	0	Black-chinned Sparrow	<.01	0
Cactus Wren	0.08	0.01	Canyon Wren	<.01	0
Orange-crowned Warbler	0.07	0.06	Golden Eagle	<.01	0
Acorn Woodpecker	0.07	0.04	Horned Lark	<.01	0
Grasshopper Sparrow	0.07	0	Lawrence's Goldfinch	<.01	0

Yellow-breasted Chat	0.05	0	Prairie Falcon	<.01	0
Greater Roadrunner	0.05	0	Tricolored Blackbird	01	

Many of these urban-favoring species have penetrated far into native habitat in the western portion of the study area, occurring on proportionately more wildland points west of Powder Canyon than east. This is probably due to the narrowness of the corridor in the west, which has resulted in fewer points being more than about 1/2 mile from any urban edge.

East vs. West

In determining which species were more frequently encountered in the west than in the east, we combined our walking transect observations with our point count data (by treating the geographic center of the transect as a single point and counting each species as either present or absent) to maximize our data in areas where point counts were sparse. Many urban-favoring species and those common in scrubby habitats throughout the study area (e.g. Western Scrub-Jay, California Quail) dominated in the west (Table 3), while those occurring more frequently in the east (Table 4) ran the gamut from grassland species (e.g. Western Meadowlark) to woodland species (e.g. Ash-throated Flycatcher). This suggests the western points are dominated by a more homogeneous array of species than eastern points, known as "relaxation" (see Soule et al. 1988) of diversity. This can be more clearly seen in Table 5, which presents diversity indices for regions west to east along the corridor. Note the "Whittier Hills" (far western Region) is depauperate as compared to regions to the east of with less open space.

Table 3. Birds recorded more frequently at *western* than eastern points^a

Species	Frequency west of Powder Canyon	Frequency east of Powder Canyon, inclusive	Species	Frequency west of Powder Canyon	Frequency east of Powder Canyon, inclusive
	n=92	n=285		n=92	n=285
Wrentit	0.87	0.54	Allen's Hummingbird	0.17	0.01
Spotted Towhee	0.85	0.70	Pacific-slope Flycatcher	0.12	0.09
Song Sparrow	0.79	0.70	American Crow	0.11	0.06
Bewick's Wren	0.78	0.56	Orange-cr. Warbler	0.11	0.08
California Towhee	0.72	0.66	Cactus Wren	0.10	0.08
Western Scrub-Jay	0.58	0.39	Hooded Oriole	0.08	0.07
Black-headed Grosbeak	0.58	0.40	Cooper's Hawk	0.07	0.06
Anna's Hummingbird	0.52	0.34	Northern Flicker	0.05	0.04
California Quail	0.52	0.34	Band-tailed Pigeon	0.02	<.01
Northern Mockingbird	0.48	0.27	Swainson's Thrush	0.02	0.01
House Finch	0.47	0.33	Western Wood-pewee	0.02	0.01
California Thrasher	0.40	0.39	Loggerhead Shrike	0.02	0.02
Bushtit	0.37	0.36	Black-chinned Sparrow	0.01	<.01
Mourning Dove	0.34	0.32	Northern Harrier	0.01	<.01
Bullock's Oriole	0.27	0.21			

^awalking transect observations and point count data combined

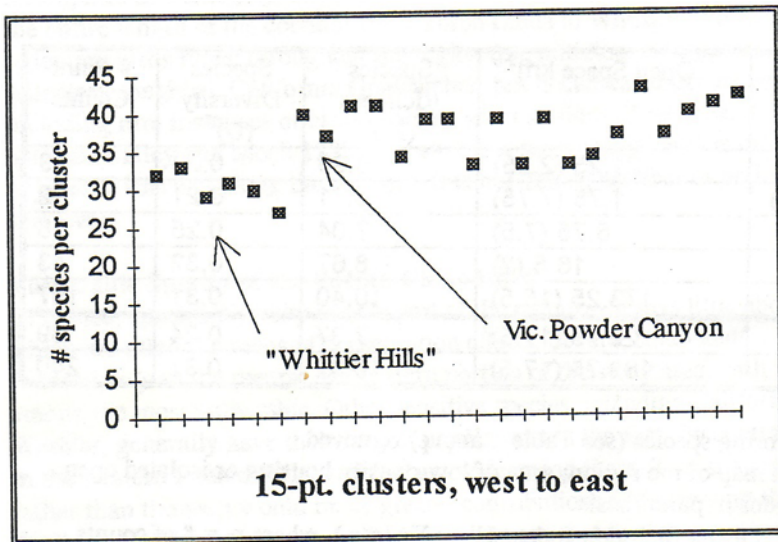
Table 4. Birds recorded more frequently at *eastern* than western points^a

Species	Frequency east of Powder Canyon, inclusive	Frequency west of Powder Canyon	Species	Frequency east Of Powder Canyon, inclusive	Frequency west of Powder Canyon
	n=285	n=92		n=285	n=92
House Wren	0.51	0.42	Turkey Vulture	0.07	0.03
Ash-thr. Flycatcher	0.36	0.15	Lark Sparrow	0.07	0
Nuttall's Woodpecker	0.33	0.20	White-tailed Kite	0.06	0
Black Phoebe	0.27	0.11	Cassin's Kingbird	0.05	0.01
Common Yellowthroat	0.25	0.12	Yellow Warbler	0.05	0.01
Brown-headed Cowbird	0.25	0.18	American Robin	0.05	0.02
Lesser Goldfinch	0.22	0.17	Red-winged Blackbird	0.05	0.02
Common Raven	0.22	0.20	Western Kingbird	0.04	0.02
Rufous-cr. Sparrow	0.21	0.15	Red-shouldered Hawk	0.04	0.01
Blue Grosbeak	0.19	0.07	American Goldfinch	0.03	0.01
Redtailed Hawk	0.19	0.16	Downy Woodpecker	0.03	0.01
Costa's Hummingbird	0.17	0.08	Warbling Vireo	0.03	0.01
Westem Meadowlark	0.17	0.01	Brewer's Blackbird	0.02	0
Black-ch. Hummingbird	0.16	0.09	House Sparrow	0.02	0
European Starling	0.15	0.08	Western Bluebird	0.02	0
American Kestrel	0.13	0.09	Bell's Vireo	0.01	0
Acorn Woodpecker	0.11	0.08	Lawrence's Goldfinch	0.01	0
Lazuli Bunting	0.11	0.03	Golden Eagle	0.01	0
Oak Titmouse	0.11	0	Canyon Wren	<.01	0
Say's Phoebe	0.09	0.01	Horned Lark	<.01	0
Grasshopper Sparrow	0.09	0	Prairie Falcon	<.01	0
Hutton's Vireo	0.08	0.04	Sage Sparrow	<.01	0

'walking transect. observations and point count data combined

[Note: Phainopepla, Loggerhead Shrike, and California Gnatcatcher and were recorded with equal frequency on western and eastern points (16%, 2% and 1%, resp.)] Figure 1 (below) graphically illustrates the drop in species diversity as one moves from west to east along the Puente-Chino Hills. This graph was created by lumping point counts and walking transects into consecutive groups of 15 from east to west, and counting the total number of species in each group. Note how those to the west of Powder Canyon support consistently lower diversity than those to the east. Closer examination of the total diversity of various subregions in the study area confirmed this pattern of decreasing diversity toward the west (see Table 5 below).

Figure 1. Total number of species recorded, west to east.^a



^awalking transect observations and point count data combined; urban-favoring species (see Table 1 above) removed

This pattern may be the result of several changes along the corridor from east to west, including amount of a particular habitat, amount of open space, the degree of isolation of the western portion of the corridor, and "natural" distribution of species along the corridor. While it is beyond the scope of this study to identify these underlying causes, we can make speculations based on our data.

