Christmas Bird Counts Reveal Wintering Bird Status and Trends in California's Central Valley

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INTRODUCTION

Since the first Christmas Bird Count (CBC) was conducted in 1900, many thousands of birders have braved a full December or January day out in the wind and rain and cold to count birds. Fifteen-mile diameter CBC circles have been established all over the continent and beyond. During the winter of 2005-2006 over 57,000 people counted birds in over 2,000 different count circles (LeBaron 2006).

The CBC is now well-established as an excellent way to educate the public about birds and conservation as well as a very enjoyable way to spend a winter's day. In addition, the data accumulated through the years contain a wealth of information about distribution of wintering birds. The fact that The Audubon Society makes all these data available online (http://www.audubon.org/bird/cbc/hr/index.html) allows anyone with a computer to explore this data set.

CBC data must be used with caution, as noted by Sauer and Link (2002). CBC data are not always collected in a consistent manner within different circles or from year to year. Skill levels and field effort levels vary widely. Variations in weather on a single count day can dramatically affect the numbers recorded. Nonetheless, useful information can still be extracted from CBCs as demonstrated by an impressive bibliography of over 300 scientific papers published using these data. In general, the shortcomings of the data can be minimized if one chooses relatively common species that are fairly easy to find and identify, and if one looks at data over a number of years and a number of count circles. When trends that are highly statistically significant emerge from such a review, they can indicate real phenomena or, at a minimum, suggest areas for more rigorous research.

Christmas Bird Counting in California's Central Valley (= CV) apparently began in 1910 with the first count in the Marysville area (Manolis 2006). Among the species reported on that count were: Valley Partridge, Gardiner's Woodpecker and Vigor's Wren—species now better known as, California Quail (*Callipepla californica*), Downy Woodpecker (*Picoides pubescens*) and Bewick's Wren (*Thryomanes bewickii*), respectively. By the winter of 1978-1979 14 counts were conducted from Redding to Fresno. During the 106th CBC in the winter of 2005-06 over 660 hardy participants counted birds in 22 CV count circles.

I reviewed data from the last thirty years of CBCs conducted within the CV. I compared data for some shorebird and raptor species to state-wide and continent-wide numbers to assess the relative importance of the CV for these species. I also analyzed trends for some selected species and report on statistically significant changes revealed by these analyses.

METHODS

Identification of CV count circles

The boundaries of the CV can be defined differently, based on soils, elevation, dominant flora, or other factors. For my analyses, I defined the CV as running from Redding in the north to the foothills of the Techachapi range south of Bakersfield. At the foothill edges in the west and east, I included areas above the alluvial valley floor that were mainly composed of grassland and/or oak savannah habitats, but excluded areas where conifers (generally Gray Pine, *Pinus sabiniana*) begin to become common. I included the Sacramento-San Joaquin Delta, but selectively excluded for certain species the Benicia count circle which includes habitats more typical of the San Francisco Bay (e. g., tidal mud flats, coastal marshes dominated by highly saline waters).

I considered those count circles with most of their area within the CV as defined above (Figure 1) for use in this analysis. Counts used are: Redding, Red Bluff, Chico, Oroville, Peace Valley, Marysville, Lincoln, Folsom, Sacramento, Putah Creek, Rio Cosumnes, Benicia, Stockton, Wallace-Bellota, East Contra Costa, Caswell-Westley, LaGrange-Waterford, Lost Lake/Fresno, Milburn-Fresno, Bakersfield, and Buena Vista-Kern. Nearly all circles are completely with the CV as defined. Some circles (e.g., Folsom) include some area more typically considered low foothill rather than CV habitats.

Other criteria for use of count circles

If a count circle had an effort level less than 32 party hours for any given count year, I excluded that count circle for that year. I considered this level of effort, equivalent to 4 parties in the field for 8 hours each, as the minimum necessary to cover a circle.

To compare long-term trends in the current CV counts to statewide or North American counts, I compared data from the counts number 77 through 91 (1976-77 through 1990-91) to data from counts 92-through 106 (1991-92 through 2005-06). For these analyses, I included only those counts conducted in at least 10 of the 15 years from each period. This included CBC circles: Benicia, Chico, Folsom, LaGrange-Waterford, Los Banos, Lost Lake/Fresno, Oroville, Putah Creek, Peace Valley, Red Bluff, Redding, Sacramento, Stockton, and Wallace-Bellota. As mentioned above, I ex-

