Analyses of California Christmas Bird Count data on Mountain Plover

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Because the bulk of the population of the Mountain Plover winters in California (Root 1988, Knopf and Wunder 2006), examination of California Christmas Bird Count (CBC) data might yield information about population trends. I have devoted much of the last several years to analyzing CBC data to assess trends in many bird species including Ruddy Turnstones (Pandolfino and Helmericks 2005), Hooded Mergansers (Pandolfino et al. 2006), Yellow-billed Magpies (Crosbie et al. 2008), Loggerhead Shrike (Pandolfino 2008), Rough-legged Hawk (Pandolfino and Suedkamp Wells 2009), and others. I have also focused my attention on Central Valley trends in general and on grassland birds in particular (Pandolfino 2006).

Recently I looked at statewide trends in Mountain Plovers in some detail and perhaps my analyses will be helpful in determining whether the listing of this species is warranted. Much of this has been reviewed in general terms by Hunting and Edson (2008), but I provide more detailed quantitative analyses and more current data.

There are a number of ways one can look at CBC data. The simplest approach is to simply analyze summaries over large regions. This approach may be useful for some common, widespread species, but not for rare and highly localized species. Also, over time CBC circles are abandoned and new ones begun. Therefore, it is important to select from the entire universe of CBC circles those that are most relevant to the species in question. Mountain Plovers are found on only a very small percentage of all CBCs. For example, in Count Year 109, only 10 circles out of over 2000 North American circles (<0.5%) recorded this species. Many of those circles record single birds and find them very rarely. Typically, a very few CBC circles account for most of the Mountain Plovers recorded (e.g., over the past 10 years, five California circles account for over 95% of all Mountain Plovers found on all California counts).

Because of these factors, I have based my analyses on California CBC circles that meet the following two criteria: 1) a count that has been conducted at least 20 times during the past 60 years; and 2) a count that has found more than 10 Mountain Plovers at least once during this period. This leaves just 12 CBC circles, but they account for over 99% of all the Mountain Plovers recorded on all California counts during the period (see attached spreadsheet for CBC circles and all raw data).

Since you indicated a particular interest in recent data, I have analyzed the past nine years in some detail (Figures 1-3). However, I think it is important to view these recent data in the context of the longer term. Therefore, I also include analyses over the past 60 years (Figures 4-7).

RESULTS and DISCUSSION

Near Term Trends

Figure 1 shows the abundance of Mountain Plover on California CBCs over the past 9 years (Count Years 101-109). This figure uses data normalized for party hours. It is often useful to examine CBC data with and without this normalization since many species that are not widely distributed across a count circle (like Mountain Plover on nearly all counts) can be underestimated when normalized for effort across the entire circle. Figure 2 uses total numbers of Mountain Plovers. Both approaches yield essentially identical results and show significant declines (10-11%/year) over this period.

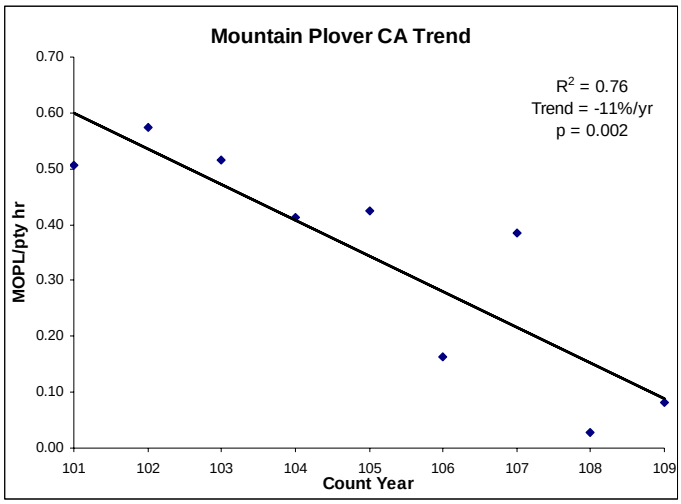


Figure 1: Mountain Plover (MOPL) numbers per party hour from CA CBCs from Count Year 101 (winter 2000-2001) to Count Year 109 (winter 2008-2009). Trend based on linear regression.