To identify subtle but real vegetation differences between western and eastern sites, we mapped the distribution of the various native trees and shrubs recorded on our vegetation surveys. As mentioned above, we found "foothill chaparral" largely confined to the northeastern Puente Hills, with western outliers of this vegetation group including a single Scrub Oak found in Powder Canyon, which appeared withered and senescent, being nearly consumed by a large Mexican Elderberry. A second Scrub Oak was located in 1998 along Skyline Trail just west of Colima Dr., and also being nearly strangled, this one by Wild Cucumber. Complementing this pattern, Laurel Sumac and several Coastal Sage Scrub taxa (e.g. Purple Sage) dominate the western Puente Hills, then cross over to the south near Powder Canyon and track the southern Rank of the hills to the east. As expected, several birds that favor Coastal Sage Scrub (e.g. Cactus Wren) were recorded much more frequently in the far western and southern flanks of the hills. However, none of the chaparral-dwelling birds recorded during the study were particularly confined to foothill chaparral, and Cactus Wrens and other Coastal Sage Scrub species were recorded regularly on the north slope of the hills.

Furthermore, the species absent in the west included birds that favor a variety of vegetation types, including grassland, woodland, and riparian habitats. This lends further support to the notion that amount of habitat in the landscape or region, rather than microhabitat type at a particular site, is more responsible for species occurrence in the study area (see Bolger et al. 1997).

Patch size, or amount of open space regardless of habitat type, may not be affecting distribution along the corridor itself as much as it has been shown to affect diversity in discrete habitat patches in the San Diego area (see Sould et al. 1988, Alberts et al. 1993). Table 5 (below) compares the species diversity and richness of the various regions in the study area, and shows how survey points in the Whittier Hills (Region 1) are not nearly as diverse as those in and around the Shell property east of Fullerton Rd., despite the comparable areas of their open space.

Table 5. Relationship between geographical location, corridor area and bird species diversity^a

Region (listed west to east)	Open Space km ² ^b	Species	Species	# Point
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		Richness (H') ^c	Diversity (D) ^d	Counts
1 (605 Fwy. to Colima Rd.)	21.25 (2.25)	6.96	0.23	59
2 (Colima Rd. to Hacienda Dr.)	1.75(7.75)	5.11	0.21	12
3 (Hacienda to Fullerton Rd.)	6.75(7.5)	7.04	0.25	18
4 (Fullerton Rd. to 57 Fwy)	16.5(2)	8.67	0.32	43
5 and 6 (east of 57 Fwy.)	173.25 (15.5)	10.40	0.31	197
1, 2, and 3	29.75 (17.5)	7.37	0-.24	89
1, 5, and 6	89.75 (17.5)	10.32	0.31	240

^a Based on point counts only; urban-favoring species (see Table 1 above) removed

^b Estimated using a grid overlain onto a map of the region; area of low-density housing or isolated open space patches adjacent to corridor in parenthesis

^c Unweighted for rare species; Calculated using Shannon Index: $H' = -\sum p_i \ln(p_i)$, where $p_i = \#$ of counts where recorded/# counts in Region

^d Weighted for rare species; Calculated using Simpson Index: $D = 1/\sum p_i^2$

This leaves isolation, or the distance between a given habitat and larger reserves of open space. To explore the possible effects of isolation of diversity in the western Puente Hills, we used data from additional surveys conducted in isolated habitat patches adjacent to the wildlife corridor. The northeastern corner of the Chino Hills (north of Grand Ave. in Diamond Bar/City of Chino Hills) has an amount of open space comparable to the Whittier Hills, but is still tentatively connected to the expanses of wildland of Tonner Canyon in the vicinity of Grand Ave. in the City of Chino Hills. This area north of Grand Ave. has strikingly greater species diversity and richness than the Whittier Hills (8.48, 0.41 vs. 6.96, 0.23, resp., from Scott and Cooper 1998, unpubl. data). Similarly, the Powder Canyon area is still barely contiguous with a larger block of open space east of Fullerton Rd., which may be sustaining its current species diversity. Time since isolation (see Sould 1988) may also be a factor, as the development that isolate the Whittier Hills is several decades old, while that surrounding the Chino Hills north of Grand Ave. is mostly less than 10 years old. Thus, if the habitat in these connections is allowed to become urbanized, as they have been to the west of Powder Canyon, what was once open space along a peninsula will become increasingly isolated patches.

Wildlife Corridor vs. Chain of Reserves

Despite several major road crossings, undeveloped portions of the Puente-Chino Hills appear to be functioning as a wildlife corridor for organisms operating at a larger scale, allowing for movement of large mammals throughout the region (Beier 1996, C. Haas, pers. comm.). While this study did not address similar movement in bird species, we observed raptors that probably traveled west along the corridor to forage in the far western portion of the study area. In May, 1998, D. Cooper watched a White-tailed Kite hunt at the mouth of Canyon 6 in Hacienda Heights, then fly southeast over the houses toward a known breeding site near Powder Canyon. This species was also observed during the summers of 1997 and 1998 foraging near Colima Rd. Also during the summer of 1998, D. Cooper observed another White-tailed Kite carrying food flying north over the 60 Freeway in City of Chino Hills toward a known nest site in large open space patch in the Phillips Ranch section of Pomona. These observations were encouraging, and suggest that highly mobile raptors probably do not require habitat contiguity *per se* during the breeding season, as long as large blocks of habitat are available nearby for foraging and seclusion of nest sites.

Sedentary, terrestrial bird species might conceivably use a contiguous habitat corridor for dispersal, particularly if they are unwilling to travel through residential areas (Sould et al 1988). However, taxa falling into this category, such as California Quail and Greater Roadrunner, were generally found along the entire length of the corridor from Yorba Linda to Whittier. While it is not yet known if or how sedentary birds move throughout the region (e.g utilizing underpasses, direct flights), research on one sedentary songbird, California Gnatcatcher, has documented extensive dispersal events by juvenals, including rare instances of birds crossing short sections of residential development to reach isolated patches (Bailey and Mock 1998). Because this study looked only at diversity, rather than nesting success or juvenal survival along the corridor, it is not known whether or no its confined populations are stable at low levels.

Vulnerable Species of the Puente-Chino Hills

Of course, species diversity is only part of the picture—it says little about the distribution of rare species, which are often the focus of conservation efforts. Several state- and/or federally protected taxa are believed to breed only in the central and eastern portion of the study area, with raptors and grassland species among the most vulnerable. Other sensitive species, including California Gnatcatcher and Yellow Warbler, generally have their largest populations in the east. By contrast, no sensitive species breeds only in the western Puente Hills, and few are widespread there. This suggests that land purchases in the east, rather than the west would make greater contributions to conserving the *regional* avian diversity of Southern California as a whole. This is not to say that farther conservation acquisitions in the western Puente Hills would be an ecological lost cause, as they would enhance *local* species diversity, extending natural systems into an otherwise heavily-urbanized area of Los Angeles.

Based on our observations, we have assembled a list of species deemed most vulnerable to extirpation due to habitat loss in the study area. Other species, particularly nightbirds (Lesser Nighthawk, Common Poorwill) might also be included as "vulnerable", but were not adequately surveyed for during this study.

Northern Harrier

Restricted to fewer than three breeding pairs (none in some years?). Requires extensive grassland where water collects during the winter. Suitable habitat may be confined to widest portion of study area in San Bernardino County (vic. City of Chino Hills, Chino Hills State Park).