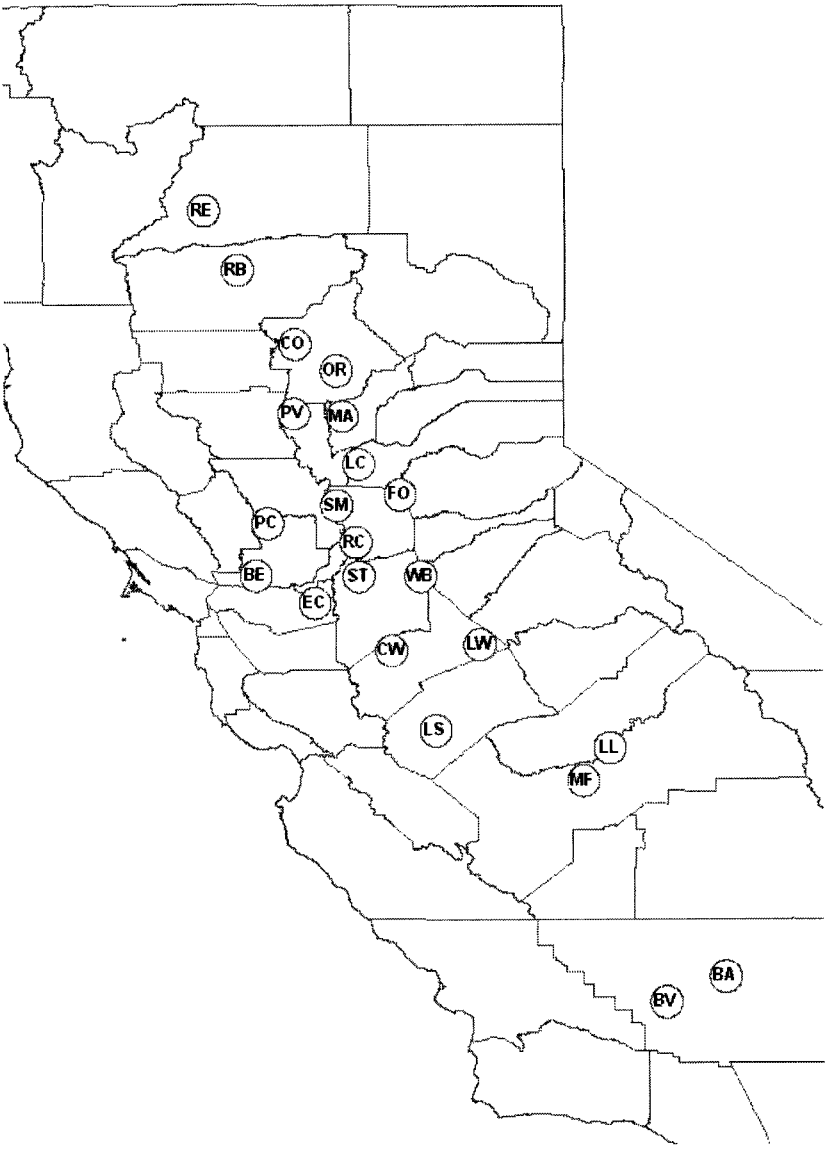


Figure 1. Map showing all the CBC circles used for these analyses. The circles are approximately to scale. Circles are: BA-Bakersfield, BE-Benicia, BV-Buena Vista-Kern, CO-Chico, CW-Caswell-Westley, EC-East Contra Costa, FO-Folsom, LC-Lincoln, LL-Lost Lake-Fresno, LS-Los Banos, LW-LaGrange-Waterford, MA-Marysville, MF-Milburn-Fresno, OR-Oroville, PC-Putah Creek, PV-Peace Valley, RB-Red Bluff, RC-Rio Cosumnes, RE-Redding, SM-Sacramento, ST-Stockton, and, WB-Wallace-Bellota.

cluded the Benicia count from the analysis for certain species likely to be found in non-CV habitats within that circle, specifically: Snowy Egret (*Egretta thula*), Greater Yellowlegs (*Tringa melanoleuca*), Long-billed Curlew (*Numenius americanus*), Least Sandpiper (*Calidris minutilla*), and Dunlin (*Calidris alpina*).

For the analysis of Lewis's Woodpecker (*Melanerpes lewis*) occurrence, I used only those count circles that had reported at least 10 Lewis's Woodpeckers on at least two occasions, as follows: Chico, Folsom, LaGrange-Waterford, Lost Lake/Fresno, Oroville, Putah Creek, Peace Valley, Red Bluff, Redding, and Wallace-Bellota.

Data sources and analysis

All CBC data were taken from the National Audubon Society's online database. Some data were obtained directly from the local count circle compilers. When discrepancies were found, the local compilers' data were used. For trend analyses, CBC data were reported as birds per party-hour, calculated by dividing the total number of birds by the total number of party-hours for all counts used in a given analysis.

