Audubon CALIFORNIA

2012 Mountain Plover Winter Survey

Submitted to:

U.S. Fish and Wildlife Service
Region 8 – Migratory Bird Program
2800 Cottage Way
Sacramento, CA 95825
FWS Agreement No. 80211AJ109

by

Audubon California
765 University Avenue, Suite 200
Sacramento, CA 95825

Banded Mountain Plover photographed on January 30, 2012 in Fresno County, California amongst a flock of 129 birds. Bird was banded at the Pawnee National Grasslands in Colorado. Photo by Gary Woods.

BACKGROUND

The Mountain Plover (*Charadrius montanus*) is one of the most threatened shorebirds in North America. It is a U.S. Fish and Wildlife (USFWS) species of conservation concern and one of five shorebird species designated as "highly imperiled" under the U.S. Shorebird Conservation Plan (Brown et al. 2001). Changing land use on both the breeding and non-breeding grounds is believed to be a major cause in the species' decline (Andres and Stone 2010). Documenting these changes and corresponding trends in Mountain Plover numbers and distribution are critically important for its conservation. One crucial gap in our knowledge that will influence our ability to effectively protect Mountain Plovers is the relative lack of information about Mountain Plover wintering distribution and the threats these birds face on the wintering grounds (Andres and Stone 2010). Previous work has demonstrated the importance of California habitats in supporting a large proportion of the Mountain Plover population over winter (Knopf and Rupert 1995, Hunting et al. 2001, Wunder and Knopf 2003, Shuford et al. 2004).

On June 29, 2010, the U.S. Fish and Wildlife Service reinstated a proposal to list the Mountain Plover as threatened under the Endangered Species Act. In light of this proposed listing, and in response to a request for new information on Mountain Plover numbers, distribution and habitat use, Audubon California organized a California statewide winter census in January 2011, funded by the USFWS (Audubon California 2011). Prior to 2011, the last statewide survey was conducted in 2002. For the 2011 survey, all known historic sites were surveyed throughout the state, based on previous survey results and eBird observations since 1990 (e.g., 1994 Audubon survey, Hunting et al. 2001, Wunder and Knopf 2003). The 2011 statewide winter survey resulted in only 1,235 birds being observed, raising the alarm that the population may be continuing to decline.

Partially in response to the low numbers observed in 2011, Audubon California organized a follow-up survey in January 2012, again funded by USFWS, to help us determine whether the number of birds wintering in California in several key locations has declined as severely as the 2011 survey suggested. In 2012, we limited the survey effort to key areas where the majority of Mountain Plovers have historically been observed, without resurveying all potential Mountain Plover habitat as in 2011.We carried out the California survey around the same time that similar survey efforts were being completed in Arizona and Texas in an attempt to assist USFWS obtain a more complete population estimate for the winter population overall. Our primary objectives were to:

1) Estimate the California wintering population size of Mountain Plovers; and
2) Assess whether the population decline observed in 2011 is still evident one year later.

METHODS

Using historic Mountain Plover location and survey data in combination with physical and biological landscape attributes, we developed a survey extent for 2012 that was likely to capture 75% or more of the wintering Mountain Plover population in California. We used the same survey methods developed and applied in 2011 (see Appendix 1), including the use of a largely volunteer, citizen science-based approach in partnership with local professional biologists familiar with the species and the landscapes.

Survey Extent

The four regions where Mountain Plovers have consistently been reported during statewide surveys since 1994 are: Panoche Valley, Carrizo Plain, Antelope Valley, and Imperial Valley. These areas accounted for 100% of all birds detected in 2011 and 83% in 2002. Surveys in 2011 in Sacramento Valley, San Joaquin Valley, Monterey County, and San Jacinto Valley, where birds have previously

been reported, failed to yield any sightings. In addition, previous surveys and anecdotal observations tell us that the numbers of Mountain Plovers in these regions are typically low. Therefore, for this limited survey, we chose to only resurvey the four key regions above, using the same survey extent within each region that was developed in 2011 (Figure 1, Appendix 3). This eliminated areas that did not have appropriate habitat or were developed.

Although the formal survey was restricted to these four regions, we also monitored eBird (www.ebird.org/california) and birding listservs to document any Mountain Plovers detected at other locations in California during the survey period, and we also searched eBird for records in 2011 and 2012 between November and February to determine if birds were being found in other areas.

Survey Coordination

We solicited volunteer surveyors from the 2011 list of volunteers as well as others through California eBird, local Audubon chapters in California, and regional birder lists. We primarily used previously experienced volunteers in partnership with local professional biologists familiar with the species and habitat. At the Carrizo Plain we partnered with Kathy Sharum, Bureau of Land Management (BLM) and in Imperial Valley we partnered with Kathy Molina, Natural History Museum of Los Angeles County. Volunteers were assigned specific geographic areas (Figure 3) and were given maps delineating the extent of their survey area. Within each region, counting occurred on a single day as much as possible to avoid double counting. The survey was conducted January 27-29, 2012.

The four survey regions were divided into the same individual survey areas delineated in 2011, designed to be covered by one survey team in one half to a full day. For the Imperial Valley, we surveyed the same areas as previous covered during valley-wide surveys in 2007, 2008, and 2011 (K. Molina 2011) (see Appendix 2). For the Carrizo Plain, we surveyed areas as delineated from Carrizo Plain Mountain Plover surveys conducted over the past seven years by BLM (K. Sharum, pers. comm.) (Figure 3).

Volunteers were provided with a map of their survey area(s), a data form, and a survey protocol. In addition, we provided a tutorial describing Mountain Plover identification, suitable habitat types, how to conduct the survey, and how to record and submit the data (see Appendix 1). Briefly, volunteers were instructed to drive all publicly accessible roads within their survey area, stopping and scanning suitable habitat for Mountain Plovers with binoculars and spotting scopes. Upon detecting Mountain Plovers, volunteers recorded the following:

- Date and time of day
- Total number of birds (or estimated in the case of large, moving flocks)
- GPS coordinates if possible
- Habitat type/land-use type
- Field stage
- Irrigation status
- Vegetation height
- Behavior

In addition, volunteers mapped locations of all flocks on the survey map provided. In an effort to track the total effort of the survey, we asked volunteers to record total miles driven and total hours spent during the survey.

RESULTS

Survey Effort

A total of 61 surveyors divided among 38 search teams participated in January 2012. We surveyed 42 predefined areas, covering approximately 692 miles and totaling approximately 77 team hours of effort (excluding Imperial Valley; Table 1).

Weather conditions were fair within most regions on the survey days, with no significant fog or excessive wind. However, the northern end of the Carrizo Plain experienced heavy fog on January 27 (Area 11, Bitterwater Road and Bitterwater Valley Road); therefore these areas were resurveyed on January 28; only data from January 28th was included in the analysis.

Numbers and Distribution

A total of 3,290 Mountain Plovers among 36 flocks were observed (Table 2, Figure 2, 3; Appendix 4) between January 27-29, 2012 in three of the four survey regions. No birds were found in Panoche Valley. By comparison, in 2011, 1,235 birds among 13 flocks were observed (Table 2). Imperial Valley accounted for 89% of the birds detected during the survey in 2012. In addition, during the survey period, an additional 167 birds were reported to us via email and eBird (Avian Knowledge Network 2012) from the Central Valley at three locations.

Birds were observed in 3 counties during the survey (San Luis Obispo, Los Angeles, Imperial), with additional observations in 3 counties in the Central Valley (Fresno, Sutter, Sacramento) based on anecdotal records.

Habitat Use

Mountain Plovers were observed in the following agricultural land-use types: fallow field, grassland, alfalfa, cultivated grass (most likely bermuda grass), unknown crop, and field covered in black plastic (Figure 5). Over half (51%) of the Mountain Plovers were observed in cultivated grass fields. Alfalfa fields accounted for an additional 20% of the sightings, with 450 birds observed in one single flock in an alfalfa field in Imperial Valley. The remaining observations were in natural grasslands and abandoned agriculture.

Field stage was also recorded along with land-use type and included burned, mowed, disked, etc. (Figure 5). The majority of birds (48%) were observed in fields that had been recently burned (from unknown crop), all located in Imperial Valley, followed by mowed fields (Appendix 2). Bare ground accounted for 39% of all sightings; 49% were in vegetation <10 cm., and only 2 flocks totaling 208 birds were observed in vegetation 10-20 cm.

DISCUSSION

Numbers and Distribution

Our results from the 2011 California Statewide Mountain Plover survey had suggested a steep decline in both the number and distribution of wintering Mountain Plovers in California. Relative to the average number from three previous statewide surveys (Hunting et al. 2001), Mountain Plover numbers were down more than 50% in 2011, and birds were detected in only five California counties. Fortunately, during our 2012 survey we observed over 3,000 Mountain Plovers in six counties while only focusing within four focal regions, where the majority of birds have typically been observed and which experienced the same level of survey effort in both years. The results in 2012 were the highest of the five statewide surveys (Figure 4, Table 2). This suggests that in 2011 Mountain Plovers may

have simply wintered in other regions where surveys were not implemented, possibly not even in California. It is unclear what conditions caused fewer birds in 2011 and where those birds may have wintered but it seems unlikely that large numbers were uncounted elsewhere in California given the extensive survey coverage and their limited distribution in the state. Data searching in eBird between November and February in 2011 and 2012 yielded primarily sightings from within the major survey regions (Figure 3) suggesting birds are primarily restricted to these main regions. While formal surveys were not conducted in the Central Valley in 2012, we believe few additional birds would have been sighted due to the fact that numerous birders looked in typical Mountain Plover areas in the valley, and few birds were found and reported to eBird. In addition, vast portions of the Central Valley no longer provide adequate habitat due to changes in agricultural practices and development.

In 2011, 67% of Mountain Plovers detected were found in the Imperial Valley and in 2012, 89% occurred in Imperial Valley, underscoring the importance of this area for wintering birds. Despite the lower number of birds in 2011, the last two surveys suggest that numbers of Mountain Plovers in Panoche Valley, Carrizo Plain, and Antelope Valleys may be decreasing. It is unclear why use of Carrizo Plain and Panoche Valley would decline; grazed natural grasslands remain abundant in both areas but we do not know if other conditions could be a factor in their distribution and numbers during the survey period, such as whether food resources may have diminished due to rainfall patterns each January. In Antelope Valley, where birds primarily utilize crop fields, development and fragmentation, as well as cropping changes away from alfalfa may explain declining use of this region. Understanding the impacts of weather patterns, food availability, within season dispersal, and land cover characteristics might help us understand the shifts in Mountain Plover distributions in California.

Habitat Use

This survey and all the others since 1994 demonstrate that Mountain Plovers wintering in California are dependent almost exclusively on agricultural land and certain crops/management regimes in particular. In 2011 and 2012, agricultural fields accounted for 79% and 97% of Mountain Plover observations, respectively. Fallow agricultural fields characterized by bare dirt, recently burned fields, and fields with very short cultivated grass or alfalfa were the most commonly used habitats. This is consistent with previous statewide survey efforts, where fallow, grazed and burned (barren) agricultural fields made up 63-85% of Mountain Plover observations (Hunting et al. 2001). In the Imperial Valley, Wunder and Knopf (2003) reported frequent use of grazed and growing alfalfa, and Shuford et al. (2004) found 81% of all Mountain Plovers using stubble hayfields, burned after harvest.

Management of agricultural habitat also appears to be a factor in Mountain Plover locations. While in 2012 most birds were found in recently burned fields (in Imperial Valley), in 2011 no fields in Imperial Valley were burned during the survey period and most birds were instead observed in bare plowed or furrowed fields, followed by mowed or grazed alfalfa. Almost all fields each year were dry with no active irrigation. The exception in 2011 was one field flood irrigated that also contained plastic covering and two wet fields in 2012 with growing grass (Appendix 2).

The survey results confirm the general assumption that Mountain Plovers do not typically use areas with taller vegetation (greater than 10 cm), and this result can have a bearing on management plans for Mountain Plovers, whatever the vegetation or crop type. Vegetation was short in alfalfa fields where Mountain Plovers were observed in 2011, and in 2012, 95% of the birds were observed in vegetation less than 10 cm. Similar results were reported for the 1994 and 1998 statewide surveys where vegetation height averaged 5.6 and 5.1 centimeters, respectively (Hunting et al. 2001).