White-tailed Kite

Probably fewer than ten breeding pairs during this study. Requires extensive grassland interspersed with clumps of woodland for nesting. As with the preceding species, narrowly-confined open space (e.g. vic. La Habra Hts., Whittier hills) is apparently unsuitable for breeding, and all pairs were believed to have nested east of Powder Canyon.

Prairie Falcon

Golden Eagle

These two raptors are confined to 1-2 breeding pairs each, all east of the 57 Fwy. Both may be dependent on larger blocks of open space than that protected by Chino Hills State Park alone. At least the eagle is believed to forage west all along the corridor during the breeding season (observed at Rose Hills Memorial Park in July 1997). Given their low numbers, one can safely assume that both are teetering on the verge of extirpation in the Puente-Chino Hills. By comparison, the entire Santa Ana Mountains support 4-5 pairs of Golden Eagles.

Burrowing Owl

Recently extirpated. Reestablishment is conceivable in remaining grazed areas north and east of Chino Hills State Park. A semi-colonial species associated with California Ground-Squirrels and possibly cattle grazing, but also dependent on flat, extensive grassland and dirt fields. The last bird in the study area was observed in 1993 near the main entrance of Chino Hills State Park.

Oak Titmouse

Patchily distributed and largely confined to the eastern Puente and western Chino Hills (e.g. scarce within Chino Hills State Park away from the Santa Ana River). Firestone Boy Scout Reserve and the Shell property (west of 57 Fwy.) may support the largest population of this species. It is also present in patches of oak woodland within Diamond Bar, but many of sites these face imminent development.

California Gnatcatcher

A quintessential private-land-dependent species, its main distribution extends from the northern fringes of Brea east to western Yorba Linda. This area also protects the largest, least-fragmented expanse of Coastal Sage Scrub in the study area. Now extirpated from apparently suitable habitat within Chino Hills State Park just to the north and from its historical range in Diamond Bar and Whittier, this species occurs only as scattered pairs west of this core area (e.g. La Habra Heights). Individual gnatcatchers observed just south of the 91 Fwy. at Coal Canyon (G. Hund pers. comm.) may represent a tiny population there, or may represent transients, as the north face of the Santa Ana Mountains is dominated by chaparral, rather than their preferred Coastal Sage Scrub.

Loggerhead Shrike

Scattered breeding populations throughout range, this semi-colonial species apparently favors overgrazed and sparsely-vegetated areas in the region. Only one group is located on protected land (upper Aliso Cyn., Chino Hills State Park). Two other "populations" (2-5 pairs) are in the vicinity of English Rd., City of Chino Hills; and on Shell property south of the "Vantage Pointe" housing development. Scattered pairs were found at Rose Hills Memorial Park, on MRCA land in La

Habra Hts., and in Yorba Linda. Can persist as a breeder in fairly developed areas (e.g. along powerline rights-of-way in the Los Angeles Basin), provided some flat, scrubby grassland is present.

Horned Lark

This species breeds exclusively in flat, open land with sparse vegetation. Even recently-graded housing sites have supported breeding pairs as long as they were located within extensive, non-wooded country. However, these are obviously unsustainable habitats, and aside from scattered pairs on soon-to-be-developed land within the City of Chino Hills (e.g. along Eucalyptus Ave.), the only sizable breeding population appears to persist near the freshwater marsh in upper Tonner Canyon at Grand Ave.

Hutton's Vireo

This bird was initially believed to be restricted to mesic Coast Live Oak woodland in the central portion of the study area, but in 1998, scattered pairs or individuals were detected in outlying areas (e.g. Turnbull Cyn., Whittier) and even in dense Eucalyptus groves (Murphy Ranch Park, Whittier; Hollow Run Park, City of Chino Hills). It appears to be very patchily distributed in the study area, confined to areas with extensive groves of tall trees along streams. Like Oak Titmouse, this species is very scarce in the southern and southeastern portion of the study area, and, like Oak Titmouse, appears to reach its peak abundance in the vicinity of Diamond Bar/Rowland Heights.

Least Bell's Vireo

This species is probably confined to just two areas, southeastern Chino Hills State Park and Carbon Canyon Regional Park. Although these areas are well-protected, the vireo is extremely local even within these areas and is considered vulnerable to habitat alteration. In Chino Hills State Park, it occurs along the Santa Ana River east of the Green River Golf Course, with most singing birds farther to the east where Hwy. 71 crosses the river adjacent to the spillway. A pair feeding young was apparently found during 1998 (K. Miner, pers. comm.) near the park headquarters, and scattered single males were noted in 1998 along Lower Aliso Cyn. (CHSP), along Hwy. 71 adj. to the Prado Basin and in Schabarum Park (Rowland Heights). Birds in Carbon Cyn. Regional Park occur within a flood control basin, a location that is notoriously vulnerable to periodic habitat alteration.

Lark Sparrow

Occurring only east of Harbor Blvd., the largest populations may be on Shell property (south of the "Vantage Point" housing development), although several areas suspected of supporting breeding Lark Sparrows were off-limits during this study (e.g. east of Chino Hills State Park). This bird tends to occur mainly in association with cattle, and is largely absent from the southeastern Chino Hills (incl. Chino Hills State Park).

Grasshopper Sparrow

Largely confined to extensive grassland east of Harbor Blvd., this species is somewhat nomadic, often breeding commonly in one area for a few years and moving on. As such, several large blocks of habitat are probably necessary for its persistence within the study area. Currently, Chino Hills State Park is the only protected area that supports this species, though a small colony (3-5 pairs) was detected in the eastern portion of Powder Canyon, and at least one pair bred in 1995 along the Skyline Trail in Whittier & Schinahl, pers. comm.)

Bell's Sage Sparrow

Distribution poorly known—a single juvenal bird was found in Coastal Sage Scrub south of the "Vantage Point" housing development in 1997; unrecorded 1998. While widespread in the foothills of the mountains surrounding the Puente-Chino Hills, lowland populations of this species are dependent on extensive tracts of Coastal Sage Scrub and are almost extirpated from Southern California. Black-chinned Sparrow Like Grasshopper Sparrow, loosely colonial. Only a single group found, in 1997 in dense Coastal Sage Scrub on Wells Fargo property in northern Yorba Linda. This bird may also breed irregularly in similar habitat along the Skyline Trail in the Whittier Hills (L. Schmah, pers. comm.), and conceivably on Firestone Boy Scout Reserve, which was not surveyed. The most extensive habitat for this species is found south of Chino Hills State Park and is currently threatened by ongoing development in northern Yorba Linda.

Lazuli Bunting

Also somewhat nomadic and loosely colonial, the largest population was found in and around the Shell property (south of "Vantage Point" housing development). Birds were found to be scarce within Chino Hills State Park, despite the presence of much suitable habitat. Somewhat of a habitat generalist, its presence in an area as a breeder may depend on large blocks of open grassland/riparian scrub, as it does not breed in isolated habitat patches adjacent to the corridor.

Tricolored Blackbird

A small colony (c. 100 pairs) was noted breeding in the freshwater marsh along Grand Avenue between Diamond Bar and City of Chino Hills (see above). This is apparently City of Industry property and the site for a proposed reservoir (C. Schlotterbeck), which, depending on its construction could extirpate this species in the region.