All Breeding Bird Survey (BBS) data were taken from the BBS Analysis Web Site (http://www.mbr-pwrc.usgs.gov/bbs/bbs.html).

Table 1. CBCs with highest totals of grassland/open country diurnal raptors.[1]

Count Circle	State	Average of Count Years: 99-106
Mad Island Marsh	TX	911
Lincoln	CA	730
Benicia	CA	705
Rio Cosumnes	CA	688
Sacramento	CA	658
Pt. Reyes	CA	623
Lacassine NWR	LA	573
Attwater NWR	TX	503
Crowley	LA	486
Stockton	CA	471
Los Banos	CA	470
Cypress Crk	TX	449

[1] = White-tailed Kite, Northern Harrier, Gray Hawk, Harris's Hawk, Swainson's Hawk, White-tailed Hawk, Zone-tailed Hawk, Red-tailed Hawk, Ferruginous Hawk, Rough-legged Hawk, Golden Eagle, Crested Caracara, American Kestrel, Merlin, Aplomado Falcon, and Prairie Falcon.

RESULTS AND DISCUSSION

Importance of the CV for North America's wintering raptors

The critical importance of the CV for wintering raptors is a fact generally under-appreciated, even by local birders. Twenty-one species of hawks, eagles and owls are regularly recorded on CV CBCs. Most of these birds are strongly associated with the grasslands and other open habitats of the valley. To demonstrate the relative importance of the CV to these species I compared the average total for 15 species of grassland/open country diurnal raptors for all the count circles within Canada and the U.S. over the last eight years, count years 99 through 106. This analysis includes nearly 2000 circles in every state and province and shows that CV count circles dominate the top counts. Four of the top five count circles and six of the top 12 circles are all within the CV (Table 1). This analysis shows that two regions, the CV and the coastal plains of Texas and Louisiana, harbor tremendous numbers of wintering raptors. This is of significant conservation concern since both regions are experiencing rapid conversion of these habitats.

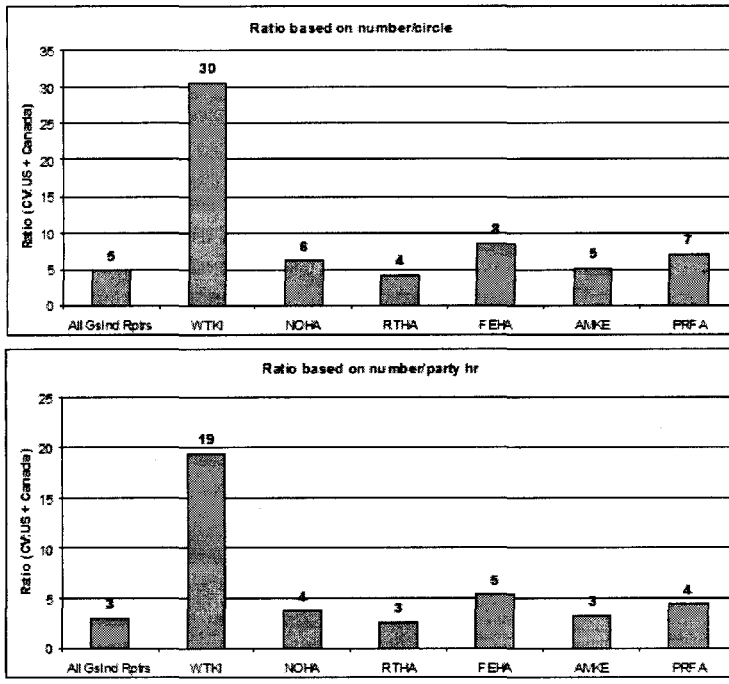


Figure 2. Ratios comparing numbers of grassland raptors (count totals and number per party-hour) from CV count circles to numbers from all U.S. and Canada circles for count years 99-106 (WTKI = White-tailed Kite, NOHA = Northern Harrier, RTHA = Red-tailed Hawk, FEHA = Ferruginous Hawk, AMKE = American Kestrel, PRFA = Prairie Falcon).