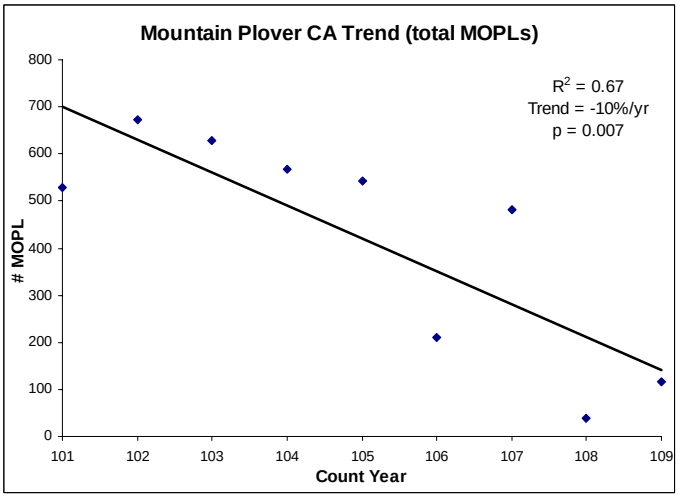


Figure 2: Mountain Plover (MOPL) total numbers from CA CBCs from Count Year 101 (winter 2000-2001) to Count Year 109 (winter 2008-2009). Trend based on linear regression.

Since only five CBCs accounted for over 95% of all Mountain Plovers found on all California counts during this period, I also looked at each of those five counts separately (Figure 3). Examination of individual counts demonstrates the difficulty of using CBC data to track a rare and sparsely distributed species. When analyzed separately, the year-to-year variation keeps any of the trends from reaching significance ($P < 0.05$). Even a count like Salton Sea south (SS), which regularly reports hundreds of Mountain Plovers, is usually the high count for all of North America, and accounts for most of the Mountain Plovers counted in California, can have years where very few Mountain Plovers are found. This could be due to the birds being away from traditional spots in a given year or on a given day; weather conditions that make finding the birds more difficult; real variation in the presence of the species in a given year; or a host of other variables. Such dramatic fluctuations are seen in most of the other counts shown in Figure 3. However, it should be noted that ALL five of these counts show evidence of declines over this time period. Also, the fact that the SS circle found no Mountain Plovers during the past two years may be important. This count has been conducted consistently since Count Year 69 and only once before have they been unable to find a single Mountain Plover. I contacted the compiler for that count and he confirms that special effort was made to locate Mountain Plovers each year in all the usual locations (O. Johnson, pers. comm.). In fact, he said that efforts to find birds during the entire count week (from 3 days before through 3 days after the count day) were unsuccessful. There has been no apparent change in the habitat so this absence remains a mystery. This observation may be particularly important given that the Imperial Valley has been identified as a key wintering area for this species (Wunder & Knopf 2003, Hunting and Edson 2008).