Warbling Vireo

Yellow Warbler

Western Wood-Pewee

Yellow-breasted Chat

Swainson's Thrush

The true extent of these birds' breeding ranges is poorly understood. All were detected in scattered wooded canyons and larger riparian stretches throughout the study area during 1997-8, including such seemingly marginal sites as Schabarum Park and Turnbull Canyon. However, whether they actually breed in all of these localities is not known, as their nests can be difficult to observe unless one is specifically searching for them. The largest populations are probably secure within Chino Hills State Park, but based on our walking transects, the entire park may only support a handful of breeding pairs of each species. All require some riparian vegetation with emergent native trees such as willows or sycamores, but many seemingly suitable sites lack these species (e.g. Carbon Canyon; the creek along Hacienda Blvd.; Walnut Creek in Covina). Parasitism by Brown-headed Cowbirds is probably a major threat to all these birds throughout the study area. They are included because they occur in very low densities overall (though may be locally common), and more research is warranted on their ecology within the Puente-Chino Hills.

Conservation Assessment of Surveyed Regions

Wildland-Sensitive Species

We have compiled a list of species we consider characteristic of wildlands in the study area (See Table 6, Appendix A, below). These are birds that tend to be absent from urban and suburban habitats, and are generally restricted to fairly large expanses of native habitat. They are generally found throughout the corridor, so would be expected to occur wherever the appropriate habitat exists. Nearly all of these species are of at least local conservation interest because of small populations, either locally (i.e. in Southern California) or globally. Note that some wildland species, particularly raptors, appear sporadically along the corridor throughout the summer, but don't necessarily breed where they occur.

Table 6. Wildland-Sensitive Species of the Puente-Chino Hills

Riparian

Yellow-breasted Chat
Yellow Warbler
Warbling Vireo
Least Bell's Vireo (Federally Endangered)

Chaparral

California Quail
Wrentit
California Thrasher
Costa's Hummingbird

Native Woodland (Coast Live Oak/Black Walnut)

Hutton's Vireo
Northern Flicker
Oak Titmouse
Western Wood-Pewee

Grassland (includes exotic grasses)

Western Meadowlark
Blue Grosbeak
Grasshopper Sparrow
White-tailed Kite

Coastal Sage Scrub

Rufous-crowned Sparrow
Greater Roadrunner
Cactus Wren
California Gnatcatcher (Federally Threatened)

Rare Species

Loggerhead Shrike (3 colonies, 3 other pairs)
Homed Lark (<5 irregular sites?)
Common Ground-Dove (2 sites)
Black-chinned Sparrow (1 colony)
Northern Harrier (2 sites)
Tricolored Blackbird (1 site)
Canyon Wren (1 site)
Golden Eagle (1 site)
Prairie Falcon (1 site)
Bell's Sage Sparrow (1 site; extirpated?)

Region 1 (605 Fwy to Colima Rd.); *Whittier/Hacienda Hts.*

Known as the "Whittier Hills", the primary conservation value of this region is its proximity to urban Los Angeles. Large areas of environmental alteration (Puente Hills Landfill, Rose Hills Memorial Park and former Chevron Oil property) and frequent fires have whittled the existing habitat down to a fairly narrow corridor of relatively undisturbed vegetation. Small populations of several indicator species, however, persist in remnant habitats within this section of the corridor.

Particularly troubling is the rarity or absence of several indicator species in Region 1, suggesting that local range contractions have occurred in the western portion of the western Puente Hills. In many cases, the missing species occurred in the Region as recently as the 1970s, but have since disappeared. Bird species are missing from every habitat category, which suggests that landscape factors, such as habitat size, degree of surrounding urbanization, etc. may be to blame. Frequent fire continues to seriously degrade the Coastal Sage Scrub habitat in this Region, resulting in a monoculture of exotic grasses too small to attract many grassland bird species.

Sycamore Canyon/Turnbull Canyon

Wildland-sensitive species (12/8)

These two drainages represent the only significant riparian habitats in Region 1, with small patches of riparian vegetation (willows, mulefat) scattered throughout the region. While the narrow width of the riparian vegetation may exclude certain bird species (e.g. Least Bell's Vireo), both support summering Yellow-breasted Chat and Yellow Warbler, two indicators of decent riparian habitat. One of the best examples of Coastal Sage Scrub habitat in the Whittier Hills may be found along a steep ridge on the north side of Sycamore Canyon. Though possessing a full complement of CSS plants (e.g. Bush Sunflower, White Sage), this slope and other patches of CSS in the Whittier Hills (e.g. Hellman Park) have apparently lost California Gnatcatcher (L. Schmahl, pers. com.).

L.A. Co. Sanitation Distr. & vic.

("Canyons 6 & 7"; part of the Hacienda Hills Open Space Reserve)

Wildland-sensitive species (9)

While these canyons feature scenic Coast Live Oak-clad slopes tall sycamores, they were found to support few wildland species, indicating a lower conservation importance relative to sites farther east. Conversation with long-time Whittier residents (e.g. J. Schmidt) suggest that these canyons have suffered numerous fires in the past two decades, which have begun to transform their woodlands to chaparral. The grassy slopes in the area were not found to support many breeding grassland birds. However, in a great example of the corridor's regional value for wide-ranging raptors, in June of 1998, a White-tailed Kite was observed hunting over the flat grassland near the canyons' mouths, then flying west toward Powder Canyon, where a pair has recently nested.

Rose Hills Memorial Park

Wildland-sensitive species (6)

Although the back part of the cemetery may protect the largest expanse of grassland in Region 1, it was apparently Coastal Sage Scrub fairly recently but has been constantly graded and mowed by Rose Hills. Despite its "unnatural" origins, this grassy expanse supports the largest or only breeding populations of several grassland species in the Whittier Hills, including Loggerhead Shrike, Western Meadowlark, and, at least irregularly, Grasshopper Sparrow. An adult Golden Eagle was observed foraging here during July of 1997, which is probably the same bird that has nested recently in the Chino Hills.

Hellman Park

Wildland-sensitive species (7)

The slopes and ridges here support one of two large tracts of Coastal Sage Scrub in the Whittier Hills, the other being the north side of Sycamore Cyn. The colony of Cactus Wren that occurs here in Hellman Park may be one of the largest in the entire Puente-Chino Hills.

Former Chevron (MRCA)

Wildland-sensitive species (8)

This MRCA parcel protects degraded Coastal Sage Scrub and sumac chaparral habitat that has been nearly overrun with fire-following exotic plants (e.g. Castor Bean, Tree-Tobacco). Cactus Wren was detected here, although they have been reduced to fewer than three pairs on the southwestern edge of property adjacent to a residential neighborhood. The eucalyptus grove planted on the southern edge of the property has increased the local diversity of the site by supporting species that would not ordinarily occur in scrub habitats, including Northern Flicker, Cassin's Kingbird and Red-shouldered Hawk, but has reduced the amount of Coastal Sage Scrub available to species like Rufous-crowned Sparrows. Like most scrubland habitats in the study area, too-frequent fires threaten to totally convert the habitat here to weedy grassland.

Region 2 (Colima Rd. to Hacienda Blvd.) *Whittier, La Habra Hts., Hacienda Hts.*

Though biogeographically part of the Whittier Hills (abundant Laurel Sumac, little Black Walnut or "foothill" chaparral), this small region was singled out to illustrate the ecological limitations of narrowly confined open space. This patch is bounded by the triangle formed by Colima Rd. and Hacienda Blvd., and features a narrow bottleneck on its eastern edge (near the Buddhist Temple in Hacienda Hts.) and 4-lane Colima Rd. on the west, where traffic moves at freeway speeds. Oak woodland is sparse here, and walnut woodland practically non-existent. The bulk of the native vegetation may be actually found in the numerous fragments within the low-density housing tracts of La Habra Hts. to the south of the corridor, which support a limited subset of wildland-sensitive species (see above).