Natural grasslands made up a greater proportion of habitat used by Mountain Plovers in 2011 compared to previous surveys (Hunting et al. 2001), possibly due to the relatively low numbers of Mountain Plovers seen in the Imperial Valley. In 2011, all three flocks in the Panoche Valley and Carrizo Plain were found in natural grasslands, accounting for 20% of the Mountain Plovers seen statewide, whereas in 2012, natural grasslands accounted for only 2% of all birds seen. Despite the decrease in 2012, numbers in 2011 as well as in previous years suggest that these flat, valley grasslands still remain important. Although Mountain Plovers have adapted to using agricultural habitats, particularly in the Imperial Valley, protecting these natural habitats should be a top priority in conserving the species. Areas such as Carrizo Plain and Panoche Valley may be particularly important in years when conditions are less suitable in agricultural landscapes in the Imperial Valley or if shifts occur in agricultural practices.

RECOMMENDATIONS

Research Needs

The differences in numbers and apparent distribution of Mountain Plovers between 2011 and 2012 in California highlight the need for more intensive research focused on patterns of movement and distribution, as well as habitat suitability. While we can now make general conclusions about habitat associations, in particular which crops tend to get used and their general affinity for shorter vegetation, we know almost nothing about what specifically is driving their use of particular sites and fields or how that may change over the winter season. Tailored research on habitat use and characteristics, as well as within season dispersal, could help us understand how birds are utilizing areas such as Imperial Valley and what variables influence habitat value. We do not know, for instance, how long plovers stay in burned fields. Birds may utilize the resource shortly after it is burned to eat insects, and then move to other fields (K. Molina, pers. comm.), so a pattern of rotation may be appropriate. Timing of rain may also impact distribution, and whether birds stay in a particular area because of a food resource (insect hatching). Developing a study that tracks individual birds through color banding or satellite transmitters in combination with studying precipitation, food availability, and habitat use is probably the only way to fully understand and manage for wintering Mountain Plovers in California.

Management Recommendations

Over the past few decades, cropland in California has become increasingly important to wintering Mountain Plovers. Although native grasslands are thought to be preferred, Mountain Plovers have become more common in agricultural fields in places such as California's Central Valley (Knopf and Rupert 1995) and Imperial Valley (Wunder and Knopf 2003). The results of the 2011 and 2012 California Mountain Plover surveys support previous studies that have demonstrated the importance of California's agricultural habitats for wintering Mountain Plovers. In the absence of suitable natural habitat, agricultural crops will continue to provide the bulk of Mountain Plover wintering habitat in California. Thus, reductions in the amount of these crops and changes in management practices have the potential to greatly limit winter habitat availability. Yet, the availability and distribution of these important agricultural habitats can vary greatly among years as economic forces impact crop selection and as weather conditions and water supplies vary. To support wintering Mountain Plovers in California we present the following recommendations:

1. <u>Maintain alfalfa, cultivated grass, or other suitable habitats in critical Mountain Plover areas in the Imperial Valley and Antelope Valley</u>. Because alfalfa is a relatively low value crop with high water demand, there are likely to be increasing incentives for farmers to switch to more valuable crops that require less water. Although this may be necessary for water supply and economic reasons, a complete loss of alfalfa or grass fields to unsuitable alternative crops could

have a significant impact on wintering Mountain Plovers. We recommend identifying those key areas within regions that regularly attract Mountain Plovers and working to ensure that a significant proportion of areas are maintained in suitable conditions.

2. Promote frequent alfalfa harvest and/or grazing during mid-winter. We recommend encouraging and providing incentives for farmers to cut these fields at least once over the winter to maintain vegetation height at levels that will encourage use by Mountain Plovers.
3. Promote field fallowing and maintaining winter burned fields or areas with short vegetation. Ensuring an abundance of this habitat, particularly in the Imperial Valley, would greatly benefit wintering Mountain Plovers. We recommend working with farmers to encourage and provide incentives for leaving some fields fallow and controlling weed growth in these fields to maintain suitable vegetation heights. In cases where a winter cover crop is needed or desired, maintaining relatively low vegetation heights should be encouraged.
4. Protect and manage natural grassland habitats in the Panoche Valley and Carrizo Plain. These areas should be protected from development and other disturbances. Grassland habitats and suitable management should also be prioritized and encouraged in other regularly used areas of the Central Valley. Priority areas should include grasslands in Yolo and Solano Counties and around Pixley National Wildlife Refuge. Moreover, management plans should include using grazing and burning to create and maintain the short vegetation during winter months.

ACKNOWLEDGMENTS

This survey would not have been possible without the extraordinary efforts of many dedicated citizen science volunteers. We extend our thanks to all those who participated. The successful organization and implementation of this survey was made possible through collaboration with Kathy Molina, Natural History Museum of Los Angeles County, who coordinated the Imperial Valley portion of the survey, and Kathy Sharum, Bureau of Land Management, who coordinated the Carrizo Plain portion of the survey. Funding for this survey was provided by the U.S. Fish and Wildlife Service Region 8 - Migratory Bird Program (FWS Agreement No. 80211AJ109).

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Table 1. Mountain Plover survey effort by survey region in California, January 2012.

Area	Miles	Hours
Panoche Valley	20.0	6.0
Carrizo Plain	300.8	27.8
Antelope Valley	327.0	43.0
Imperial Valley	>2,000 km^2	*

* not reported

Table 2. Numbers, by survey year, of Mountain Plovers at major wintering sites in California.

	Statewide Survey				Selective Survey
Location	**1994**	**1998**	**2002**	**2011**	**2012**
Central Valley	547	417	277	0	167*
Panoche Valley	0	44	25	45	0
Carrizo Plain	0	174	145	206	84
Antelope Valley	36	332	655	156	134
San Jacinto	0	229	0	0	not surveyed
Imperial Valley	2329	878	1241	827	3072
San Bernadino Co.	118	19	0	0	not surveyed
Pyramid Hills, Kings Co.	0	170	143	0	not surveyed
other	27	28	11	1	
TOTAL	**3057**	**2291**	**2497**	**1235**	**3457**

*eBird records from survey period.

Data for 1994, 1998 & 2002 were obtained from Hunting 2007.

Figure 1. Mountain Plover survey regions in California, January 27-29, 2012.

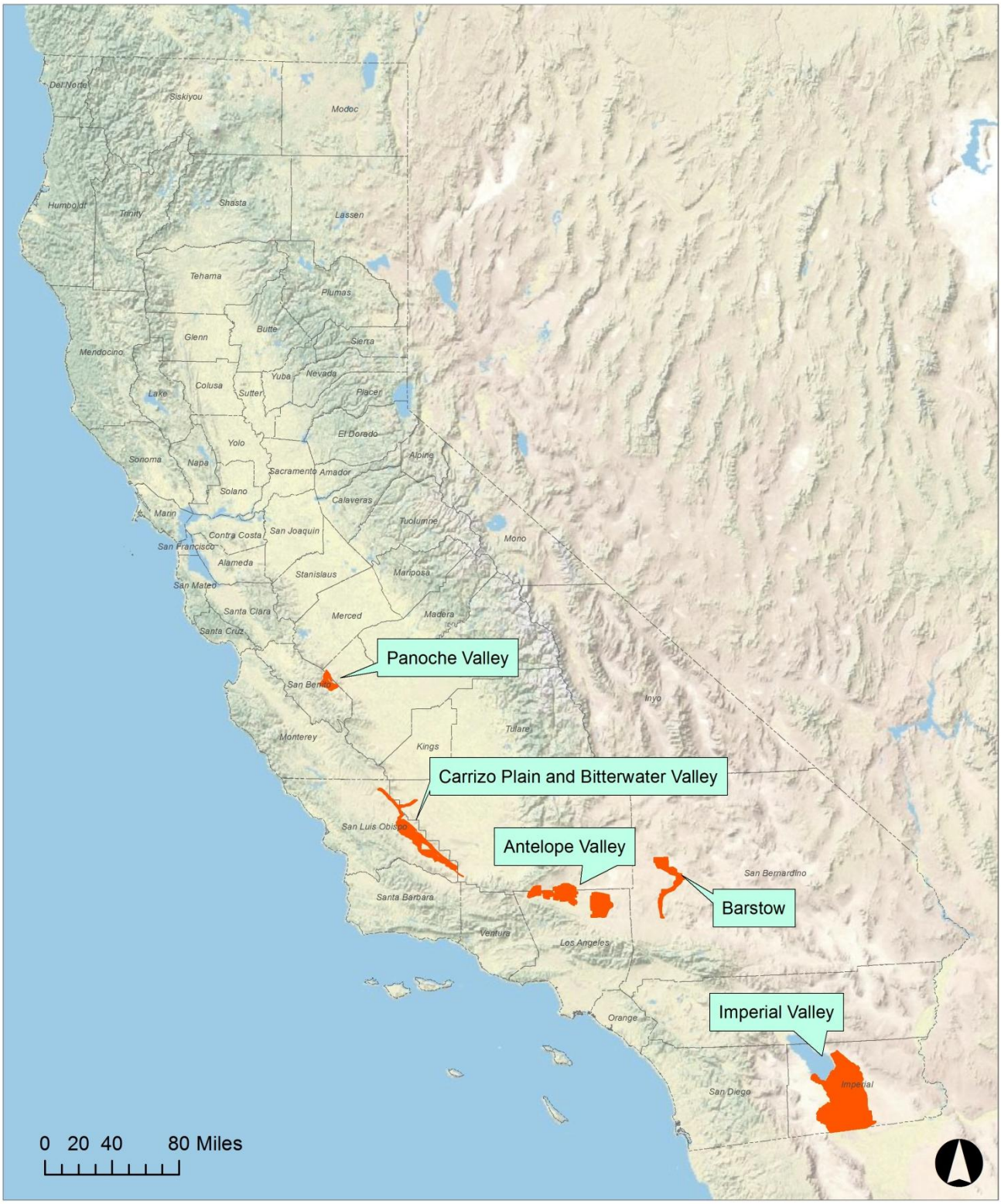


Figure 2. Distribution of Mountain Plover flock locations during January 2011 and 2012 California surveys, plus flocks observed outside the survey window November – February, 2011 and 2012 from throughout California (eBird data).

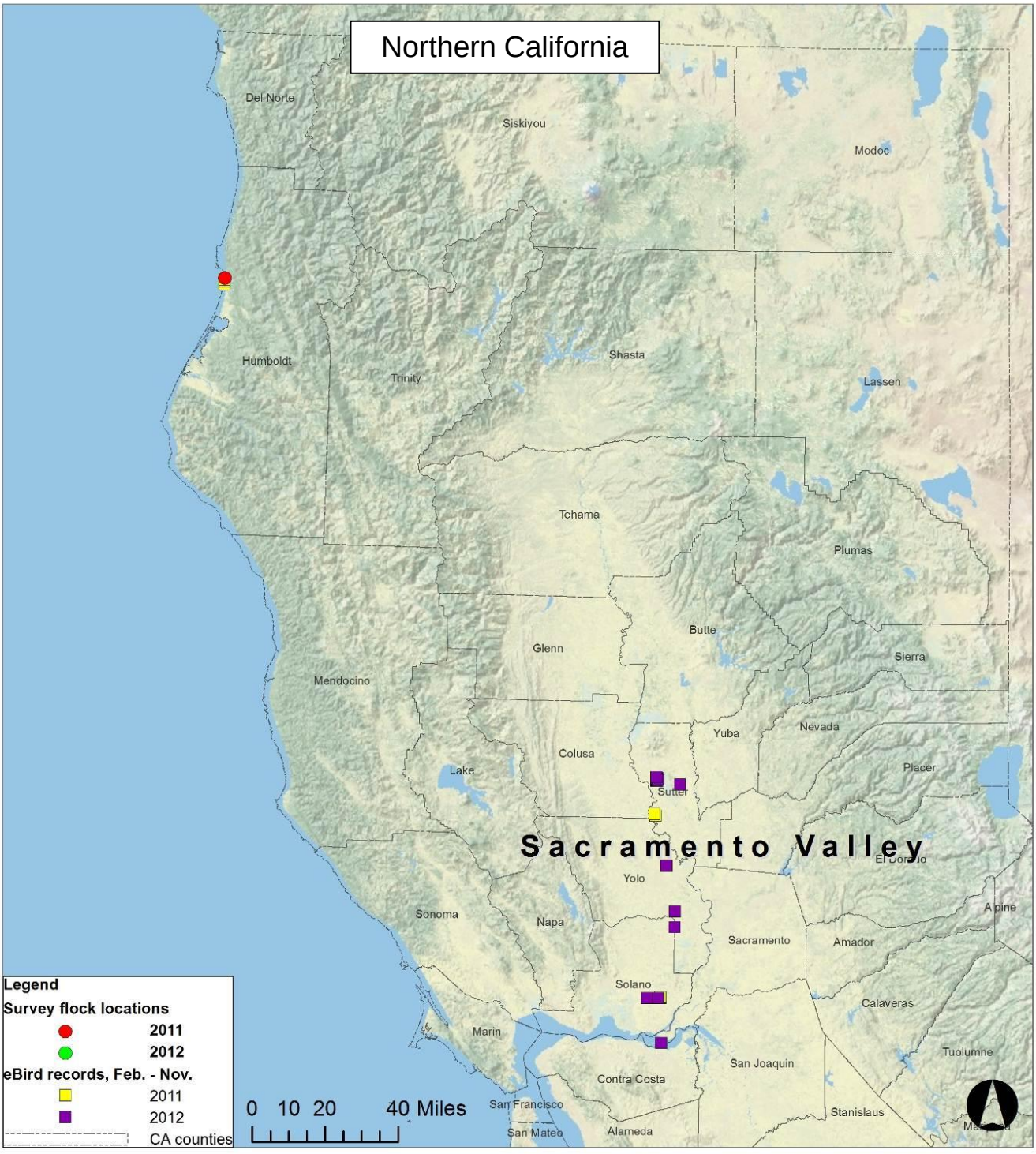


Figure 2, cont.