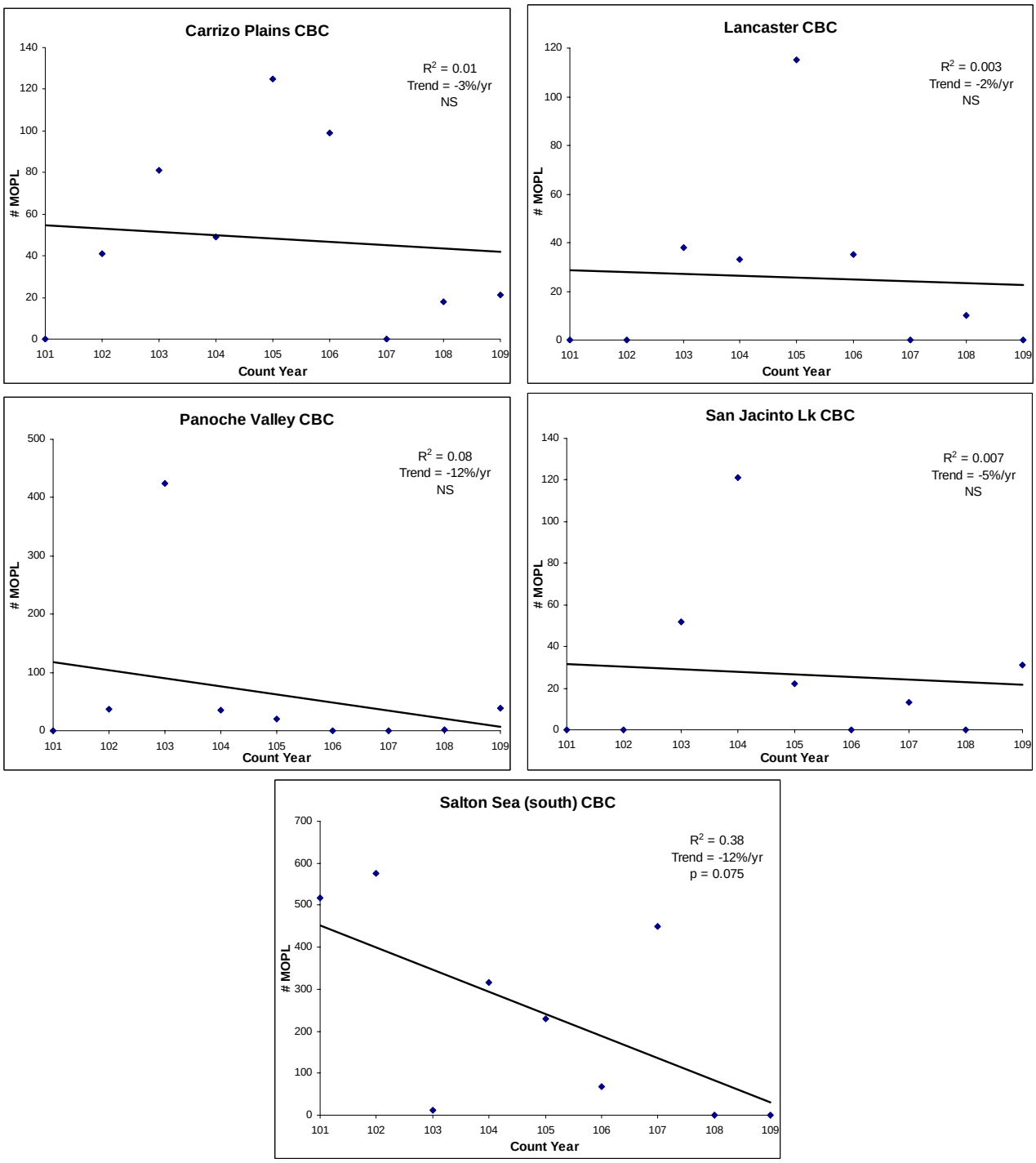


Figure 3: Mountain Plover (MOPL) total numbers from five CA CBCs from Count Year 101 (winter 2000-2001) to Count Year 109 (winter 2008-2009). Trend based on linear regression.

Long Term Trends

In general, the long term trends in Mountain Plover numbers based on California CBC data (Figure 4) reflect the trends seen in Breeding Bird Survey (BBS) data (Sauer et al. 2008). North American BBS data from 1970-2007 show a statistically significant 2.7%/year decline; California CBC data from 1950-2009 show a statistically significant decline of 2%/year. However, both datasets suffer from the fact the sparse distribution of this species is such that Mountain Plovers are detected on relatively few BBS routes and relatively few CBCs. One can somewhat dampen the effects of year-to-year variations in numbers by looking at a moving average (top graph in Figure 4). However, even this suggests the possibility of some cyclic nature to Mountain Plover population fluctuations.