Former Unocal (MRCA)

Wildland-sensitive species (10)

This diverse parcel of sumac chaparral, riparian scrub, grassland and Coastal Sage Scrub is a particularly bird-rich site. Most surprisingly, a small population of California Gnatcatcher was found here in a large patch of planted California Buckwheat. Say's Phoebe, a bird recently rediscovered as a breeder in coastal Southern California, reaches its westernmost distribution (in the study area) in the grassland fragments here. A large patch of prickly-pear-rich Coastal Sage Scrub persists on the north side of this property on both sides of Colima Rd., and may account for the conspicuous presence of Costa's Hummingbird and Greater Roadrunner here. This property is essentially contiguous with the open space of the Friendly Hills development and, farther south, Murphy Ranch Park in southeastern Whittier. The maintenance of its diverse bird community may depend upon curbing development to the north, which continues to whittle away its remaining Coastal Sage Scrub and grassland.

Murphy Ranch Park

Wildland-sensitive species (2)

Located in southeast Whittier, this semi-wild park is dominated by planted Eucalyptus trees with scattered native Coast Live Oaks and shrubs. Its depauperate bird community provides an illustration of what a poor substitute even well-wooded parks provide for many native bird species. A few small willows along the creek and a small Coast Live Oak-filled gully at the far north end of the park appear to be the only intact native vegetation community within the park. Inexplicably, the park is carefully manicured so that an understory cannot develop, although no lawn has been planted. Restoration potential of its native oak woodland and riparian corridor using native plants appears excellent.

"Friendly Hills" Open Space (La Habra Hts.)

Wildland-sensitive species (5)

Located adjacent to and just north of Murphy Ranch park this patch of Coastal Sage Scrub and grassland was found to support a tiny population of California Gnatcatcher (as few as one pair). Aside from this species, few other indicator species were noted, probably due to either its small size and isolation from other habitats. This parcel is a good example of the shortcomings of small, isolated open space-it supports many widespread, abundant species (e.g. Wrentit, California Quail), but very few slightly less common ones (e.g. Rufous-crowned Sparrow, Western Meadowlark), which were undoubtedly more common prior to development.

Region 3 (Hacienda Blvd. to Fullerton Rd./Harbor Blvd.) *La Habra Hts., Rowland Hts., Hacienda Hts.*

The open space here is similarly narrowly confined between the suburbs of La Habra and Hacienda Hts., except for the block comprised of Schabarum Park/Powder Cyn. The older (1960's) suburbs to the south of the corridor have retained patches of original oak-walnut woodland and scrub habitats as well as orchard remnants (incl. giant eucalyptus). Consequently, they support a limited number of non-urban species such as House Wren, Pacific-slope Flycatcher, Bullock's Oriole). To the north, the newer tract home neighborhoods are comparatively devoid of native birds.

The wildland portions of Region 3 marks an east-west transition zone of the study area, most apparent in the vegetation composition of the woodland and scrub communities. Southern California Black Walnut, a tree endemic to the L.A. Basin, is dominant in the chaparral and woodland in the eastern portion of Region 3, but practically absent further west. Several chaparral plants also appear in here, especially within Powder Canyon, that are more widespread to the east, discussed below. Finally, several wildland-sensitive birds (see below) that are scarce in Region 1 were found to be fairly common east of here, particularly grassland and Coastal Sage Scrub species.

Powder Canyon (MRCA)/Schabarum Park

Wildland-sensitive species (15)

Powder Cyn. preserves the westernmost extensive stand of Southern California Black Walnut Woodland in the study area, as well a large Coast Live Oak woodland (that of the Whittier Hills is highly fragmented). Numerous chaparral shrubs, incl. Chaparral Honeysuckle and Holly-leaf Redberry become much less common in Puente Hills chaparral west of here, suggesting that this site represents a significant east-west biogeographical boundary in the study area.

Perhaps the most striking differences between this area and that to the west lie in their grassland birds. All four of the grassland indicator species breed on grassy slopes on the southeast portion of Powder Canyon, but are practically absent as breeders in grassland to the west. Several other open-country species, such as Say's Phoebe, are common here and highly localized further west. The habitats seem to be ecologically contiguous with the more extensive open space east of Fullerton Rd., although recent development along Harbor Blvd. has all but eliminated this link.

One of the few patches of Coastal Sage Scrub in the Region may be found on the northwest corner of Schabarum Park, near the southern terminus of Azusa Blvd., which supports a population of Cactus Wren and Costa's Hummingbird. Several pairs of Western Bluebird breed in Western Sycamores in Schabarum, Park, which makes it the farthest-west breeding location for this species in the Puente Hills. Interestingly, the riparian corridor through Schabarum Park was found to harbor several sensitive riparian bird species. Two territorial Yellow-breasted Chat were found in 1997, and surveys in 1998 revealed several singing Warbling Vireo and a singing Least Bell's Vireo, the latter probably a migrant. While the habitat is currently too sparse for all of these species (it is mowed and cleared regularly by the park crew), the simple fact that they were present in June indicates that breeding is at least a possibility here. Every effort should be taken to improve the management of this site for riparian species.

"Canyon Ranch" development (Hacienda Hts.)

Wildland-sensitive species (6)

This parcel was first visited during this study in 1998, and was found to protect a small canyon with several ancient sycamores along the stream, as well as a fairly extensive Coast Live Oak woodland on its east-facing slope. While Hutton's Vireo was the only woodland wildland species found here, more surveys could turn up additional species.

Seirafi Property (La Habra Hts.)

Wildland-sensitive species (5)

This small canyon with a decent patch of Coastal Sage Scrub near the intersection of Leucadia Dr. and Skyline Trail deserves mention, because it would be a logical addition to the corridors protected, contiguous open space. Sizable populations of Cactus Wren and Rufous-crowned Sparrow were found here.

Region 4 (Fullerton Rd./Harbor Blvd. to 57 Fwy.) Rowland Hts., Diamond Bar, Brea

Wildland-sensitive species (19)

Due to access problems surveying the Shell Property, which makes up the majority of the land in Region 3, we are only reporting on birds found in the designated open space to the north and south of the Shea housing development. This large patch of open space between Harbor Blvd. and the 57 Freeway is a gold mine of locally rare breeding species. Birds that are common in Region 3 that are either absent or scarce to the west include Grasshopper Sparrow, Lazuli Bunting, Say's Phoebe, Loggerhead Shrike, Lark Sparrow and Oak Titmouse. One of the largest Los Angeles-area population of Grasshopper Sparrow may be present here. Other species detected here worth mentioning include Bell's Sage Sparrow (only breeding season record for entire study area, with the nearest birds in Santa Ana and San Gabriel mtns.); Lesser Nighthawk and Golden Eagle, both of which are extremely scarce in the Puente-Chino Hills, though more numerous elsewhere in southern California. The eagles (adult and immature observed) probably wandered over from a known nest site within Chino Hills State Park.

The creek just south of Shea Development supports a severely-degraded riparian zone, heavily-grazed Coastal Sage Scrub, and intact Black Walnut Woodland, the latter located just east of Harbor Blvd. This area was found to have strong populations of several uncommon species (e.g. Lazuli Bunting) and is therefore of conservation interest. It is likely that habitats on the Shell property to the south and east feature a similar array of wildland species, including California Gnatcatcher (which persists just southeast of here on Torch property in the City of Brea). Additionally, much of the topography in this Region is flat and will undoubtedly be developed quickly if not protected.

Several private development holdings (incl. Ridgemoore, Southpointe) support excellent but critically-threatened examples of mature Coast Live Oak woodland, with some giant, 100+ year-old trees (visible from Pathfinder Rd.). It is possible that the presence of these woodlands may be vital in sustaining the woodland bird community west of the 57 Fwy., since several woodland-dwelling wildland species become rare west of here. These woodlands will almost certainly be destroyed soon unless protected immediately.