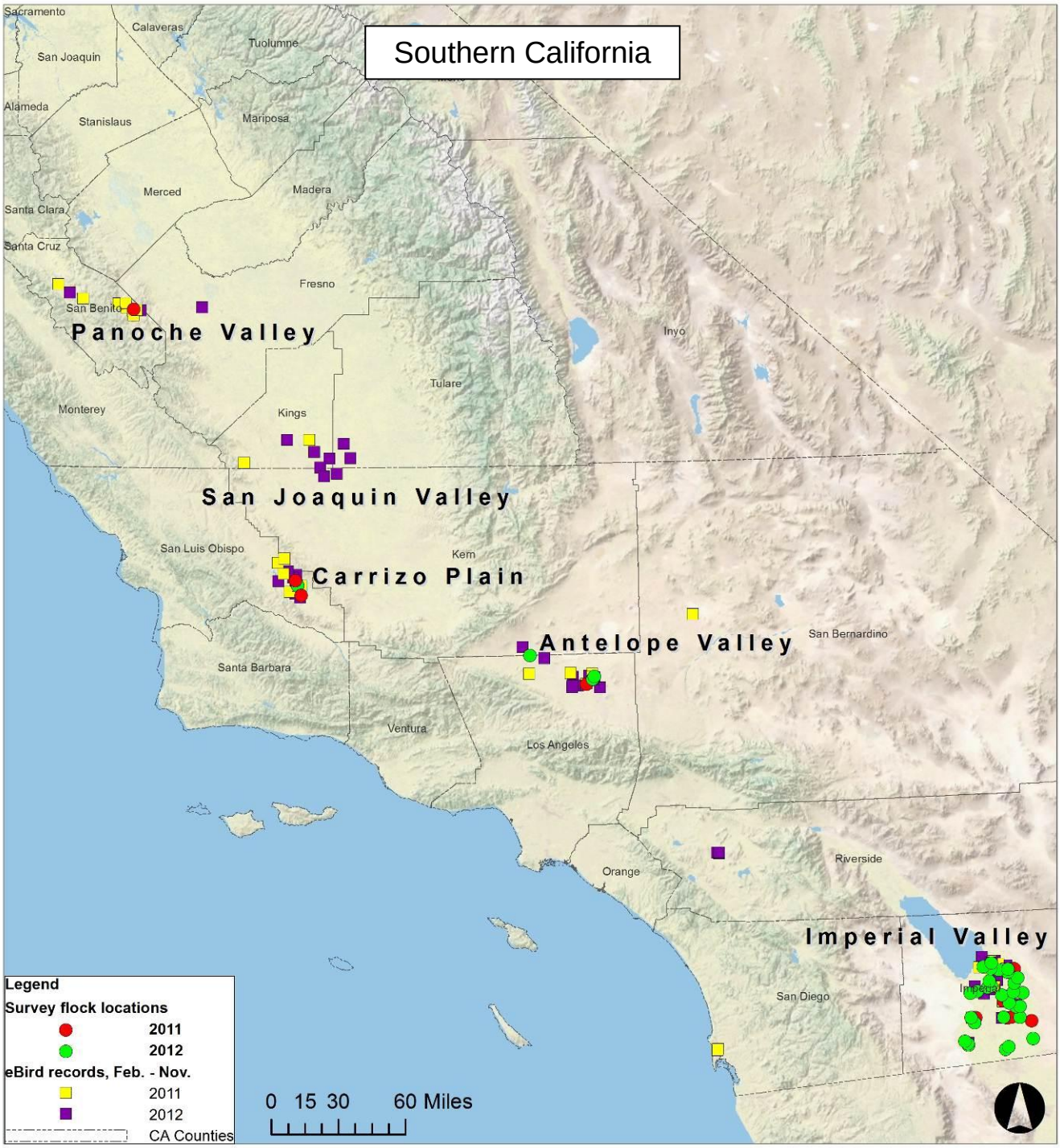
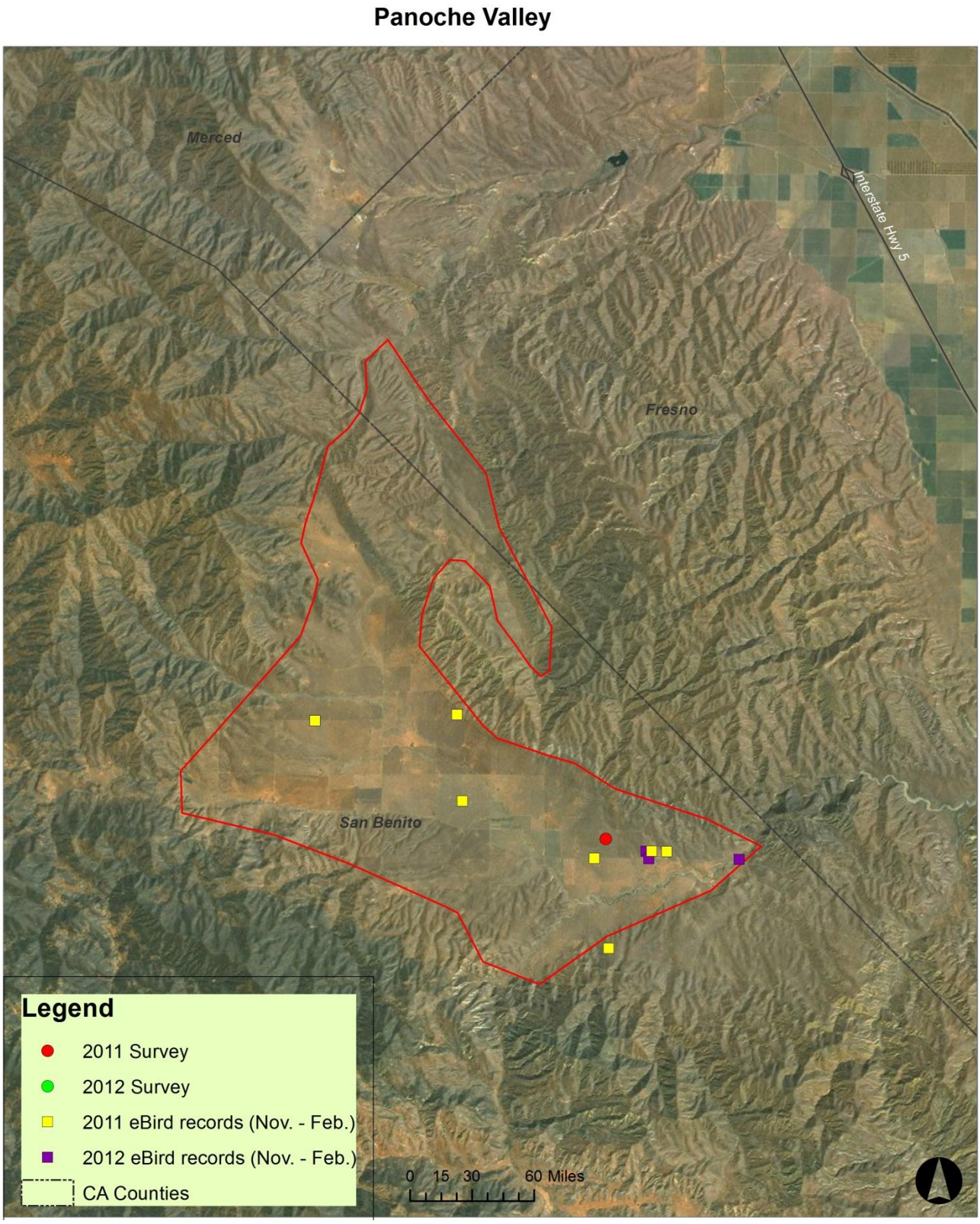


Figure 3. Survey extent within Panoche Valley, Carrizo Plain, and Antelope Valley survey regions in California with results from 2011 and 2012 surveys plus eBird data from November – February 2011 and 2012.



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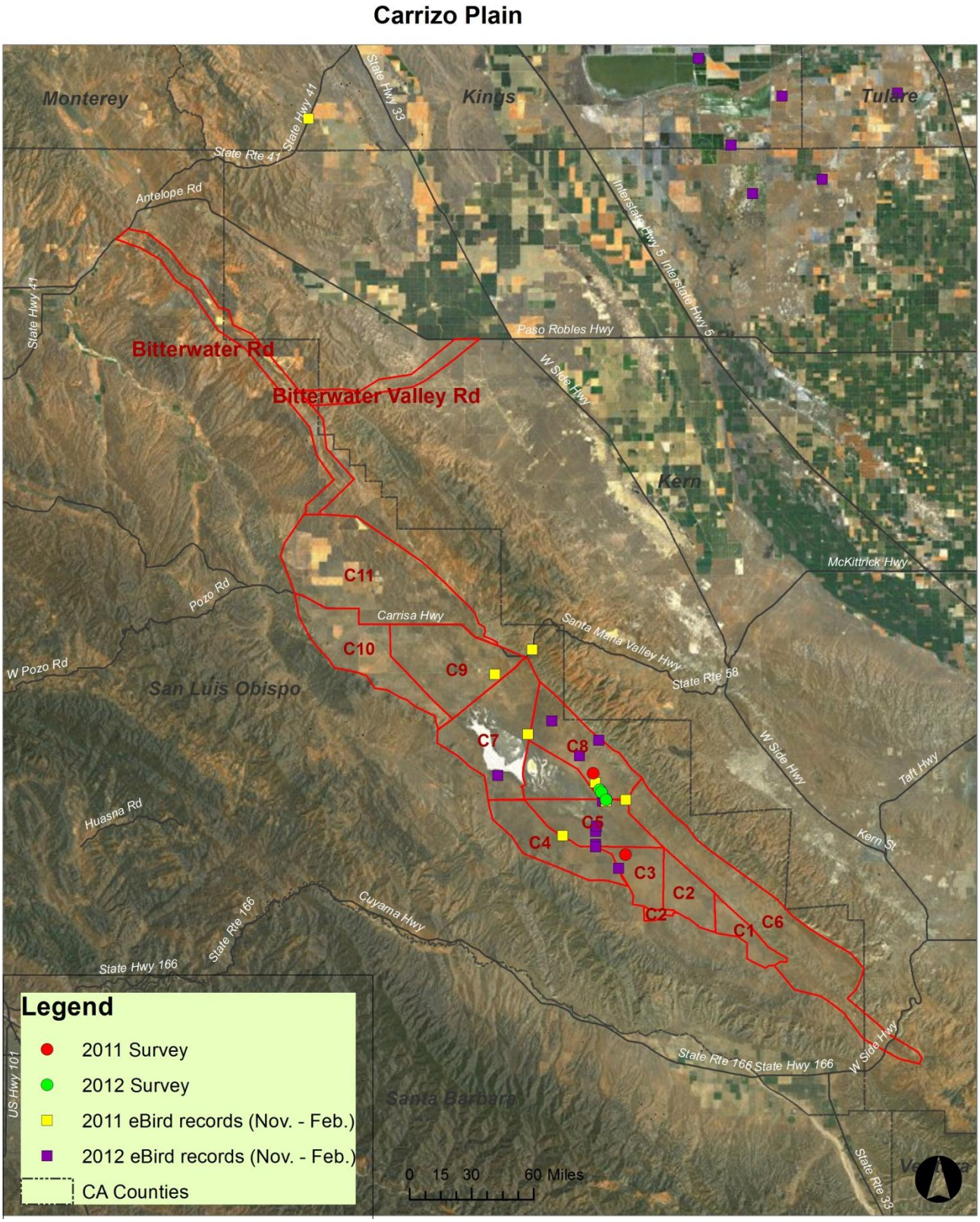


Figure 3, cont.