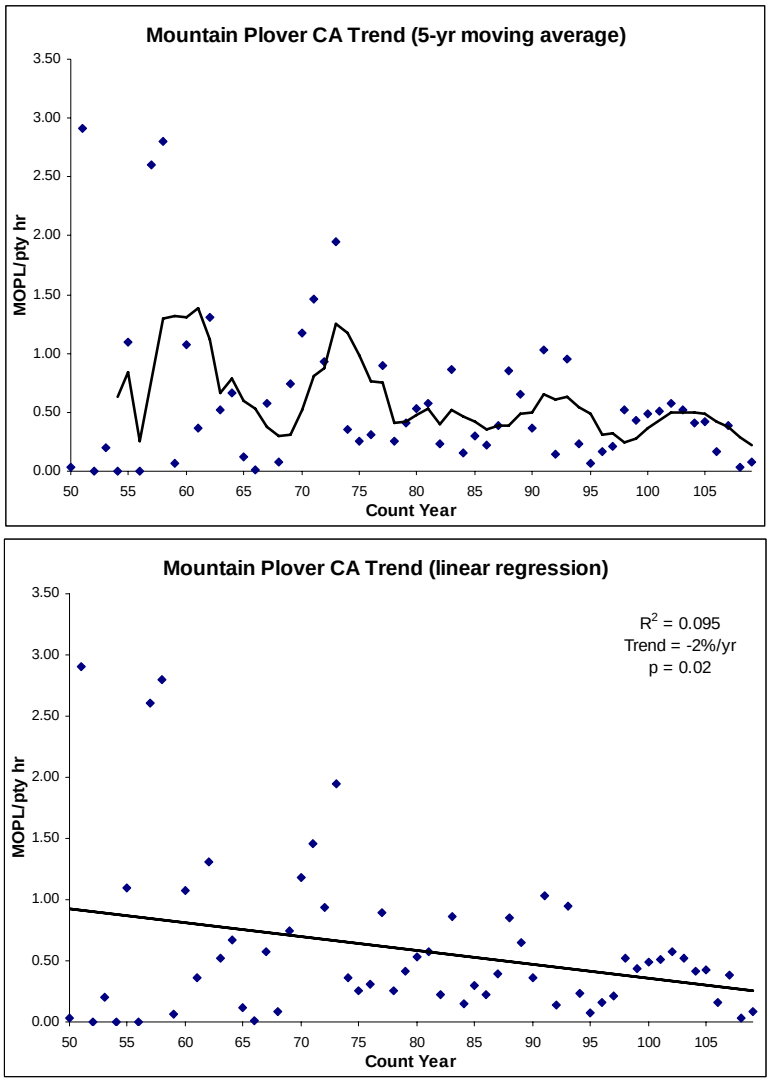


Figure 4: Mountain Plover (MOPL) numbers per party hour from CA CBCs from Count Year 50 (winter 1949-1950) to Count Year 109 (winter 2008-2009).

Once again, looking at individual counts can help reveal what is driving the overall decline seen in the cumulative totals. Figure 5 looks at two coastal counts: Orange County Coastal (OC) and San Diego (SD). OC accounted for bulk of Mountain Plovers recorded on CBCs during the late 1950s and early 1960s. Most of those birds were found in croplands in the Irvine area (Hamilton and Willick 1996), habitats that have been entirely lost to urbanization. SD enjoyed a brief period with substantial numbers of birds, but has found none since Count Year 91 (see attached spreadsheet). As reflected by these CBCs, Mountain Plovers are now nearly absent from coastal California (Hunting and Edson 2008).