Region 5 (57 Fwy. east to San Bernardino Co. line) *Brea, Yorba Linda; Los Angeles and Orange Co.*

Due to access problems in Diamond Bar, Firestone Boy Scout Reserve, and various private holdings (e.g. Shell property), we are reporting only on surveys conducted along a narrow strip in the southwestern portion of this region (Torch and Monterey Resources property), as well as scattered holdings in Yorba Linda to the east. Despite this restriction and based upon our findings during 1997 and 1998, Region 4 may have more sensitive species than any other in the study area. The Coastal Sage Scrub here is particularly extensive and floristically diverse (e.g. with Yerba Santa), though critically threatened by development.

Torch Property

Wildland-sensitive species (13)

Like the former Chevron property in Whittier, the Torch land has been degraded by years of oil extraction. However, Torch supports a surprisingly intact riparian and Coastal Sage Scrub bird community that Chevron may never see. Several calling California Gnatcatchers were detected adjacent to Wildcat Dr., just east of the 57 Fwy. (where recent development has no doubt destroyed large amounts of Gnatcatcher habitat), and additional birds may be present elsewhere in the area. The riparian woodland along Tonner Cyn. begins near Brea Cyn. Rd. and greatly improves to the east, where it most of the riparian and woodland indicator species were found. Just east of the Torch property line, Firestone Boy Scout Reserve supports a stand of mature sycamore trees above a dense willow forest, which could not be surveyed during this study. We are confident that this area supports several indicator species, as well as scarce breeders such as Western Wood-Pewee and Warbling Vireo.

Monterey Resources Property

Wildland-sensitive species (5)

This parcel is similar to the adjoining Torch property in its level of disturbance, but lacks both the riparian habitats as well as extensive Coastal Sage Scrub vegetation. Much of the latter was apparently destroyed when the lower (southern) portion was graded, and now sumac chaparral dominates the remaining vegetation. Native woodland was probably never present here, though extensive further east up Carbon Canyon. The habitat on the adjacent Orange Co. landfill property appears similar to that on Monterey Resources land, but with much more extensive Coastal Sage Scrub, particularly cactus-dominated scrub. Several Cactus Wren were heard from the entrance road, and while no fieldwork was conducted on landfill property during this study, a representative we spoke with in 1997 informed us that California Gnatcatchers had been recorded on the property during previous surveys.

Carbon Canyon Regional Park

Wildland-sensitive species (16)

One of the finest examples of riparian habitat in the entire study area may be found within this park. It features extensive willow forest with one of the two populations of Least Bell's Vireo in the study area; the other being along the Santa Ana River near Prado Dam. Other scarce riparian species believed to breed at the park include Yellow Warbler, Warbling Vireo, and Swainson's Thrush. A family of California Gnatcatchers was located in Coastal Sage Scrub on the south side of the park during 1997 fieldwork, suggesting that this species may still have a semi-contiguous range from the Torch Property east through northwestern Yorba Linda. Finally, one of the two remaining populations of Common Ground-Dove in the study area persists in the lemon groves adjacent to this park.

Chino Hills State Park, "Olinda Annex"

Wildland-sensitive species (10)

This section of Chino Hills State Park protects a variety of habitats (except riparian), but is dominated by mixed walnut and sumac chaparral. A small amount of Coast Live Oak woodland exists at the far northern edge of this site, contiguous with the spectacular oak woodland on the Firestone Boy Scout Reservation. It appears to be currently well protected by the park.

Vic. Fairmont Blvd. (Yorba Linda)

Wildland-sensitive species (8)

These contiguous properties support what may be the largest population of California Gnatcatcher in the study area. Several birds were detected adjacent to Fairmont Blvd. in western Yorba Linda in habitat that is contiguous for several miles to the west. All Coastal Sage Scrub indicator species were also found to be encouragingly numerous in this area, which may support the finest example of intact Coastal Sage Scrub in the entire study area, with little exotic grassland and few roads cutting through the habitat. This site is critically threatened by development (G. Hund, pers. comm.).

Wells Fargo Bank and vic. (Orange Co.)

Wildland-sensitive species (13)

Access here was very difficult due to steep terrain and few trails, but peripheral surveys suggest that this is a diverse, rich area of Coastal Sage Scrub and grassland. With the exception of California Gnatcatcher, which may be present but just elusive, several wildland species of these habitats were common, including Grasshopper Sparrow, Cactus Wren, Western Meadowlark, and Costa's Hummingbird. Northern Harrier was observed both in 1997 and 1998 along Wire Springs Rd. leading in to Chino Hills State Park, so may nest locally. The Coastal Sage Scrub along Wire Springs Rd. was not found to support California Gnatcatchers, but did harbor (at least in 1997) a small colony of Black-chinned Sparrow, a foothill chaparral species that was otherwise undetected in the study area.

Featherly Regional Park (Yorba Linda)

Wildland-sensitive species (8)

We elected to only visit this park twice during the study, since its resources are presumably well protected. While the woodland and riparian habitat along the Santa Ana River in this area will probably not see much more development, is seriously threatened by *Arundo donax*, the "giant reed", which has nearly choked-out all riparian growth along this stretch of the river. *Arundo* removal, combined with Brown-headed Cowbird trapping, should result in a strong rebound of the riparian species here, particularly Yellow Warbler and Least Bell's Vireo.

Region 6 (San Bernardino and Riverside Co.) *City of Chino Hills; San Bernardino County*

Region 5 is currently undergoing the most rampant transformation to urban development anywhere in the study area, particularly within the City of Chino Hills. Unless habitat acquisition occurs quickly, much of its biodiversity will simply be lost. All records are from visual and aural surveys conducted along public roads. While the

open space of the upper portions of Tonner and Soquel canyons could not be surveyed thoroughly because of lack of access, it is clear that these canyons are storehouses of avian diversity in Region 5.

**City of Chino Hills, north
(60 Fwy. south to Chino Ave. and Eucalyptus Ave.)**

Wildland-sensitive species (20)

The habitat patches in this region were surveyed from the numerous public roads in the area, which provided fairly good access. Evidence of species decline was noted in the virtual absence of some of the same birds that are common in more intact open space to the south and west, particularly oak woodland species like Hutton's Vireo, Oak Titmouse, and Lark Sparrow. As expected, most of the grassland bird diversity was confined to the largest habitat patches and along the extensive open space of Upper Tonner Cyn., and along English Rd., a soon-to-be-developed patch of flat pastureland east of Chino Hills Parkway. The largest population of Loggerhead Shrike in the study area occurs along English Rd. may also include the most significant riparian habitats in the region, with summering Yellow Warbler and Warbling Vireo on territory during the summer of 1998. Finally English Rd. may provide the last reasonable habitat for Burrowing Owl in the region, an open-country species that was totally extirpated from the Puente-Chino Hills in the early 1990's.

Upper Carbon Canyon (San Bernardino Co., incl. City of Chino Hills)

Wildland-sensitive species (22)

Most of this region was inaccessible to our surveys. While many wildland species of the study area were found to be present here, the explosion of development along Carbon Canyon Rd. should result in the extirpation of many of these birds within the boundaries City of Chino Hills, particularly if Upper Tonner Canyon is opened for development or a reservoir project, as has been rumored (C. Schlotterbeck, pers.comm.) Extensive Coast Live Oak woodland and grassland remains here, but the exact extent of riparian habitats was not learned due to access problems. Coastal Sage Scrub is scarce, probably naturally replaced by chaparral in this area due to cooler nights and higher rainfall than points south and east.