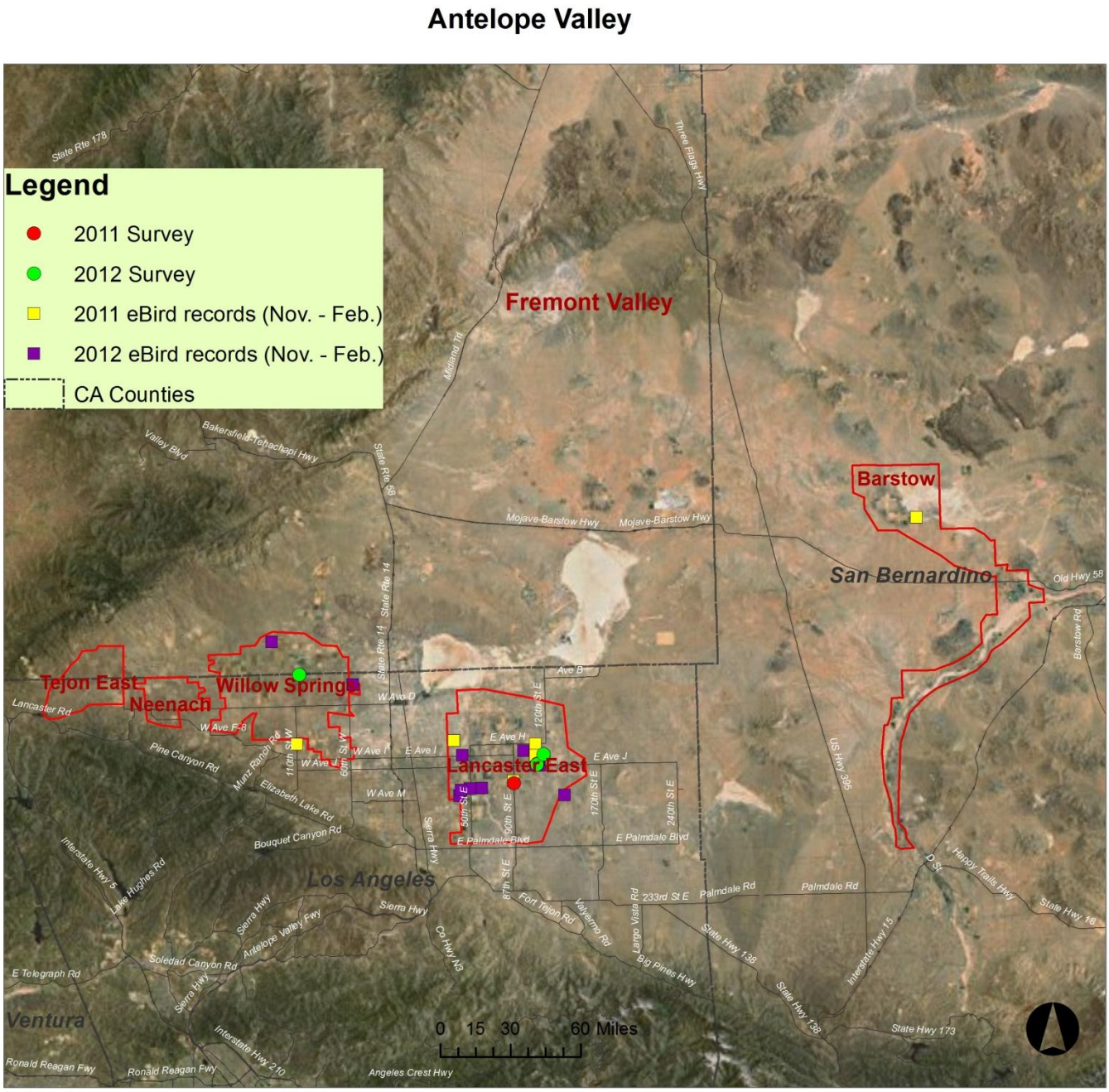


Figure 4. Number of Mountain Plovers observed during California statewide surveys, 1994-2012. Numbers above columns indicate the number of flocks observed. Note that 1994-2011 were considered statewide surveys, whereas 2012 was not but likely accounted for >75% of plovers.

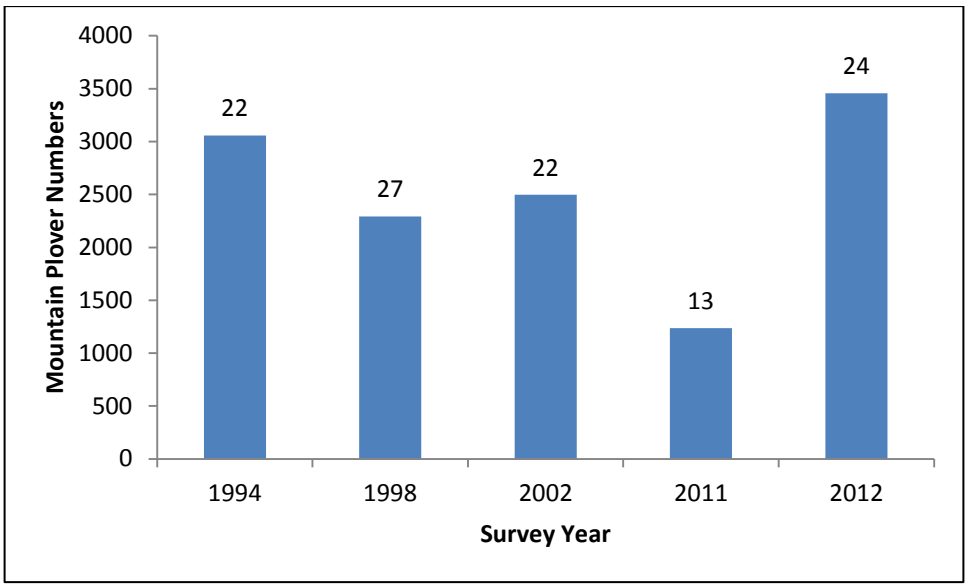
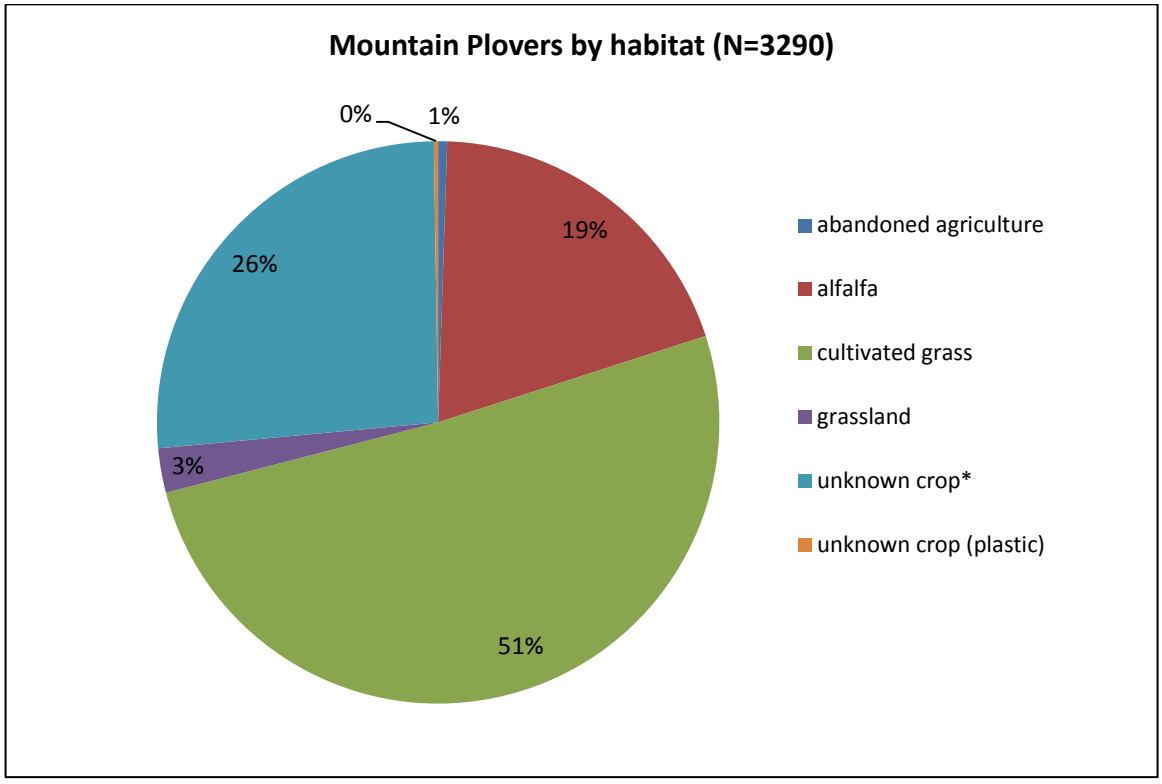


Figure 5. Habitat/agriculture type and condition used by Mountain Plovers (individual birds and flocks) sighted during the 2012 winter survey in California.



*unknown crop refers to a field that is bare, tilled, or burned.