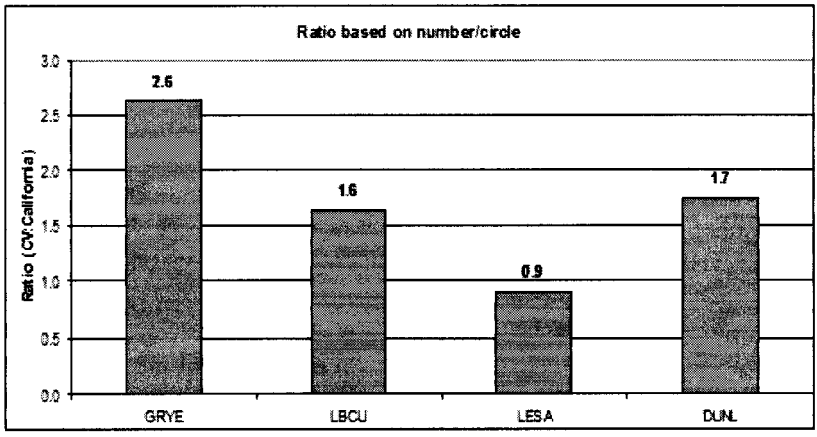
Another way to assess the relative importance of the CV for these birds is by evaluating species abundances in CV CBCs compared to continent-wide CBCs (Figure 2). This analysis shows that CV count circles report five times as many grassland raptors per circle compared to the average for all U.S. and Canada circles. On a per party-hour basis (to correct for differences in effort level among counts), the CV circles report three times as many grassland raptors. For individual species, as expected, the CV records a substantial portion of the continent's White-tailed Kites. Perhaps more surprising is the fact that the ratios are also large for Ferruginous Hawks and Prairie Falcons. On a continental basis, the density of all these raptors within CV count circles is very high.

Since the mid-1980s over 250,000 acres of the CV's approximately 5 million acres of grasslands have been lost. More that 100,000 acres of grasslands have been converted to more intensive agricultural uses such as vineyards (California Grape Acreage Reports, 2003, from California Agricultural Statistics Service, http://www.nass.usda.gov/ca/bul/acreage/indexgab.htm) and over 160,000 acres have been lost to urbanization (Farmland Mapping and Monitoring Program Statistics and Reports, 2002, from California Department of Conservation, http://www.consrv.ca.gov/DLRP/fmmp/stats_reports/county_conversion_tables.htm). The loss has particularly severe in some counties. For example, over 65% of the CV grasslands of Placer County have been lost during this period.

Importance of the CV for shorebirds

It is well established that California's great coastal estuaries are crucial habitats for wintering shorebirds. Many thousands of birds crowd the tidal mudflats of Humboldt Bay, Bodega Bay, the San Francisco Bay area, and other sites along the coast. However, for many shorebird species, the CV may support numbers that rival those found at these coastal sites (Manolis and Tangren 1975, Shuford et al. 1998).

Figure 3 compares the numbers for selected shorebird species from CBC data for all of California with data for the CV. These data exclude the Benicia count as explained above. This analysis shows that CV counts record these species at abundances that range from equal to 3 times as great as all other counts in the state. The relative importance of the CV for these shorebirds may be even greater than suggested by this analysis. Based on discussions with count compilers and consistent with the conclusion of Shuford et al. (1998), shorebirds in the CV are found mainly in flooded agricultural fields, managed wetlands and other man-made habitats. These habitats are widely dispersed within the CV count circles, often occur on private property, and vary in location from year to year, likely resulting in less than complete coverage. Also, the bulk of these habitats within the entire CV are not included in any circle. In contrast, along the coast, these shorebird species are frequently concentrated in huge numbers on tidal flats, most of which



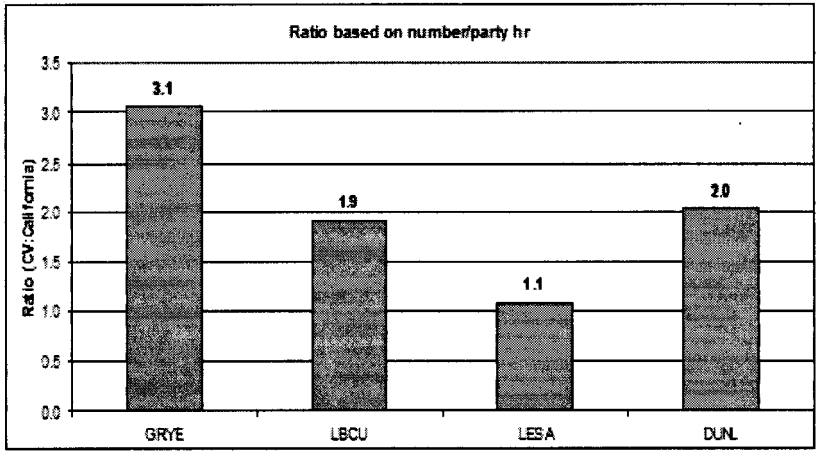


Figure 3. Ratios comparing numbers (count totals and number per party-hour) of selected shorebird species from CV count circles to numbers from the all California circles for count years 102-106 (GRYE = Greater Yellowlegs, LBCU = Long-billed Curlew, LESA = Least Sandpiper, DUNL = Dunlin).

are within existing count circles. Therefore, it is likely that most of the areas of large concentrations of shorebirds along the coast of California are counted during Christmas Bird Counts. The more highly dispersed nature of shorebirds in the CV could mean that a higher proportion of the CV-wintering shorebirds go uncounted.