The recent extension of Grand Ave. to connect Diamond Bar with City of Chino Hills cut directly across what is arguably the most significant wetland in the entire Puente-Chino Hills. This freshwater marsh, which includes a stock pond called "Arnold Reservoir" on most maps, supports an active breeding colony of Tricolored Blackbird, one of only a handful left in the Los Angeles Basin. At least one pair of Northern Harrier also nests in the vicinity, and Golden Eagle is regularly seen foraging in this area (B. Daniels, pers. comm.). Least Bittern may also be present in this marsh, but access to survey thoroughly was denied. This combination of open grassland adjacent to a natural freshwater marsh is now extremely rare in southern California, and is poorly reproduced by modern reservoir construction.

Chino Hills State Park (San Bernardino/Orange/Riverside Co.)

Wildland-sensitive species (24)

Because its resources are well-protected, I will not discuss Region 6 here, except to say that it protects representatives of all of the major habitats types in the study area, with nearly all wildland-sensitive species present. Habitats east of Chino Hills State Park were not surveyed due to access problems, but they probably protect a similar array of species as found in the park.

Acknowledgments

We would like to first thank the staff of the Mountains Recreation and Conservation Authority, in particular A. Gullo and A. Lethbridge for providing the funding and the logistical support for the project. C. Swift of Whittier College graciously provided aerial photos and vegetation maps. M. San Miguel, N. Landes, N. Storms, I Schmitt and C. Campbell assisted in fieldwork. M. Wimer of the Los Angeles County Breeding Bird Atlas generously provided us with breeding records, and S. Breaux, C. Campbell, B. Daniels, D. Guthrie, F. Hayes, M. Long, I Pike, L. Schmahl and J. Schmitt contributed unpublished field notes and recollections concerning bird distribution in the study area. K. Garrett, R. Minnich and M. Patten offered lucid conversation on biogeography of the study area, and R. Minnich provided helpful comments on earlier drafts. G. Hund of California Department of Parks and Recreation and C. Schlotterbeck kept us apprised of local conservation issues. M. Long of

Eaton Canyon Nature Center and A. Sanders of UC Riverside Herbarium assisted greatly in plant identification and biogeographical insight. Finally, accommodating staff at both Torch Operating Company and Monterey Resources in Brea greatly facilitated fieldwork on their properties.

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See Map 1 for locations

Appendix A. Wildland-Sensitive Species of the Puente-Chino Hills (see Appendix B for abbreviations)

			Riparian Species				Woodland Species				Coastal Sage Scrub Species				Chaparral Species			
			YBCH	YEWA	WAVI	LBVI	HUVI	NOFL	OATI	WWPE	RCSP	GRRO	CCWR	CAGN	CAQU	WREN	CATH	COHU
Region 1	1a	Sycamore Cyn.	X	X	X		X	X		X	X		X	X	X			
	1b	Turnbull Cyn.	X				X	X			X			X	X	X		
	1c	L.A. Cation	X							X	X	X		X	X	X	X	
	1d	Rose Hills Mem. Park												X	X	X		
	1e	Hellman Park								X	X	X		X	X	X		
	1f	Former Chevron						X		X	X	X		X	X	X	X	
Region 2	2a	Former Unocal								X	X	X	X	X	X	X	X	
	2b	Murphy Ranch Park					X							X				
	2c	Friendly Hills Estates											X	X	X	X		
Region 3	3a	Powder Cyn.	X		X		X	X		X	X	X		X	X	X	X	
	3b	Canyon Ranch					X			X				X	X	X	X	
	3c	Serafi Property								X		X		X	X	X		
Region 4	4a	Shell w. of 57 Fwy.					X	X	X	X	X	X		X	X	X	X	
Region 5	5a	Torch	X	X			X	X	X		X	X	X	X	X	X		
	5b	Monterey Resources									X	X	X		X	X		
	5c	Carbon Cyn. Reg. Park	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	5d	Olinda Annex, CHSP						X	X					X	X	X	X	
	5e	Fairmont Blvd.									X	X	X	X	X	X	X	
	5f	Wells Fargo									X	X	X		X	X	X	
	5g	Ch. Hills S.P. (ORA Co.)	X		X		X	X	X	X	X	X		X	X	X	X	
5h	Featherly Reg. Park	?	X	X			?	X					X	X	X			
Region 6	6a	City of Ch. Hills, north	X	X	X			X			X	X	X	X	X	X	X	
	6b	Upper Carbon Cyn.	X	X	X		X	X	X	X	X	X		X	X	X	X	
	6c	Ch. Hills S.P. (SBD/RIV Co.)	X	X	X	X	X	X	X	X	X	X		X	X	X	X	

See Map 1 for locations

Appendix A. Wildland-Sensitive Species of the Puente-Chino Hills (see Appendix B for abbreviations)

			Grassland Species				Rare	Species (various habitats)									
			WEIVIE	BLGR	GRSP	WTKI		LOSH	HOLA	COGD							
Region 1	1a	Sycamore Cyn.		X													
	1b	Turnbull Cyn		X													
	1c	L.A. Co. Sanitation		X													
	1d	Rose Hills Mem. Park	X	X			X										
	1e	Hellman Park		X													
	1f	Former Chevron															
Region 2	2a	Former Unocal		X			X										
	2b	Murphy Ranch Park															
	2c	Friendly Hills Estates															
Region 3	3a	Powder Cyn.	X	X	X	X											
	3b	Canyon Ranch															
	3c	Serafi Property															
Region 4	4	Shell w. of 57 Fwy.	X	X	X	X		X						X	X	X	
Region 5	5a	Torch		X													
	5b	Monterey Resources															
	5c	Carbon Cyn. Reg. Park		X					X								
	5d	Olinda Annex, CHSP		X													
	5e	Fairmont Blvd.															
	5f	Wells Fargo	X	X	X		X			X							
	5g	Ch. Hills S.P. (ORA Co.)	X	X	X	X	X						X	X			
	5h	Featherly Reg. Park		?		X			X								
Region 6	6a	City of Ch. Hills, north	X	X	X	X	X	X				X	X		X		
	6b	Upper Carbon Cyn.	X	X	X	X	X	X				X	X		X		
	6c	Ch. Hills S.P. (SBD/RIV Co.)	X	X	X	X	X					X			X	X	

Appendix B. Breeding birds of the Puente-Chino Hills; plants mentioned in the text

BIRDS

(Single asterisks indicate species recorded during study with no evidence of breeding)

(Double asterisks indicate species not recorded but known to have bred recently)