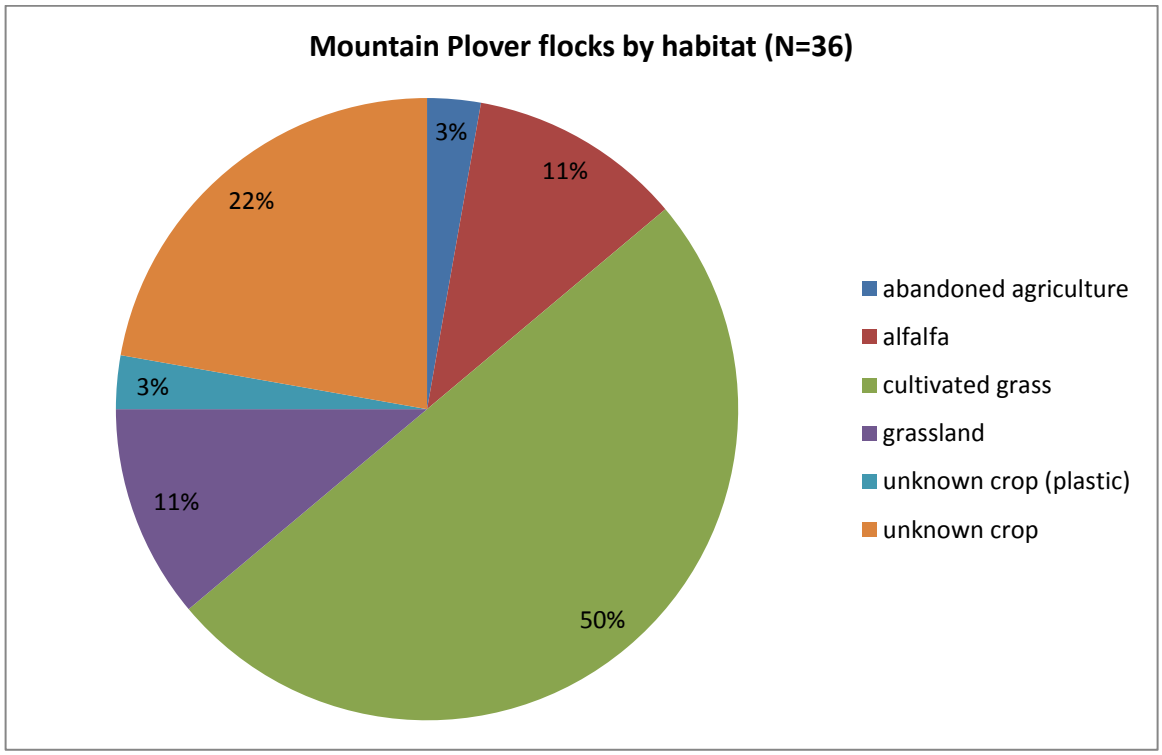
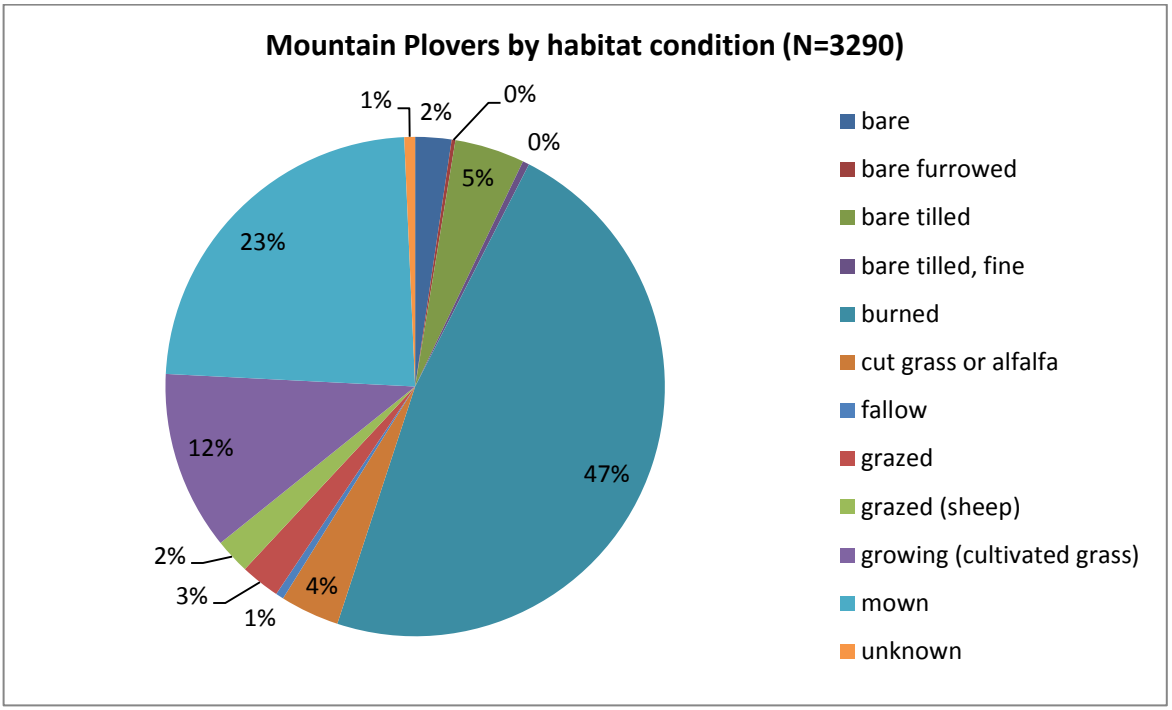
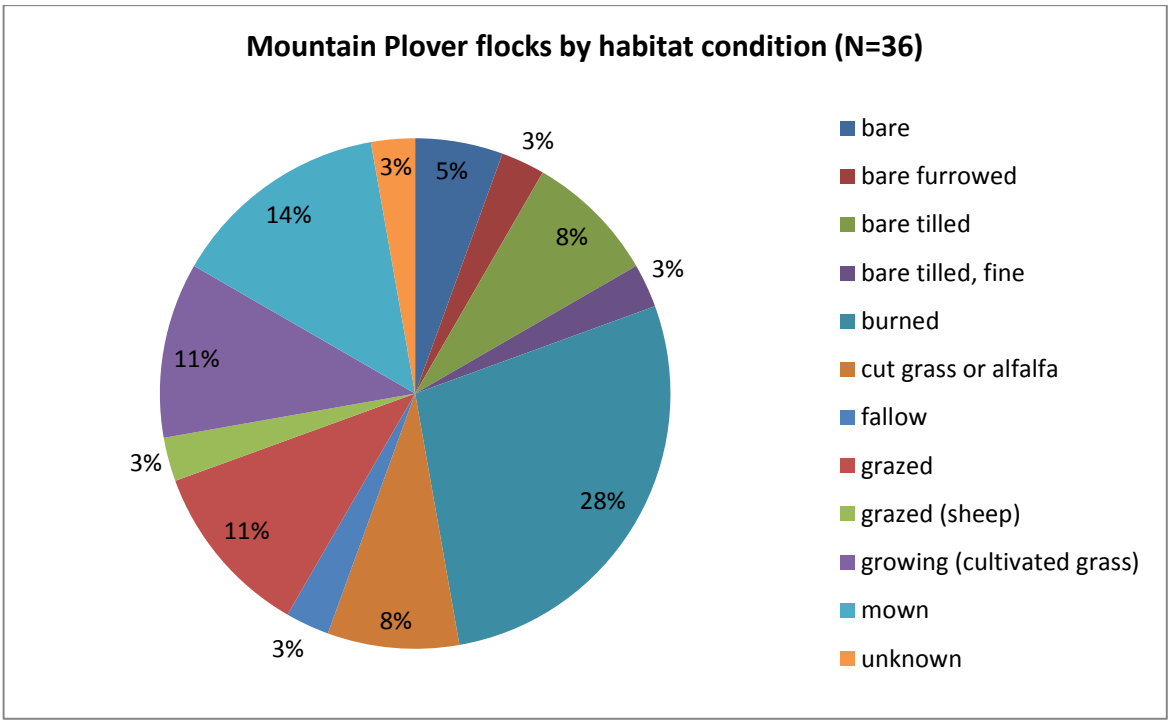


Figure 5, cont.





Appendix 1.

Audubon CALIFORNIA

CALIFORNIA MOUNTAIN PLOVER SURVEY
JANUARY 27-29, 2012
SURVEY PROTOCOL

In 2011, Audubon California, in collaboration with the U.S. Fish and Wildlife Service, completed a statewide Mountain Plover winter survey. Because of low numbers of birds detected, we are repeating the survey in 2012 primarily at key wintering sites: Panoche Valley, Carrizo Plain, Antelope Valley, and Imperial Valley.

For more Mountain Plover information: http://ca.audubon.org/birds/mountainPlover-survey.php

SURVEY OBJECTIVES:

1) Determine the abundance of Mountain Plover (MOUP) wintering in California;
2) Identify or confirm important Mountain Plover wintering area; and
3) Ascertain which habitat types and management practices support Mountain Plovers.
4) Record any observations of Long-billed Curlews during the survey.

WHAT TO BRING:
Surveyors will be provided with:

1) A survey map, delineating publicly accessible roads (this map can be sent to you via email or snail mail) in your selected or assigned survey area;
2) A copy of the survey protocol (this document); and
3) Data sheet/s.

Surveyors are responsible for providing their own:

1) Optics – binoculars and a spotting scope
2) Vehicle
3) GPS unit (optional). If you have a GPS unit please bring it. It will be extremely helpful in recording Mountain Plover locations. If you do not have a GPS unit, you will just need to record Mountain Plover locations on the map provided to you.
4) Cell Phone (optional). If you have a cell phone, bring it along. Audubon staff will be available to answer any questions during your survey.
5) Pens/pencils/clipboard

METHODOLOGY:

Survey areas are designed to be covered in a half-day to a full-day. Surveyors will be free to conduct their survey on any day during the 3-day survey window (January 27-29). However, in some of the smaller geographical areas (e.g., Carrizo Plain, Panoche Valley) an effort will be made to cover the entire area over a 1-2 day period.

Ideally, surveys should begin shortly after sunrise (7 – 7:30am) to ensure all of the survey area can be covered at a leisurely pace. Surveyors will travel all publicly accessible roads, keeping an eye out for any suitable Mountain Plover habitat. A list and description of potentially suitable habitat types is provided at the end of this document.

Surveyors will scan all potentially suitable fields in your area from an access road to determine the presence/absence of Mountain Plover. You will not need to walk into the fields, simply scan them with your spotting scope and binoculars. Initial scrutiny of a field can be achieved in a slow moving vehicle with a passenger carefully scanning the area for the target species with binoculars. If plovers (or curlews) are detected, pull off to the edge of the road (if on main paved roads, pull completely onto the shoulder where dry) and scan with a scope to obtain an accurate count and document habitat type and management. To make this survey as complete as possible, we must be able to scrutinize all fields to the greatest extent possible, which means driving all paved and dirt access roads within your area.

If you encounter cabled or otherwise gated access roads that prohibit passage, scan the field from the best safe observation point. IMPORTANT – Please respect NO TRESPASSING signs. Do not drive or even walk on any posted roads unless you have previously obtained permission from the private property owner.

CAUTIONS

In some areas some roads are hard packed dirt surfaces and passable even in a sedan or non-4WD vehicle. However, wet, sandy or soft patches, and potholes, could be present so watch for these and carefully drive around them. Also be aware that heavy farming equipment (tractors, balers, tractor trailers, etc.) may be operating in your area. Always drive slowly on field roads to minimize dust kick-up. If you're near a working field, always yield the right of way to farm equipment or livestock. Even if you have 4-wheel drive, avoid traveling on dirt farm roads within 1-2 days following moderate rain as many roads will become impassable, plus you may create unwanted ruts, slide off the road, or simply become stuck.

DATA TO BE COLLECTED

General Survey Information

Date – Date of the survey (mm/dd/yyyy).
Survey area – This will be given to you when you choose (or are assigned) an area.
County – What county your survey area is within.
Start – Time when your survey begins.
End – Time when your survey ends.
Miles traveled – To gauge the effort of the survey, we ask all surveyors to record the amount of ground covered during the survey. This can be done by simply setting your odometer at the beginning of the survey and then recording the value at the conclusion of the survey. We also ask that surveyors highlight all roads traveled during the survey on the map provided.
Weather – Basic weather conditions, such as temperature, % cloud cover, wind conditions, etc.
Names – Names of all individuals participating in the survey.
Email – Email address of surveyor(s).

Observational Data

Flock # - Beginning with Flock #1, each flock you encounter (regardless of species) will be labeled sequentially (i.e., Flock #1, Flock #2, Flock #3…)
Time – Time at which a flock was first observed.
Flock size – Number of individuals within the flock. If the number is an estimate because it is not possible to count every bird (e.g., many birds in flight), please indicate so on the data form by checking the "yes" box. Otherwise check the "no" box.
Location – If you have a GPS unit please record the latitude and longitude of the observation. If you do not have a GPS unit, please provide a short description if possible. For example, "At the

intersection of Main street and County Rd 29". Whether you have a GPS unit or not, please mark the observation on your survey map.
Habitat – Habitat where the flock was observed. A list of possible habitat categories is provided on the data form.
Field Stage – Note whether the field (if agricultural) where the birds are observed is bare dirt (tilled, smoothed or furrowed), a green and growing crop, recently mowed, recently burned, grazed, inactive or fallow.
Irrigation type and status –If irrigation is present, please indicate if it is flood irrigation or sprinkler irrigation. If no irrigation is present, leave these fields blank. Also, indicate if the soil is wet or dry.
Vegetation height – The approximate average height of the vegetation the Mountain Plovers (or Long-billed Curlews are using).
Behavior – Please indicate if the flock is feeding, roosting (resting, preening, bathing) or flying. If some members of a flock are feeding while others are roosting, check both.

POTENTIAL MOUNTAIN PLOVER HABITAT

Mountain Plovers use a number of different habitats during the winter including:

- *Herbaceous grasslands* – areas dominated by native or naturalized upland grasses and forbs. Annual or perennial grasses, non-irrigated, non-farmed, may be grazed.
- *Pasture* – cultivated areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops. Often irrigated.
- *Alfalfa*
- *Bermuda grass (turf grass*) – areas cultivated with perennial grasses maintained at a height of less than 8 cm. for lawn use of turf grass production.
- *Vegetables*
- *Alkaline flats* – barren, dried out lake beds.

In addition, the fields of the following production stages are often used by Mountain Plovers:

- Bare dirt (flat or furrowed)
- Recently burned
- Recently tilled
- Recently harvested or cut
- Grazed
- Fallow

FOLLOWING THE SURVEY

Please mail completed data forms and map indicating flock locations and roads traveled to:

Andrea Jones
Audubon California
601 Embarcadero, Suite 14
Morro Bay, CA 93442

Questions? please contact Andrea Jones at ajones@audubon.org or 805-772-1995.

Thank you!!

Appendix 2.