The CV deserves particular attention as an important area from a shorebird conservation perspective. Nearly all of the shorebird habitat in the CV is created by human activities. Agricultural operations are focused on food production and even the managed wetlands are managed mainly to benefit waterfowl. With few exceptions, any benefit for shorebirds is incidental, and these habitats enjoy no protections specific to the needs of

shorebirds. In contrast, most of the intertidal areas of the coast have some sort of permanent protection. However, if one assumes that even conservative estimates of sea level rise due to global climate change will occur, the coastal estuary habitats may be in jeopardy. Many of these estuaries are adjacent to highly urbanized areas and development has often occurred up to or very close to the current high tide locations. As sea levels rise, the extent and quality of the tidal mud flats could decrease dramatically (http://www.unep-wcmc.org/climate/impacts.htm), making the relative importance of the CV for wintering shorebirds even greater than it is today.

Trends for selected species

I examined CBC data for the last 30 years for selected species, comparing the 15-year period from count number 77 through count number 91 to the 15-year period from count number 92 through 106. Species that showed statistically significant changes (t-test, $p<0.05$ for pairwise tests, uncorrected for multiple comparisons) are shown in Table 2.

Four waterbird species, Snowy Egret, White-faced Ibis (*Plegadis chihi*), Greater Yellowlegs, and Long-billed Curlew all showed significant population increases. An increase in wintering White-faced Ibis was previously reported by Shuford et al. (1996) who used several data sources including CBC data from 1970-1994. The increase in these four species may be due to the large increases in the total acreage of managed wetlands (http://www.centralvalleyjointventure.org/accomplishments/; B.Deuel, pers. comm.) and flooded fields in the CV in the last few decades. In particular, the transition from burning of rice straw in fall to flooding of rice has produced an increase of approximately 300,000 acres of flooded fields in winter over this time period and an additional increase of over 100,000 acres of unburned rice fields that may be temporarily flooded by rainfall (P. Buttner, pers. comm.; http://www.landwateruse.water.ca.gov/annualdata/landuse/years.cfm).

The increased availability of winter-flooded rice as a factor in the increase in these four species may be underestimated by this analysis. The two CV count circles that include the largest rice acreage, Lincoln and Marysville, were excluded because they were not conducted throughout this 30-year period. Of the count circles included in this analysis, Sacramento and Peace Valley have the most rice acreage. If one looks at the last five years (counts 102-106) and includes data from Lincoln and Marysville, one finds that: the Sacramento count ranks among the top four CV counts for each of the four waterbird species above, Marysville ranks among the top four for the Greater Yellowlegs and White-faced Ibis, Lincoln ranks in the top four for the Greater Yellowlegs and Snowy Egret, and Peace Valley ranks in the top four counts for the White-faced Ibis.

Warnock et al (1995) and Shuford et al. (1998) showed that some shorebirds move between coastal and inland areas in California in apparent

Table 2. Changes in CBC abundance (birds per party-hour) of selected species in the Central Valley[1].

Species	Average 77-91	Average 92-106	Change	P[3]
Snowy Egret	**0.18** ± 0.08[2]	**0.32** ± 0.09	**70%**	**<0.0002**
White-faced Ibis	**0.09** ± 0.07	**1.6** ± 2.2	**1573%**	**<0.01**
Red-shouldered Hawk	**0.11** ± 0.05	**0.24** ± 0.05	**132%**	**<0.0001**
Rough-legged Hawk	**0.05** ± 0.03	**0.02** ± 0.01	**-57%**	**<0.002**
American Kestrel	**1.1** ± 0.2	**0.8** ± 0.1	**-26%**	**<0.0001**
Killdeer	**3.4** ± 0.8	**2.7** ± 1.0	**-20%**	**<0.04**
Greater Yellowlegs	**0:24** ± 0.1	**0.45** ± 0.1	**84%**	**<0.001**
Long-billed Curlew	**0.8** ± 0.4	**1.3** ± 0.6	**56%**	**<0.03**
Loggerhead Shrike	**0.31** ± 0.04	**0.28** ± 0.07	**-9%**	**<0.03**
Lark Sparrow	**2.4** ± 0.5	**1.6** ± 0.3	**-31%**	**<0.0001**
Western Meadowlark	**14.4** ± 3.2	**11.2** ± 2.5	**-22%**	**<0.003**

[1]= Data from Benicia, Chico, Folsom, Lost Lake-Fresno, Los Banos, LaGrange-Waterford, Oroville, Putah Creek, Peace Valley, Red Bluff, Redding, Sacramento, Stockton, and Wallace-Bellota CBCs, except that Snowy Egret, Greater Yellowlegs and Long-billed Curlew analyses exclude data from Benicia.