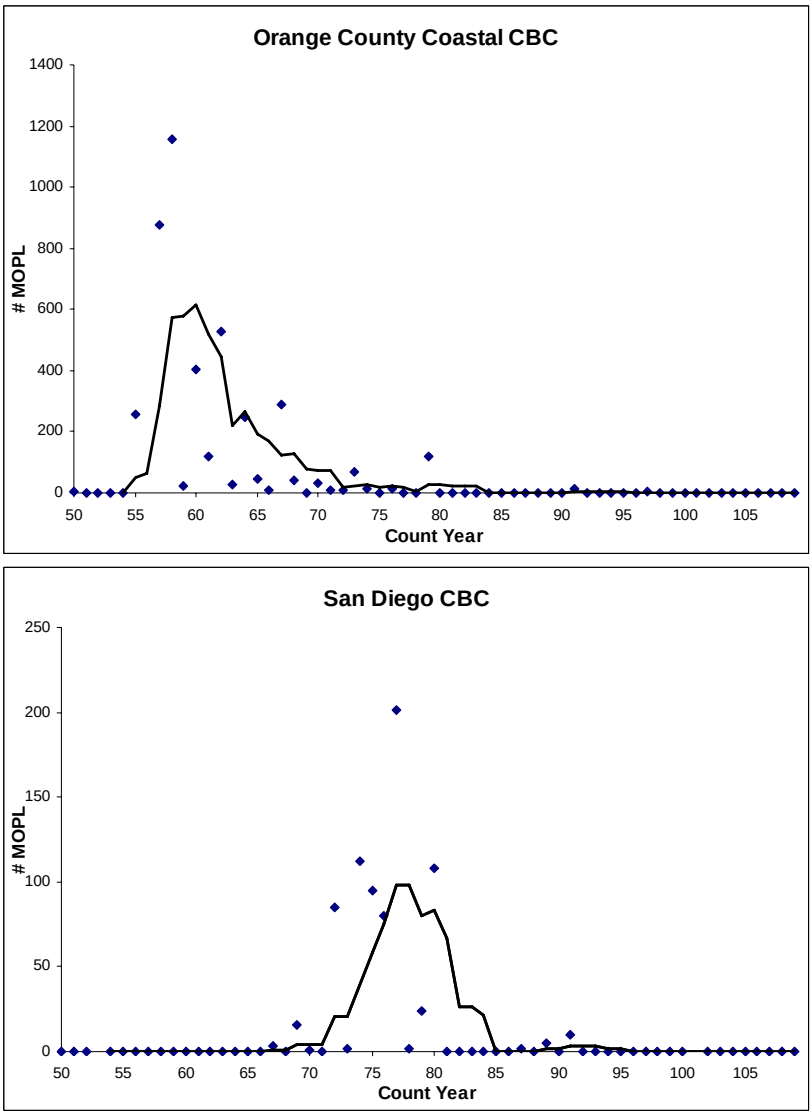


Figure 5: Mountain Plover (MOPL) total numbers from two coastal CA CBCs (Orange County Coastal and San Diego) from Count Years 50-109. Trends based on 5-year moving average.

Since the decline of the species along the coast, CBCs from inland southern California and the Coast Range have accounted for most Mountain Plovers on CBCs. Figure 6 shows Mountain Plover trends for three inland southern California counts: SS, Lancaster (LN), and San Jacinto Lake (SL). All show typically large fluctuations from year to year, though all suggest a general downward trend. The same is true for the two Coast Range counts (Figure 7): Carrizo Plains (CP) and Panoche Valley (PN). The trends for the Carrizo Plains count is particularly dramatic, with the high numbers found in the 1970s not seen since.