RESULTS OF THE
2012 MOUNTAIN PLOVER SURVEY
IN THE IMPERIAL VALLEY, IMPERIAL COUNTY, CALIFORNIA

SUMMARY REPORT TO:

AUDUBON CALIFORNIA
765 UNIVERSITY AVENUE
SACRAMENTO, CALIFORNIA 95825

Photo: K. Garrett

BY:
KATHY C. MOLINA
NATURAL HISTORY MUSEUM OF LOS ANGELES COUNTY
SECTION OF ORNITHOLOGY
900 EXPOSITION BOULEVARD
LOS ANGELES, CALIFORNIA 90007

28 FEBRUARY 2012

As in 2011, a comprehensive survey for Mountain Plovers and Long-billed Curlews in agricultural fields of the Imperial Valley, Imperial Co., California was organized and conducted on 27 through 29 January 2012, utilizing the identical protocol as surveys conducted in past years. Potential volunteer surveyors were recruited via announcements placed on various southern California birding listserves and by personal contact. Volunteers were required to be familiar with the identification of the two target species (although the curlew is not considered here further) and to provide their own binoculars and field scopes, and a vehicle that could be driven on dirt roads and levees (see Molina 2011, Report to Audubon California, Appendix 3 for survey protocol). Participants were assigned one or more search areas (Fig. 1), depending on the number of days committed to the survey. The size of the survey areas was designed to allow completion in 5-6 hours. Although not depicted on Fig. 1, most of the larger and less densely populated survey areas in the southern end of the valley were further divided into "a" and "b" subareas. When the target species were encountered, volunteers were instructed to record the number of birds, map their locations, and describe field conditions. Prior to the survey window, participants were provided with survey protocol, datasheets, search area maps, and an illustrated identification guide on the major crops and farming practices of the Imperial Valley (Molina 2011, Report to Audubon California, Appendices 3-6). Volunteers were also required to sign and return to the Natural History Museum of Los Angeles County a waiver of liability (Molina 2011, Report to Audubon California, Appendix 7).

RESULTS

Nineteen search teams composed of 31 individuals (see Appendix for list of participants) took part in the census that sought to cover all agricultural lands (over 2000 km^2) of the Imperial Valley within the three day survey window. Nearly 70% of these teams were composed of highly experienced surveyors, having at least one member that had participated in one or more of the plover surveys conducted previously in the Imperial Valley. The weather during the survey window was clear and calm. Coverage of 95% of the search areas was completed in the first two days with the remainder completed on the third day. Although 3,490 detections of Mountain Plovers were reported during the three day survey, our valley-wide estimate of 3,072 plovers was somewhat lower due to observer double counts. In two instances, the observers reported the likelihood of double counting individuals that had moved to adjacent fields to coalesce into larger single flocks. In one other instance observers returned to a flock first encountered on the previous day and reported a slightly larger total in a subsequent count. In these cases only the larger count for each location was summed for the valley-wide total. Plovers were more numerous and more widely dispersed in 2012 (Fig. 2) than in 2011, mirroring a pattern of dispersion and abundance observed in 2007 and 2008 (Figs. 3&4). During the present survey (and in contrast to the results of the 2011 survey), plovers were encountered primarily in burned or mown fields (Fig. 5), field types that have consistently ranked first or second among all field types in our previous surveys (Molina, unpubl. data). In 2012, plovers also used (but to a lesser degree) fields that were bare, grazed, or where germination and growth of recent plantings were underway.

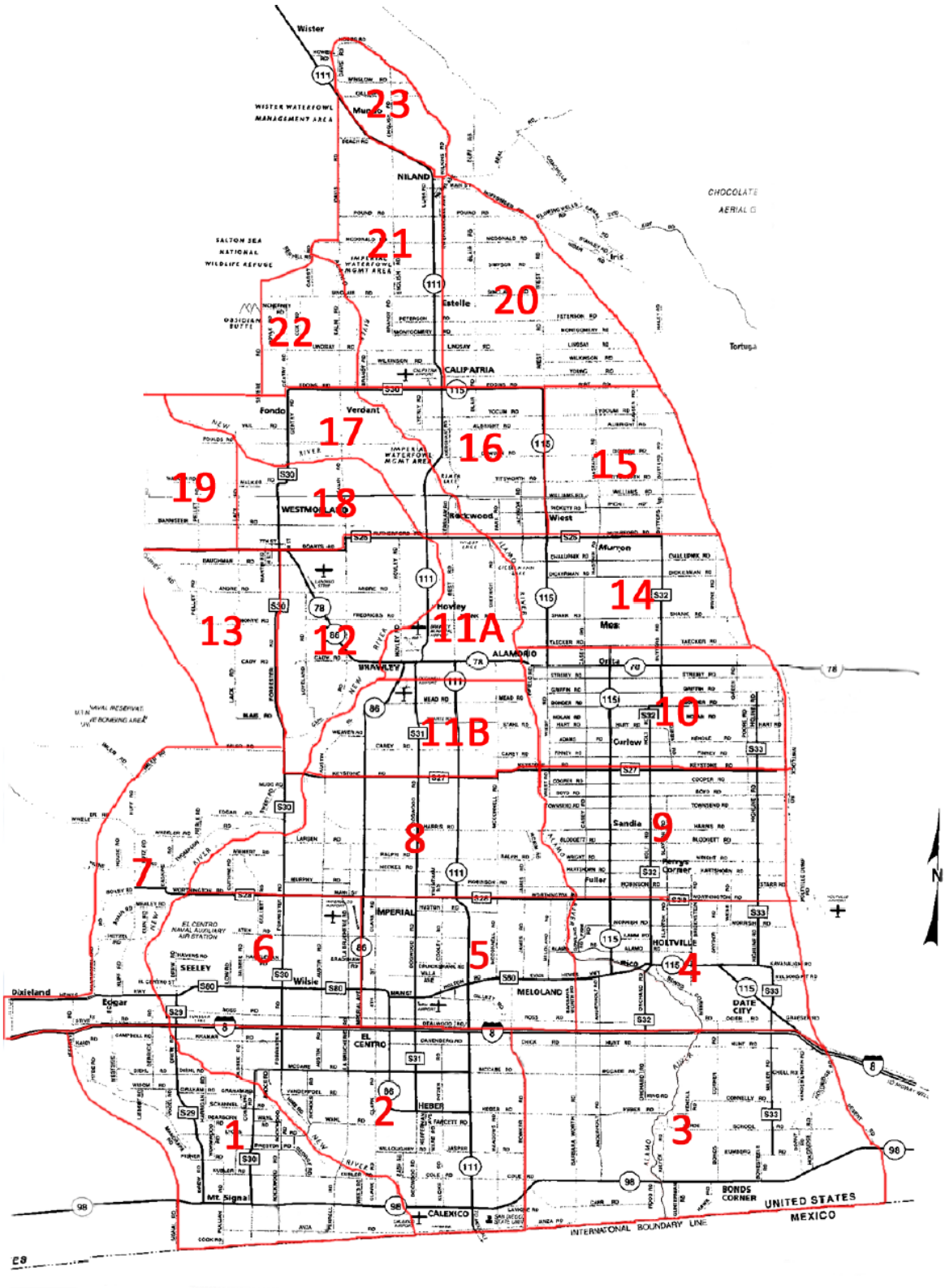


Fig. 1. Delineations of search areas in the Imperial Valley, Imperial Co., California

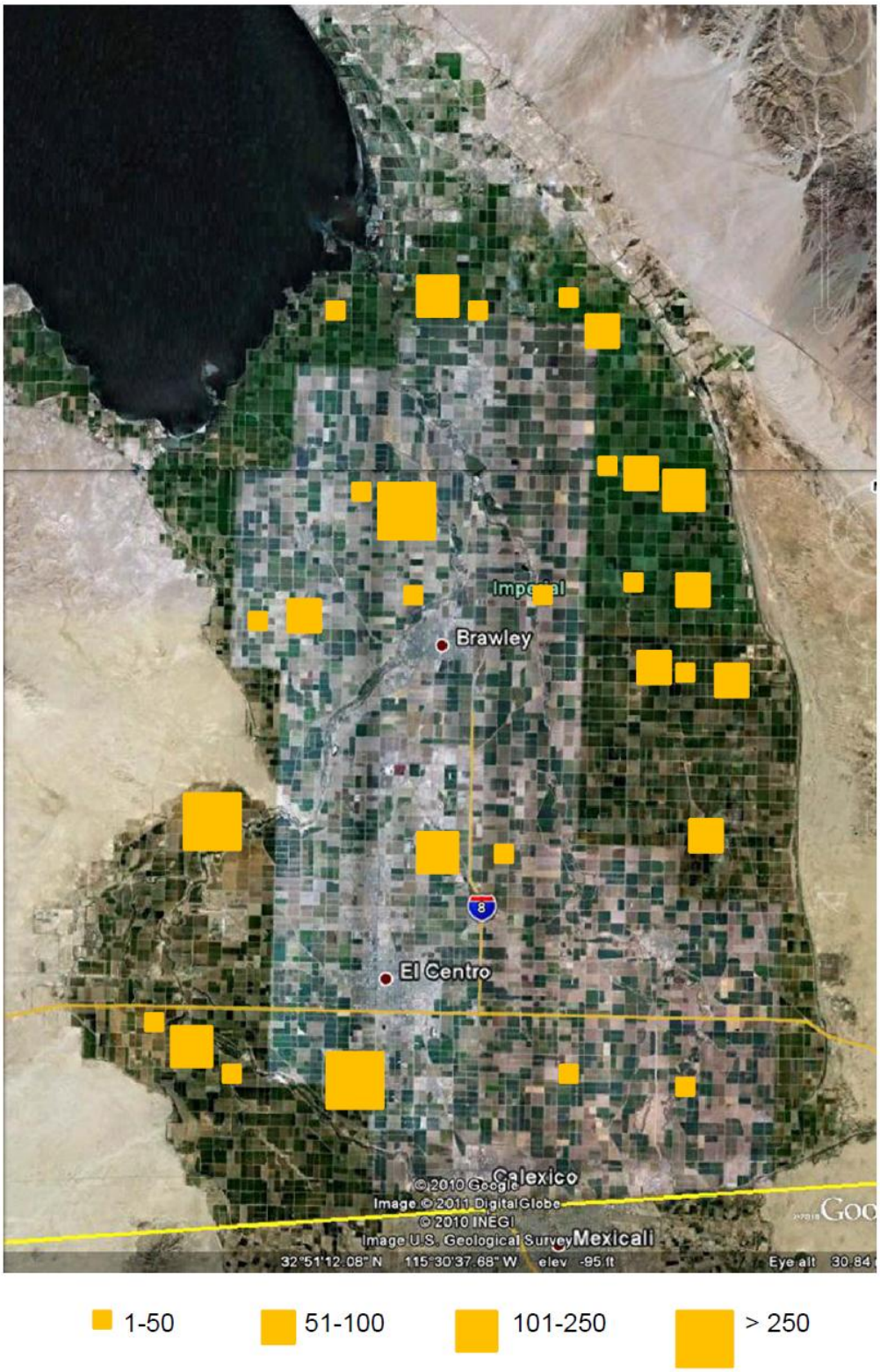


Fig. 2. Number and approximate locations of Mountain Plovers detected on 27-29 January 2012 survey of the Imperial Valley, California. Filled squares denote flock size; position within search areas are generalized.

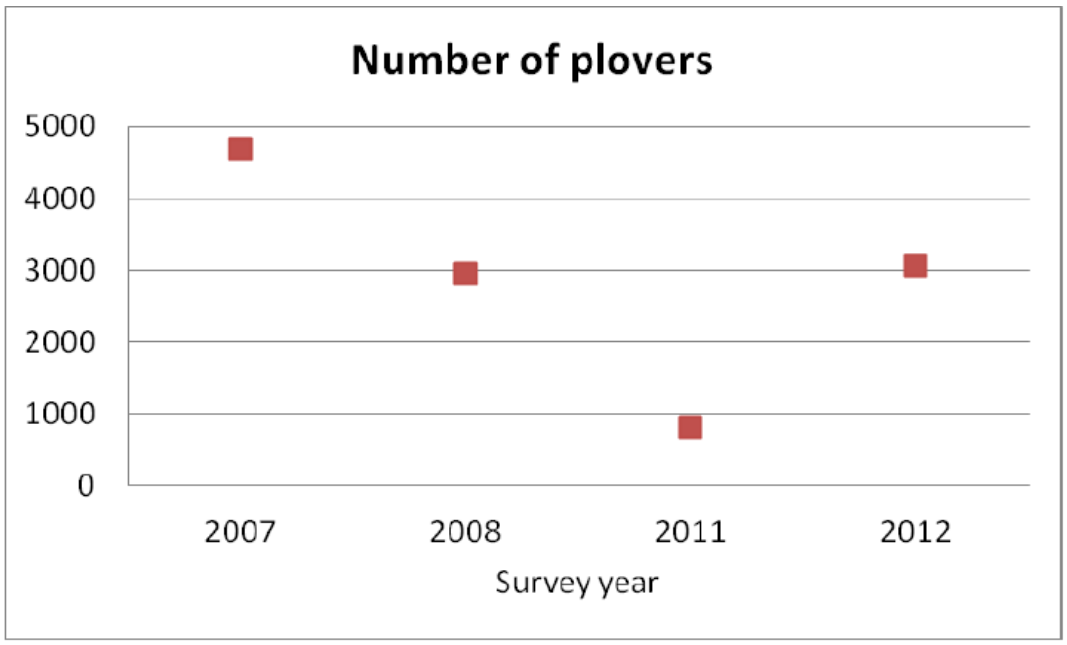


Figure 3. Number of Mountain Plovers detected on surveys conducted in 2012 in comparison to surveys conducted in 2007, 2008, and 2011.