[2]= Standard Deviation

[3]= P values are for single pairwise comparisons of abundances between periods, without multiple comparison (i.e., Bonferroni) correction (see http://home.clara.net/sisa/bonhlp.htm).

response to rainfall. In order to see if rainfall might be a factor in the observed increases, I examined average rainfall data for November and December for the Sacramento and San Joaquin Valleys. Average December rainfall in the Sacramento Valley was significantly higher during the second of the two 15-year periods (63% increase, $p<0.03$). However, when numbers of any of the four species were plotted versus December rainfall, there was no apparent correlation ($r^2<0.1$). A more detailed analysis of rainfall in the days immediately prior to count dates might yet demonstrate a closer correlation between rainfall and shorebird numbers.

The White-faced Ibis showed the most dramatic increase. My analysis builds on the work of Shuford et al. (1996) and updates trends through 2006. Prior to count year 90, none of the CV count circles other than Los Banos reported a single individual of this species on count day. By the early 2000s as many as nine circles were regularly finding ibis and numbers ranging from hundreds to thousands of birds were regularly reported from the Los Banos, Peace Valley, Marysville and Sacramento counts. The average number per party-hour since 2000 has increased to over 5 times the average from the 1990s. This increase in wintering numbers coincides with an increase in the breeding population in the CV of 21% per year from 1980-2005 ($p=0.06$) as

documented by Breeding Bird Surveys (Sauer et al. 2005).

The historical status of the White-faced Ibis in the CV is of interest in light of these recent increases. Grinnell and Miller (1944) described this species as a locally common breeder in the San Joaquin Valley, but these authors noted that by the 1940s it was already in rapid decline due to habitat loss. It was considered a rare winterer in the CV by Grinnell and Miller (1944) and Hoffmann (1927), however, Shuford et al. (1996) reported several historical records that suggest that the numbers in the CV in winter may have been greater than estimated by these authors. By the 1960s and 1970s numbers had decreased dramatically throughout its North American range (Ryder 1967), likely due to a combination of habitat loss and pesticide use.

Ryder and Manry (1994) describe the recovery of the species as a breeder in California and elsewhere beginning in the 1980s. The current breeding range extends north well into the southern Sacramento Valley (Small 1994) which may represent an expansion compared to the historical range. Thus the species appears to be recovering its historical status as a locally common breeder as well as establishing a, possibly unprecedented, status as a common winterer.

The increase in managed wetlands and changes in agricultural practices such as winter flooding of rice have likely contributed to these increases in both breeding and wintering White-faced Ibis populations. Wintering White-faced Ibis in the CV have been reported to forage most often in rice stubble near managed wetlands (Shuford et al. 1996). This pattern is consistent with the observations of the compilers from the Los Banos and Peace Valley CBCs (H. Reeve and B. Deuel, pers. comm.) who reported that large numbers were often tallied moving between tule (*Schoenoplectus acutus*) marsh roosts and foraging sites. Therefore, it seems likely that a combination of factors related to intentional habitat improvements and fortuitously favorable changes in agricultural practices has aided the recovery of the White-faced Ibis as a CV breeder and winterer.

The observed increases of the Snowy Egret, Greater Yellowlegs and Long-billed Curlew may be due to similar factors. However, when one looks at broader geographic population trends for these species, the trends for each are different. CBC data for California for this 30 year period show a significant decrease for the Snowy Egret, a significant increase for Greater Yellowlegs and no significant change for Long-billed Curlew (Table 2). CBC data for the entire U.S. show no significant changes for the Snowy Egret or Long-billed Curlew but an increase for the Greater Yellowlegs. BBS data from 1966-2005 (Sauer et al. 2005) reveal small but statistically significant positive trends for breeding Snowy Egrets in both California and the U.S. and positive trends for Greater Yellowlegs in North America. BBS trends for Long-billed Curlew were not significant. Therefore, while the increase in wintering numbers of Greater Yellowlegs in the CV may be partly due to a general increase in the species' population, it is likely that habitat and weather factors have attracted more birds and that these factors, rather than

general population increases, are primarily responsible for increases in these three species.