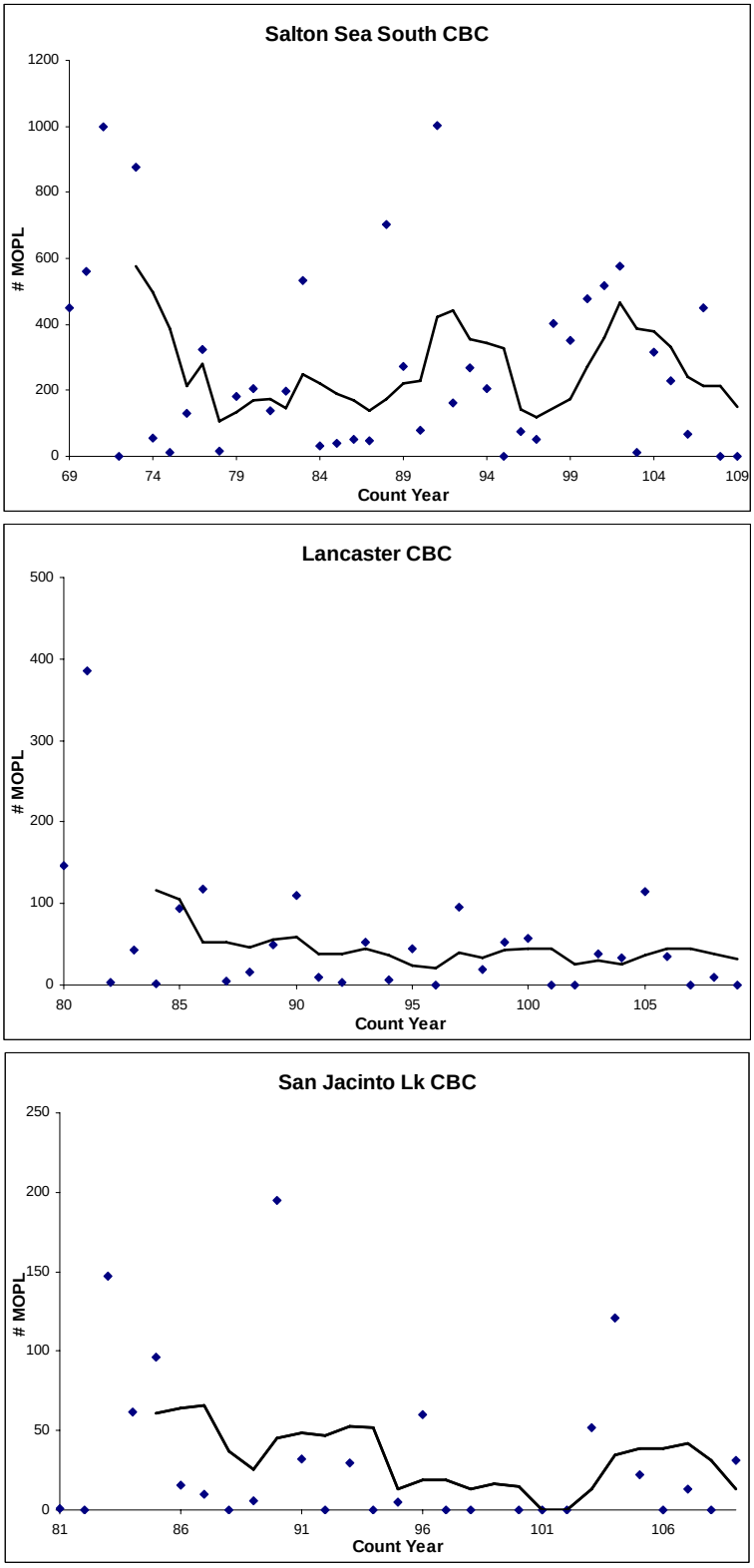
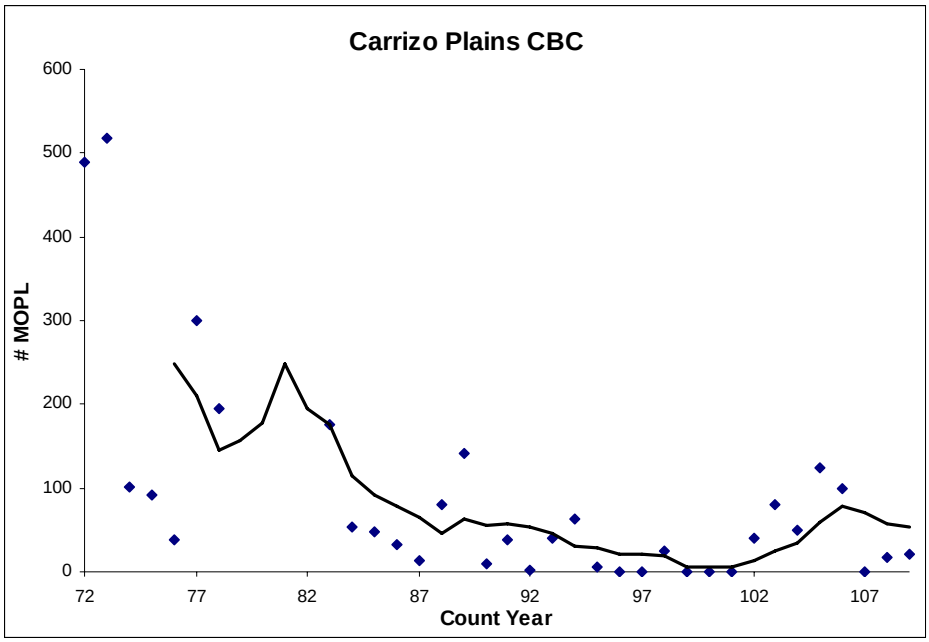


Figure 6: Mountain Plover (MOPL) total numbers from inland southern California CBCs: Salton Sea (south) CBC Count Years 69-109; Lancaster CBC Count Years 80-109; San Jacinto Lake CBC Count Years 81-109. Trends based on 5-year moving average.