English Name	Latin Name	Abbrev.
Pied-billed Grebe*	<i>Podilymbus podiceps</i>	
Double-cr. Cormorant*	<i>Phalacrocorax auritus</i>	
Great Blue Heron*	<i>Ardea herodias</i>	
Great Egret*	<i>A. albus</i>	
Snowy Egret*	<i>Egretta thula</i>	
Green Heron*	<i>Butorides virescens</i>	
Black-cr. Night-Heron*	<i>Mycticorax nycticorax</i>	
Mallard*	<i>Anas platyrhynchos</i>	
Cinnamon Teal*	<i>A. cyanoptera</i>	
Turkey Vulture*	<i>Cathartes aura</i>	
White-tailed Kite	<i>Elanus leucurus</i>	WTKI
Northern Harrier	<i>Circus cyaneus</i>	NOHA
Cooper's Hawk	<i>Accipiter cooperii</i>	
Red-shouldered Hawk	<i>Buteo lineatus</i>	
Red-tailed Hawk	<i>B. jamaicensis</i>	
Golden Eagle	<i>Aquila chrysaetos</i>	GOEA
American Kestrel	<i>Falco sparverius</i>	
Prairie Falcon	<i>F. mexicanus</i>	PRFA
California Quail	<i>Callipepla californica</i>	CAQU
American Coot*	<i>Fulica americana</i>	
Killdeer	<i>Charadrius vociferus</i>	
Spotted Sandpiper*	<i>Actitis macularia</i>	
Rock Dove	<i>Columba livia</i>	
Band-tailed Pigeon	<i>C. jasciata</i>	
Spotted Dove	<i>Streptopelia chinensis</i>	
Mourning Dove	<i>Zenaida macroura</i>	
Common Ground-Dove	<i>Columbina passerina</i>	COGD
Greater Roadrunner	<i>Geococcyx californianus</i>	GRRO
Barn Owl	<i>Tyto alba</i>	
Western Screech-Owl	<i>Otus kennicottii</i>	
Great-homed Owl	<i>Bubo virginianus</i>	
Burrowing Owl**	<i>Athene cunicularia</i>	
Lesser Nighthawk	<i>Chordeiles acutipennis</i>	
Common Poorwill**	<i>Phalaenoptilus nuttallii</i>	
White-throated Swift	<i>Aeronautes saxatalis</i>	
Black-ch. Hummingbird	<i>Archilocus alexandri</i>	
Anna's Hummingbird	<i>Calypte anna</i>	
Costa's Hummingbird	<i>C. costae</i>	COHU
Allen's Hummingbird	<i>Selasphorus sasin</i>	
Acorn Woodpecker	<i>Melanerpes formicivorus</i>	
Nuttall's Woodpecker	<i>Picoides nuttallii</i>	
Downy Woodpecker	<i>P. pubescens</i>	
Northern Flicker	<i>Colaptes auratus</i>	NOFL
Western Wood-Pewee	<i>Contopus sordidulus</i>	WWPE
Willow Flycatcher*	<i>Empidonax traillii</i>	
Pacific-slope Flycatcher	<i>E. difficilis</i>	

Appendix B. Breeding birds of the Puente-Chino Hills; plants mentioned in the text

Black Phoebe	<i>Sayornis nigricans</i>	
Say's Phoebe	<i>S. saya</i>	
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	
Cassin's Kingbird	<i>Tyrannus vociferans</i>	
Western Kingbird	<i>T. verticalis</i>	
Homed Lark	<i>Eremophila alpestris</i>	HOLA
Tree Swallow**	<i>Tachycineta bicolor</i>	
Violet-green Swallow	<i>T. thalassina</i>	
No. Rough-w. Swallow	<i>Stelgidopteryx serripennis</i>	
Cliff Swallow	<i>Hirundo pyrrhonota</i>	
Barn Swallow	<i>H. rustica</i>	
Western Scrub-Jay	<i>Aphelocoma californica</i>	
American Crow	<i>Corvus brachyrhynchos</i>	
Common Raven	<i>C. corax</i>	
Bushtit	<i>Psaltriparus minimus</i>	
White-br. Nuthatch**	<i>Sitta carolinensis</i>	
Oak Titmouse	<i>Parus inornatus</i>	OATI
Cactus Wren	<i>Campylorhynchus brunneicapillus</i>	CCWR
Canyon Wren	<i>Catherpes mexicanus</i>	
Bewick's Wren	<i>Thryomanes bewickii</i>	
House Wren	<i>Troglodytes aedon</i>	
California Gnatcatcher	<i>Poliophtila californica</i>	CAGN
Western Bluebird	<i>Sialia mexicana</i>	
Swainson's Thrush	<i>Cathearus ustulatus</i>	
America Robin	<i>Turdus migratorius</i>	
Wrentit	<i>Chamaea fasciata</i>	WREN
Northern mockingbird	<i>Mimus polyglottos</i>	
California Thrasher	<i>Toxostoma redivivum</i>	CATH
Phainopepla	<i>Phainopepla nitens</i>	
Loggerhead Shrike	<i>Lanius ludovicianus</i>	LOSH
European Starling	<i>Sturnus vulgaris</i>	
Hutton's Vireo	<i>Vireo huttoni</i>	HUVI
Least Bell's Vireo	<i>Vireo belli ssp. pusillus</i>	LBVI
Warbling Vireo	<i>Vireo gilvus</i>	WAVI
Orange-crowned Warbler	<i>Vermivora celata</i>	
Yellow Warbler	<i>Dendroica petechia</i>	YEWA
Common Yellowthroat	<i>Geothlypis trichas</i>	
Yellow-breasted Chat	<i>Icteria virens</i>	YBCH
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	
Blue Grosbeak	<i>Guiraca caerulea</i>	BLGR
Lazuli Bunting	<i>Passerina amoena</i>	
Indigo Bunting**	<i>P. cyanea</i>	
Spotted Towhee	<i>Pipilo maculatus</i>	
California Towhee	<i>P. crissalis</i>	
Rufous-crowned Sparrow	<i>Aimophila ruficeps</i>	RCSP
Black-chinned Sparrow	<i>Spizella atrogularis</i>	BCSP
Lark Sparrow	<i>Chondestes grammacus</i>	
Grasshopper Sparrow	<i>Ammodramus savvanrum</i>	GRSP
Bell's Sage Sparrow	<i>Amphispiz b. belli</i>	BSSP
Song Sparrow	<i>Melospiza melodia</i>	
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	

Appendix B. Breeding birds of the Puente-Chino Hills; plants mentioned in the text

Tricolored Blackbird	<i>A. tricolor</i>	TRBL
Western Meadowlark	<i>Sturnella neglecta</i>	WEME
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	
Brown-headed Cowbird	<i>Molothrus ater</i>	
Hooded Oriole	<i>Icterus cucullatus</i>	
Bullock's Oriole	<i>I. bullockii</i>	
Purple Finch*	<i>Carpodacus purpureus</i>	
House Finch	<i>C. mexicanus</i>	
Lesser Goldfinch	<i>Carduelis psaltria</i>	
Lawrence's Goldfinch	<i>C. lawrencei</i>	
American Goldfinch	<i>C. tristis</i>	
House Sparrow	<i>Passer domesticus</i>	

PLANTS

Chamise	<i>Adenostoma fasciculatum</i>
California Sagebrush	<i>Artemisia californica</i>
Mulefat	<i>Baccharis viminea</i>
Wild Mustard	<i>Brassica sp.</i>
Bush Sunflower	<i>Encelia californica</i>
Yerba Santa	<i>Eriodictyon sp.</i>
Calif. Buckwheat	<i>Eriogonum fasciculatum</i>
Toyon	<i>Heteromeles arbutifolia</i>
So. Calif. Black Walnut	<i>Juglans californica</i>
Chaparral Honeysuckle	<i>Lonicera subspicata</i>
Laurel Sumac	<i>Malosma laurina</i>
Wild Cucumber	<i>Marah macrocarpus</i>
Tree Tobacco	<i>Nicotiana glauca</i>
Prickly-pear or Cactus	<i>Opuntia littoralis</i>
Western Sycamore	<i>Platanus racemosa</i>
Coast Live Oak	<i>Quercus agrifolia</i>
Scrub Oak	<i>Quercus berberifolia</i>
Holly-leaf Redberry	<i>Rhamnus ilicifolia</i>
Castor Bean	<i>Ricinus communis</i>
Willow	<i>Salix ssp.</i>
Purple Sage	<i>Salvia leucophylla</i>
Black Sage	<i>Salvia mellifera</i>
Mexican Elderberry	<i>Sambucus mexicana</i>