The number of Red-shouldered Hawks (*Buteo lineatus*) reported per party-hour on CV CBCs has more than doubled between the two 15-year periods (Table 2). This increase is consistent with previously noted regional trends within California (Harlow and Bloom 1989, Roberson 1993, Shuford 1993, and Rottenborn 2000). California BBS data show a strong and highly statistically significant positive trend for 1966-2005 (10%, $p<0.001$; Sauer et al. 2005). This increase contrasts with the eastern subspecies which is described by Crocoll (1994) as declining or stable, consistent with BBS data (Sauer et al. 2005). It is unclear what is driving the rapid increase in the western population. Increases in riparian habitat, changes in pesticide use and reduced persecution of hawks may all be factors, though none are particular to California. Rottenborn (2000) suggested that the ability of this species to adapt to human alterations of the landscape and its high rate of nesting success when using exotic trees like eucalyptus (*Eucalyptus* spp.) may be factors in its increase in the state.

All of the CV wintering species that show significant decreases (Table 2) are strongly associated with grassland habitats. These decreases are likely a local reflection of trends evident throughout the continent. BBS data show that, across North America, grassland birds are in steeper, more widespread and more statistically significant decline than any other guild of birds (Knopf 1994, Pettyjohn and Sauer 1999, Sauer et al. 2005, McCracken 2005).

A winter decline of the American Kestrel (*Falco sparverius*), Loggerhead Shrike (*Lanius ludovicianus*), Lark Sparrow (*Chondestes grammacus*), and Western Meadowlark (*Sternella neglecta*) is also seen from CBC data for the entire U.S. Each of these species show statistically significant decreases ranging from 8% for the American Kestrel to 35% for the Western Meadowlark based on U.S. CBC data. BBS data also confirm a statistically significant decline within the North American breeding range for the American Kestrel, Killdeer (*Charadrius vociferus*), Loggerhead Shrike, Lark Sparrow, and Western Meadowlark (Sauer et al. 2005). All these species except the Lark Sparrow also show declines based on California BBS data (Table 4). Thus the declines in these five species in the CV may be part of a larger scale decrease across the continent. Besides loss of habitat, factors such as pesticide use and other chemical contaminants have been implicated in the declines in these species (Lanyon 1994, Yosef 1996, Jackson and Jackson 2000, Martin and Parrish 2000, Smallwood and Bird 2002).

The decline of wintering Rough-legged Hawks (*Buteo lagopus*) in the CV seems to be part of a different phenomenon. CBC data from the entire North American winter range show no significant change. When examined more carefully, the data reveal that decreases in the southern, eastern and western parts of that range are balanced by increases in the north-central

area, suggesting a shift in range rather than a widespread change in the population.

As noted earlier, the CV has lost over 250,000 acres of grassland to urbanization and more intensive agriculture since 1984. Nearly all of our remaining grasslands are on private land, mainly cattle ranches. Such private ranches and farms are where the great majority of the grassland birds are counted on CV CBCs. Therefore, the survival and economic viability of ranching in the CV is crucial to the survival of this habitat.

Irregular and irruptive species

CBC data can reveal patterns of occurrence for species that are only occasionally found in significant numbers in our area. The Lewis's Woodpecker and Varied Thrush (*Ixoreus naveius*) are two such species.

Lewis's Woodpecker abundance in the CV shows high variability over the last 30 years (Figure 4). In contrast, the related Acorn Woodpecker (*Melanerpes formicivorus*), mainly a year-round resident within the CV, is