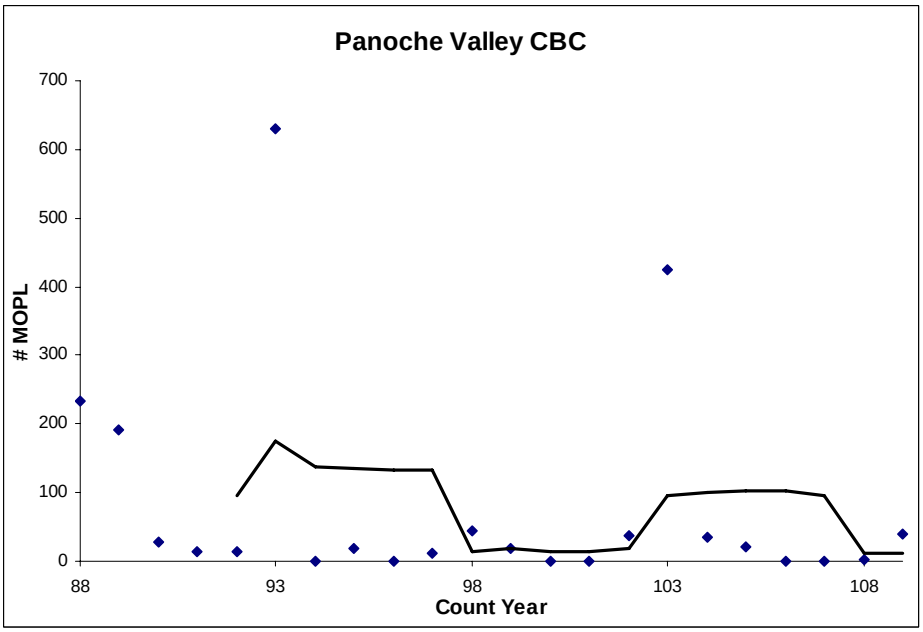


Figure 7: Mountain Plover (MOPL) total numbers from two Coast Range CBCs (Carrizo Plains and Panoche Valley) from Count Years 72-109. Trends based on 5-year moving average.

THREATS

Historical winter habitats for this species along the California coast have all but disappeared. While some scattered sites in the Central Valley still harbor small numbers of Mountain Plovers (Hunting and Edson 2008), most of these are not within existing CBC circles. Most of those sites are threatened by ongoing urbanization or conversion to more intense agriculture like vineyards and orchards (Hunting and Edson 2008). The Sacramento CBC, which occasionally recorded significant numbers into the late 1990s, has not recorded one since 2000 (see attached spreadsheet). In recent years, five CBC circles have accounted for nearly all the CBC reports of Mountain Plover. These circles and their proportion of all California Mountain Plovers counted in the period from Count Year 101-109 are: SS - 57%; PN - 15%; CP - 11%; SL - 6%; and LN - 6%. The appropriate habitat within each of these circles is under current or potential threat. Within the SS circle, the agricultural practices which support this species could change at any time due to economics or water availability (Wunder and Knopf 2003, Hunting and Edson 2008). SL and LN are both seeing dramatic urban and suburban development (Hunting and Edson 2008). CP habitats on some public land are being managed in ways that may not promote ideal conditions for Mountain Plover (Hunting and Edson 2008) and both CP and PN are now being proposed for massive solar energy projects.

CONCLUSION

In spite of the year-to-year variability of CBC data and the small number of circles which regularly record Mountain Plovers, the data are all consistent with a long term, significant decline in this species' population. The trends since 2001 look particularly alarming and suggest that these long term declines might be accelerating. Further, threats to Mountain Plover habitat within these circles is a reflection of similar threats to these habitats throughout the state.

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