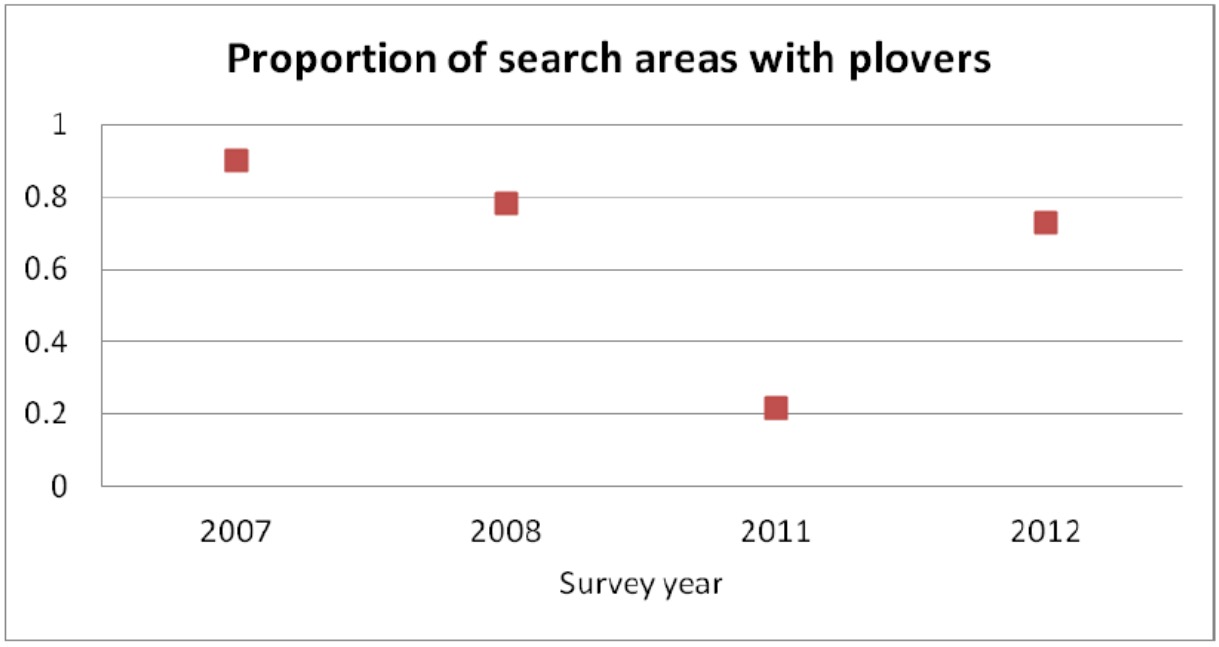


Figure 4. Proportion of search areas occupied by Mountain Plovers on surveys conducted in 2012 in comparison to surveys conducted in 2007, 2008, and 2011.

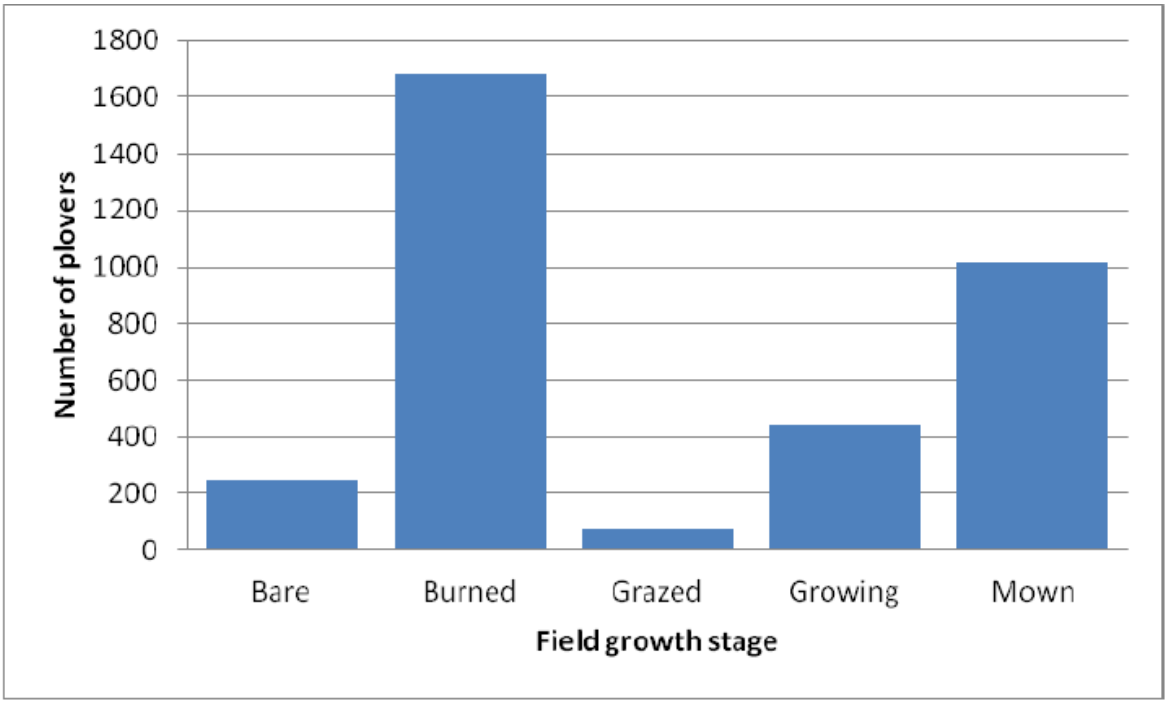


Figure 5. Pattern of field use by Mountain Plovers encountered on 2012 survey.

APPENDIX. List of survey participants and county of residence.

PARTICIPANT	COUNTY OF RESIDENCE
Tom Anderson	Imperial
Liga Auzins	Los Angeles
Marie Barrett	Imperial
Lance Benner	Los Angeles
Chuck Berthoud	out of state visitor
Shawna Bishop	Imperial
Kelly Bishop	Imperial
Eric Brooks	Los Angeles
Ann Brooks	Los Angeles
Paul Clarke	Los Angeles
Kathi Ellsworth	Los Angeles
Kimball Garrett	Los Angeles
William Heckman	Los Angeles
David Holway	San Diego
John Kelly	Los Angeles
Tito Marchant	San Diego
Jim McCarthy	San Diego
Teresa McCarthy	San Diego
Cathy McFadden	Los Angeles
Lynn Miller	Riverside
Kathy Molina	Los Angeles
Karen Riesz	San Bernardino
Noelle Ronan	Riverside
Janet Scheel	Los Angeles
Mark Scheel	Los Angeles
Julie Simonsen	San Diego
Patrick Temple	Riverside
Randy Von Nordheim	Imperial
Mitch Walters	Los Angeles
Sabrina West	San Diego
Tom Wurster	Los Angeles

Appendix 2, cont.

Raw data for Mountain Plovers encountered during 27-29 January 2012 survey of Imperial Valley, Imperial Co., California.

Area	Flock #	Species	Date	Time	Number	Behavior	Location	Lat (dms)	Long (dms)	Field Stage	Comment	Additive?
1.1	10	MP	28-Jan-12	7:46	170	forage	Drew Rd. south of Fig Lagoon	32 45 29	-115 41 55	burned	Not additive, thought by observer to be same individuals in Area 1.1, flock #12	No
1.1	12	MP	28-Jan-12	8:33	200	forage	NW corner Diehl and Derrick	32 45 32	-115 42 17	mown	Same flock as Area 1.1 #10?	
1.1	17	MP	28-Jan-12	9:47	28	forage/fly	W of Jessup, south of I-8	32 46 14	-115 43 28	mown		
1.1	11	MP	28-Jan-12	8:20	22	forage	NE corner Diehl and Derrick	32 45 04	-115 42 16	burned		
2.1	8	MP	27-Jan-12	13:34	450	forage	S. of Fawcett Rd between Bowker Rd and 111 (E. of Meadows)	32 43 12	-115 28 49	burned	new growth; median of 400-500	
3.1	1	MP	27-Jan-12	7:49	8	rest	Hunt Rd, 0.5 m E of Enz	32 46 04	-115 18 33	bare furrowed	beds covered with plastic	
3.2	2	MP	29-Jan-12	16:00	9	forage	SE corner of Bowker and Abatti	32 43 56	-115 27 40	mown		
7	1	MP	28-Jan-12	7:30	600	forage	NW corner of Edgar and Pierie Rds	32 53 30	-115 40 47	burned	freshly burned	
8.1	3	MP	27-Jan-12	9:15	203	forage/rest	N of Harris 100 yds E of McConnell	32 53 07	-115 28 54	growing	no additional field data	
8.2	4	MP	28-Jan-12	14:02	12	forage	"canal road west of Guthrie"	32 51 49	-115 39 32	burned	Not additive - see 8.2 flock # 1. no additional field data	No
8.2	1	MP	29-Jan-12	8:00	26	forage	"canal road west of Guthrie"	32 51 49	-115 39 32	burned	Resighting of 8.2 flock #4 on subsequent day. no additional field data	
9	4	MP	28-Jan-12	11:05	66	forage	Holt between Harris and Blodgett	32 52 49	-115 22 56	burned	no additional field data, probably dry bermuda	
10	2	MP	29-Jan-12	9:45	78	forage	Hwy 115 and Hart Rd, 400 m S	32 56 08	-115 24 16	burned	Lynn Miller and Pat Temple, SW quad	
10	7	MP	29-Jan-12	8:15	65	forage	SE corner Hart and Holt Rds	32 56 15	-115 22 45	mown	KLG and KCM, SE quad	
10	5	MP	27-Jan-12	13:18	8	forage	E of Wiest between Griffen and Gonder	32 57 24	-115 26 42	growing	Karen Riesz and Randy Von Nordheim, northern sector	
11.1	4	MP	28-Jan-12	15:00	14	forage	Field SW of Shank and W. Dietrich	32 59 57	-115 29 17	bare tilled, fine		
12	1	MP	27-Jan-12	13:00	23	forage	Rutherford - 1/2 way between Kalin and Brandt	33 02 35	-115 34 15		no additional field data	
13	3	MP	28-Jan-12	10:40	62	forage	Andre and Griswald	33 01 29	-115 38 04	growing		
13	1	MP	28-Jan-12	8:40	14	forage	Baughman/Pellet	33 01 58	-115 40 43	burned		
14	5	MP	28-Jan-12	9:30	75	forage	2nd field E of Butters btw Farr and Shank	33 00 17	-115 21 31	grazed (sheep)		
14	6	MP	28-Jan-12	11:00	50	forage/fly	1st field W of Hastain btw Jones and Farr	33 00 43	-115 24 55	bare		
15	3	MP	27-Jan-12	11:52	1	forage	N of Yocum/E of 115	33 06 52	-115 26 44	burned		
15	6	MP	27-Jan-12	14:34	244	forage/fly	S of Quay/2 fields E of Kaiser	33 05 07	-115 23 07	burned		
15	7	MP	28-Jan-12	10:40	70	forage/fly	SE corner Pickett and Hastain	33 03 28	-115 24 34	bare tilled		
18	2	MP	28-Jan-12	7:55	126	forage	NW corner of Rutherford and Hovley	33 02 47	-115 31 55	mown	See Area 18, Flock # 7	No
18	1	MP	28-Jan-12	7:10	110	forage/fly/rest	Rutherford Rd, 300 m W of Hwy 111	33 02 45	-115 31 55	mown	See Area 18, Flock # 7	No
18	7	MP	28-Jan-12	16:00	450	forage	SW corner Bannister and Hovley	33 03 00	-115 32 54	mown		
18	4	MP	28-Jan-12	9:45	27	forage	NE corner of Brandt and Walker	33 04 24	-115 33 29	bare		
20	3	MP	28-Jan-12	7:40	30	forage	S side of Young 3rd field E of Blair	33 07 46	-115 29 58	mown		
20	6	MP	28-Jan-12	8:20	55	forage/fly	1st and 2nd fields E of Wiest on N side Young	33 07 47	-115 26 28	bare tilled		
21	2	MP	29-Jan-12	9:05	24	forage/fly	S of Wilkinson W of English	33 08 12	-115 32 50	bare tilled		
21	10	MP	29-Jan-12	11:00	150	forage/rest	S of Hoober, E of English	33 10 01	-115 32 27	growing	no additional field data	
22	4	MP	29-Jan-12	13:00	20	forage/rest	NW corner Hatfield and Lindsay	33 08 57	-115 35 34	growing		

Appendix 3. All individual survey areas of the 2012 California Mountain Plover Survey.