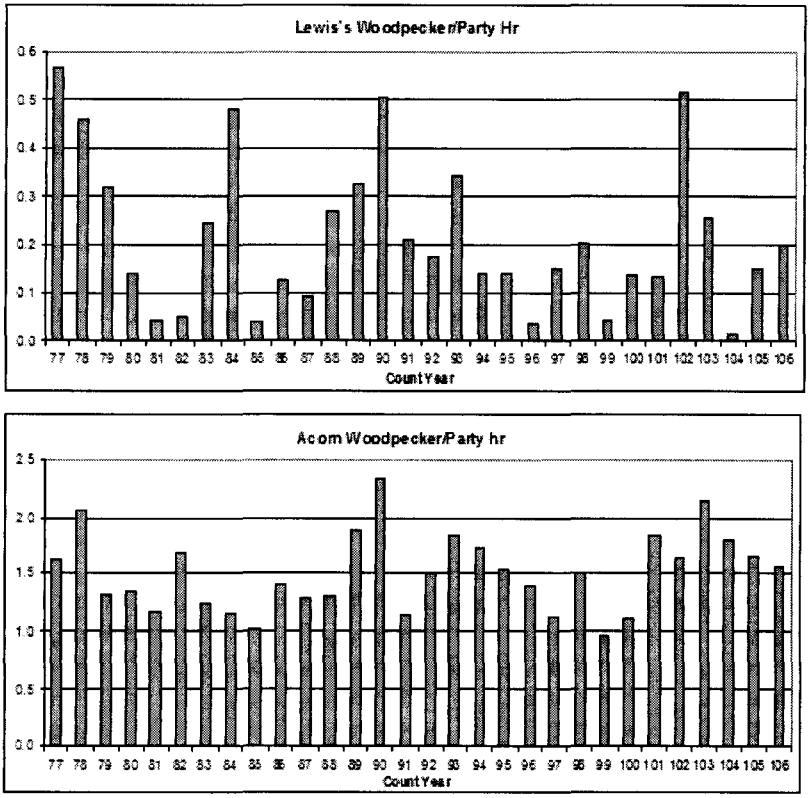


Figure 4. Numbers of Lewis's Woodpecker and Acorn Woodpecker per party-hour for CV count circles.

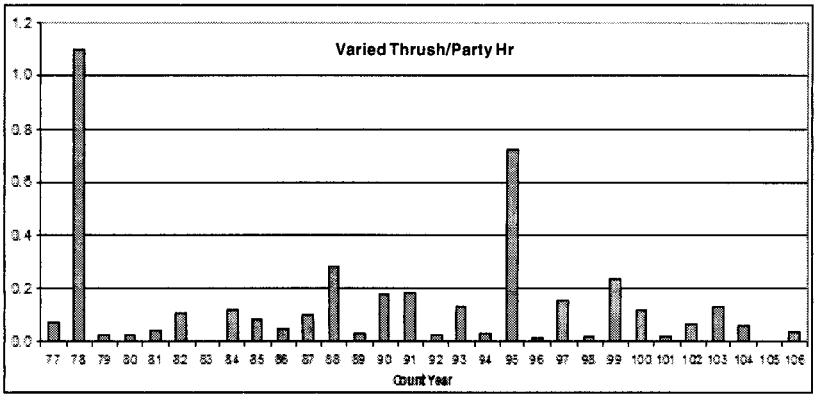


Figure 5. Numbers of Varied Thrush per party-hour for CV count circles

much less variable. Abundance during peak years for the Acorn Woodpecker is generally less than double the numbers at lowest years, whereas abundance during the peak years for the Lewis's Woodpecker is 20-30 times higher than in low years. Lewis Woodpecker influxes tend to be widespread. For example, in count year 102 four different counts spread through the CV (Red Bluff, Marysville, LaGrange-Waterford, and Wallace-Bellota) reported abundances between two and five times their 30-year average.

The Varied Thrush provides an even more extreme example. Although usually rare in the CV, this species can be fairly common to common in some years (Figure 5). Many of us still remember the invasion winter of 1994-95 when this species could be found in nearly any patch of suitable habitat throughout Northern California.

The factors driving these occasional invasions are not well understood. Lewis's Woodpecker is highly irregular and opportunistic in its wintertime dispersal (Kaufmann 1996, Tobalske 1997). In our area, large numbers of this species tend to coincide with good acorn-producing years for Blue Oak (*Quercus wislizeni*) and Valley Oak (*Q. lobata*) (pers. obs.). However, the factors involved are likely much more complex. The cyclic irruptions of the Varied Thrush have been previously documented through CBC data as well as data from the Cornell Laboratory of Ornithology's Project Feederwatch (George 2000) and seem to be correlated with peak breeding season numbers based on BBS data (Wells et al. 1996). Wells et al. (1996) speculated that acorn production in the wintering areas might also be a key factor in these irruptions.

CONCLUSIONS

Participation in a CBC can be much more than a recreational day of birding. The data collected have great potential to reveal trends and behaviors that are of great scientific interest and critical conservation

importance. The major large scale changes in the habitats of the CV over the last 30 years have been: conversion of agricultural land to urban uses, conversion of grasslands to urban and more intensive agriculture, increases in flooded acreage due to winter flooding of rice, expansion and enhancements of managed wetlands, and restoration of some riparian corridors. The results presented here for a small selection of species reveal patterns and changes that are very likely influenced by these changes in CV habitats. A number of wetland-associated birds are increasing while many grassland species are in decline. In spite of grassland losses, the CV is still a critically important haven for wintering raptors and still supports large populations of other grassland birds.

CBC data also show that, while the CV is among the most human-altered large-scale landscapes in the country, it is still a crucially important resource for a tremendous abundance and diversity of birds. This knowledge can be used to help influence land use decisions being made throughout the CV and to create a stronger rationale for preserving the wildlife characteristic of this valley.

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