Region	Area Number	Area Name	County	Date Surveyed
Carrizo	C9	Carrizo 9	San Luis Obispo	01/27/12
	C8	Carrizo 8	San Luis Obispo	01/27/12
	C8	Carrizo 8	San Luis Obispo	01/27/12
	C8	Carrizo 8	San Luis Obispo	01/27/12
	C8	Carrizo 8	San Luis Obispo	01/27/12
	C7	Carrizo 7	San Luis Obispo	01/27/12
	C6	Carrizo 6	San Luis Obispo	01/27/12
	C5	Carrizo 5	San Luis Obispo	01/27/12
	C4	Carrizo 4	San Luis Obispo	01/27/12
	C3	Carrizo 3	San Luis Obispo	01/27/12
	C1-C2	Carrizo 1 and 2	San Luis Obispo	01/27/12
	C11	Carrizo 11	San Luis Obispo	01/28/12
	C10	Carrizo 10	San Luis Obispo	01/28/12
		Bitterwater Road	San Luis Obispo	01/28/12
		Bitterwater Valley Road	San Luis Obispo	01/28/12
Antelope Valley	A99	Lancaster East	Los Angeles	01/27/12
	A99	Lancaster East	Los Angeles	01/27/12
	A96	Tejon East	Kern/Los Angeles	01/27/12
	A98	Willow Springs	Los Angeles	01/28/12
	A100 north	Barstow	San Bernadino	01/28/12
		Freemont Valley	Los Angeles	01/29/12
	A100 south	Barstow	San Bernadino	01/29/12
	A97	Neenach	Los Angeles	01/29/12
Panoche Valley	A112	Panoche Valley	San Benito County	01/28/12
Imperial Valley	IV2.1	Imperial Valley	Imperial	01/27/12
	IV15	Imperial Valley	Imperial	01/27/12
	IV15	Imperial Valley	Imperial	01/27/12
	IV3.1	Imperial Valley	Imperial	01/27/12
	IV8.1	Imperial Valley	Imperial	01/27/12
	IV10	Imperial Valley	Imperial	01/27/12
	IV12	Imperial Valley	Imperial	01/27/12
	IV14	Imperial Valley	Imperial	01/28/12
	IV18	Imperial Valley	Imperial	01/28/12
	IV1.1	Imperial Valley	Imperial	01/28/12
	IV1.1	Imperial Valley	Imperial	01/28/12
	IV1.1	Imperial Valley	Imperial	01/28/12
	IV7	Imperial Valley	Imperial	01/28/12
	IV20	Imperial Valley	Imperial	01/28/12
	IV13	Imperial Valley	Imperial	01/28/12
	IV13	Imperial Valley	Imperial	01/28/12
	IV11.1	Imperial Valley	Imperial	01/28/12
	IV14	Imperial Valley	Imperial	01/28/12
	IV15	Imperial Valley	Imperial	01/28/12
	IV18	Imperial Valley	Imperial	01/28/12
	IV20	Imperial Valley	Imperial	01/28/12
	IV9	Imperial Valley	Imperial	01/28/12
	IV3.2	Imperial Valley	Imperial	01/29/12
	IV8.2	Imperial Valley	Imperial	01/29/12
	IV10	Imperial Valley	Imperial	01/29/12
	IV10	Imperial Valley	Imperial	01/29/12
	IV21	Imperial Valley	Imperial	01/29/12
	IV21	Imperial Valley	Imperial	01/29/12
	IV22	Imperial Valley	Imperial	01/29/12

Appendix 4. Raw data for Mountain Plovers encountered during the 2012 California Mountain Plover survey, January 29-29.
(Note: Lancaster East and Willow Springs are in the Antelope Valley)

Area Number	Area Name	County	Flock #	Date	Flock Size	Estimate	Habitat	Field Stage
C8	Carrizo 8	San Luis Obispo	1	1/27/2012	4	N	grassland	grazed
C8	Carrizo 8	San Luis Obispo	2	1/27/2012	12	N	grassland	grazed
C8	Carrizo 8	San Luis Obispo	3	1/27/2012	24	Y	grassland	grazed
C8	Carrizo 8	San Luis Obispo	4	1/27/2012	44	Y	grassland	grazed
IV8.1	Imperial Valley	Imperial	3	1/27/2012	203	N	grass	growing
IV12	Imperial Valley	Imperial	1	1/27/2012	23	N	unknown	unknown
IV10	Imperial Valley	Imperial	5	1/27/2012	8	N	grass	growing
IV21	Imperial Valley	Imperial	10	1/29/2012	150	N	grass	growing
IV2.1	Imperial Valley	Imperial	8	1/27/2012	450	N	grass	burned
IV3.2	Imperial Valley	Imperial	2	1/29/2012	9	N	grass	cut
IV1.1	Imperial Valley	Imperial	12	1/28/2012	200	N	grass	mown
IV1.1	Imperial Valley	Imperial	17	1/28/2012	28	N	grass	mown
IV10	Imperial Valley	Imperial	7	1/29/2012	65	N	grass	mown
IV14	Imperial Valley	Imperial	5	1/28/2012	75	N	alfalfa	grazed (sheep)
IV13	Imperial Valley	Imperial	3	1/28/2012	62	N	grass	burned
IV18	Imperial Valley	Imperial	7	1/28/2012	450	N	alfalfa	mown
IV20	Imperial Valley	Imperial	3	1/28/2012	30	N	grass	mown
IV22	Imperial Valley	Imperial	4	1/29/2012	20	N	grass	growing
IV1.1	Imperial Valley	Imperial	11	1/28/2012	22	N	grass	burned
IV3.1	Imperial Valley	Imperial	1	1/27/2012	8	N	unk. crop (plastic)	bare furrowed
IV8.2	Imperial Valley	Imperial	1	1/29/2012	26	N	grass	burned
IV9	Imperial Valley	Imperial	4	1/28/2012	66	N	grass	burned
IV7	Imperial Valley	Imperial	1	1/28/2012	600	N	unknown	burned
IV10	Imperial Valley	Imperial	2	1/29/2012	78	N	grass	burned
IV11.1	Imperial Valley	Imperial	4	1/28/2012	14	N	unknown	bare tilled, fine
IV14	Imperial Valley	Imperial	6	1/28/2012	50	N	unknown	bare
IV13	Imperial Valley	Imperial	1	1/28/2012	14	N	grass	burned
IV15	Imperial Valley	Imperial	7	1/28/2012	70	N	unknown	bare tilled
IV18	Imperial Valley	Imperial	4	1/28/2012	27	N	unknown	bare
IV15	Imperial Valley	Imperial	6	1/27/2012	244	N	grass	burned
IV15	Imperial Valley	Imperial	3	1/27/2012	1	N	grass	burned
IV20	Imperial Valley	Imperial	6	1/28/2012	55	N	unknown	bare tilled
IV21	Imperial Valley	Imperial	2	1/29/2012	24	N	unknown	bare tilled
A99	Lancaster East	Los Angeles	1	1/27/2012	5	N	alfalfa	cut
A99	Lancaster East	Los Angeles	2	1/27/2012	112	N	alfalfa	cut
A98	Willow Springs	Los Angeles	3	1/27/2012	17	N	abandoned ag	fallow

Appendix 4, cont.

Area Number	Irrigation Type	Irrigation Status	Vegetation Height	Behavior	Latitude	Longitude	Flock Notes
C8	none	dry	<10cm	feed	35.198380	-119.769170	CDFG land elkhorn/panorama 1/4 mile west of tanks
C8	none	dry	<10cm	feed,fly	35.196050	-119.767470	12 in flight, landed to forage south side of road
C8	none	dry	<10cm	feed	35.189160	-119.761880	24-30 individuals
C8	none	dry	<10cm	feed	35.189160	-119.761880	44+ on separate area south of flock 3, CDFG due east of barn structure
IV8.1	unk	wet	unk	forage/rest	32.885278	-115.481667	N of Harris 100 yds E of McConnell
IV12	unk	unk	unk	forage	33.043056	-115.570833	Rutherford - 1/2 way between Kalin and Brandt
IV10	unk	wet	10-20cm	forage	32.956667	-115.445000	E of Wiest between Griffen and Gonder
IV21	unk	dry	10-20cm	forage/rest	33.166944	-115.540833	S of Hoober, E of English
IV2.1	unk	dry	<10cm	forage	32.720000	-115.480278	S. of Fawcett Rd between Bowker Rd and 111 (E. of Meadows)
IV3.2	unk	dry	<10cm	forage	32.732222	-115.461111	SE corner of Bowker and Abatti
IV1.1	unk	dry	<10cm	forage	32.758889	-115.704722	NW corner Diehl and Derrick
IV1.1	unk	dry	<10cm	forage/fly	32.770556	-115.724444	W of Jessup, south of I-8
IV10	unk	dry	<10cm	forage	32.937500	-115.379167	SE corner Hart and Holt Rds
IV14	unk	dry	<10cm	forage	33.004722	-115.358611	2nd field E of Butters btw Farr and Shank
IV13	unk	dry	<10cm	forage	33.024722	-115.634444	Andre and Griswald
IV18	unk	dry	<10cm	forage	33.050000	-115.548333	SW corner Bannister and Hovley
IV20	unk	dry	<10cm	forage	33.129444	-115.499444	S side of Young 3rd field E of Blair
IV22	unk	dry	<10cm	forage/rest	33.149167	-115.592778	NW corner Hatfield and Lindsay
IV1.1	unk	dry	0	forage	32.751111	-115.704444	NE corner Diehl and Derrick
IV3.1	unk	dry	0	rest	32.767778	-115.309167	Hunt Rd, 0.5 m E of Enz
IV8.2	unk	dry	0	forage	32.863611	-115.658889	"canal road west of Guthrie"
IV9	unk	dry	0	forage	32.880278	-115.382222	Holt between Harris and Blodgett
IV7	unk	dry	0	forage	32.891667	-115.679722	NW corner of Edgar and Pierie Rds
IV10	unk	dry	0	forage	32.935556	-115.404444	Hwy 115 and Hart Rd, 400 m S
IV11.1	unk	dry	0	forage	32.999167	-115.488056	Field SW of Shank and W. Dietrich
IV14	unk	dry	0	forage/fly	33.011944	-115.415278	1st field W of Hastain btw Jones and Farr
IV13	unk	dry	0	forage	33.016111	-115.678611	Baughman/Pellet
IV15	unk	dry	0	forage/fly	33.057778	-115.409444	SE corner Pickett and Hastain
IV18	unk	wet	0	forage	33.073333	-115.558056	NE corner of Brandt and Walker
IV15	unk	dry	0	forage/fly	33.085278	-115.385278	S of Quay/2 fields E of Kaiser
IV15	unk	dry	0	forage	33.114444	-115.445556	N of Yocum/E of 115
IV20	unk	dry	0	forage/fly	33.129722	-115.441111	1st and 2nd fields E of Wiest on N side Young
IV21	unk	dry	0	forage/fly	33.136667	-115.547222	S of Wilkinson W of English
A99	sprinkler	dry	10-20cm	fly	34.691389	-117.931667	SW of ranch in center of same field as flock 2
A99	sprinkler	dry	<10cm	feed	34.704722	-117.920556	NE of flock 1 in same field
A98	unk	dry	<10cm	feed	34.818805	-118.318578	field had scattered shrubs and bare soil, 100 m of new tranmission lines