# Habitat and Population Characteristics of Tricolored Blackbird Colonies in California

2005 Final Report

Prepared for the California Department of Fish and Game
Habitat Conservation Planning Branch
1416 Ninth Street, Suite 1260
Sacramento, CA 95814

William J. Hamilton III and Robert J. Meese
Department of Environmental Science & Policy
University of California
Davis, CA 95616

January 13, 2006

TABLE OF CONTENTS

## EXECUTIVE SUMMARY

1. All involved with the 2005 tri-annual tricolored blackbird Survey (the authors of this report, USFWS biologists and their consultant, Jon King, EDAW) agree on an estimate of 260,000 birds for the 2005 global population. This estimate depends largely upon the detection and purchase of two adjacent silage colonies consisting of 142,000 breeding birds. If these colonies had not been found by the authors, the global estimate would have been 120,000, well below the last coordinated survey estimate (162,000). Subsequently, another large (120,000) colony formed early in the summer at Delevan NWR. This colony, too, was not observed by participants in the tri-annual Survey.
2. The silage (silage nesting, foraging in irrigated agricultural land and grassland-scrub, with heavy adult utilization of stored grains) and Delevan (cattails nesting, foraging in rice) sites account for over half of all 2005 nests. Delevan produced 0.47 fledglings per nest, Poso Creek an average of 1.72. We believe that a major cause of the difference is black-crowned night heron predation at Delevan. We recommend that silage colony detection and buy-out be continued but stress that we consider nesting in silage to be unsustainable and that alternative, secure, permanent nesting sites in the southern San Joaquin Valley be immediately developed.
3. Ca. 58.5% of all breeding tricolors foraged for insects in growing rice or upon spilled rice. The heavy utilization of rice as a foraging habitat was not identified during the Survey, and its documentation relied upon dedicated field biologists working the entire breeding season.
4. We analyzed colony site turnover. Causes of loss of colonies include local refuge management practices, agricultural land conversions, catastrophic flooding, fluctuations in weather, and maturation of vegetative substrates.
5. Dry grassland may provide the greatest opportunity to increase and enhance tricolor habitat because it is in some areas still relatively extensive, is widely distributed throughout the Central Valley, is relatively inexpensive, and often is associated with productive tricolor colonies. Its ability to support tricolors is likely sensitive to rainfall patterns, however.
6. Distinctive weather in spring of 2005 resulted in much greater utilization of grassland sites than in 2004, including rangeland and other dryland settings, probably in response to evenly spaced atypically late rains, resulting in excellent rangeland conditions. Such inter-annual differences complicate efforts to succinctly describe tricolored blackbird foraging ecology.
7. We intensively studied foraging ecology, and documented a strong dependence upon small landscape features – very limited but highly productive habitats - at many (and all of the larger) breeding colonies, especially when adults require animal foods for their young.
8. In 2005, the mean foraging distance was estimated to be 3 km, although adults foraging for food with which to feed themselves appeared to forage, on average, more closely to the breeding colony while those foraging for animal prey for their nestlings foraged, on average, at greater distances.
9. Foraging tactics and food selection changed abruptly from mostly seeds to a combination of seeds and other vegetable matter plus animal matter as eggs hatched. Foraging adults captured only animal prey for nestlings while they took both plant and animal matter when foraging for themselves.

The spectacle of tricolor colonies:

The concept of wildlife spectacles, summarized in the recent book *Wildlife Spectacles* (Mittermeier et al., 2003), includes especially seasonal gatherings of animal species during migration, to overwinter, feed or breed. The attractiveness of these gatherings is amplified when they are large and are associated with distinctive behavioral actions. This is the spectacular impact of tricolored blackbirds (*Agelaius tricolor*) that may nest in colonies consisting of more than 100,000 individuals.

When settling, tricolors engage in distinctive group flight maneuvers, making massed and synchronous movements to and from prospective colony sites. As breeding is initiated, males make striking in-place displays associated with a song chorus. After egg-laying is complete, the spectacle subsides during incubation. After hatching, provisioning flights by both sexes commence. This process is spectacular only if the colony is successful. Predation upon eggs is usually severe and individual birds losing nests commonly abandon the site to nest again elsewhere. If, on the average, the colony enjoys a high degree of success, massive feeding flights develop. Flights to and from distant locations beyond the horizon provide a dazzling spectacle. But the greatest spectacle of all comes when a successful colony fledges. Then masses of fledglings gather at the fringes of colonies and are encouraged by their parents to fly away together, shortly to achieve independence. This is all easily witnessed at the periphery of a colony and, with an appropriate interpretation, the colony becomes a joy and has the potential to provide a broad education.

The degree of spectacular impact for each subsequent stage of breeding depends upon the vagaries of survivorship. Huge successes are the exception, but as they materialize they can be reported, like sightings of rare birds, to the viewing public. The final stages of a successful colony are well worth long distance travel and may come at a time when most other spectacles are over. The timing of these events is not highly predictable, ranging (in the Central Valley) from late March through mid-June and geographically from Kern to Colusa and Glenn counties.

To view these spectacles seek information about the location of large colonies and their status. Information about settlement is hard to come by, but once colonies are established subsequent events in the schedule of breeding become predictable. A single colony persists in Riverside County, but is under threat from development. Tom Paulek, refuge manager, announces propitious viewing times by radio announcements and crowds assemble to see this minor (in this case) spectacle. Probably the most predictable place to witness these events is at Merced National Wildlife Refuge where, depending upon management practices in any particular year, 40- to 60,000 tricolors may assemble and synchronously initiate breeding. This site is situated along a public tour route, thus offering easy access and viewing.

We recommend that the spectacular nature of tricolor colonies be identified in Department of Fish & Game literature and that a web site be established that will alert the interested public to places and times when tricolors can be observed.

# TERMS OF REFERENCE

Terms of reference are extracted from agreement P0485105, State of California with the University of California, Davis and are given as prefaces to the respective sections of this report.

# METHODS

Terms of reference from agreement:

"The [project] will describe in detail methods used to develop information on Tricolor colonies, breeding habitat, and foraging habitat…"

Surveys:

Surveys were conducted to provide the global population estimates of 420,000 in 1994, 270,000 in 1997 and 162,000 in 2000. These global Surveys were conducted according to the following scheme:

1. Select the date of the Survey on the weekend with maximum likelihood of observing breeding birds; for 2005, this was the weekend of April 23 - 25.
2. Notify all potential observers of the importance of reporting tricolor colonies on or nearest to those dates, with reports to be sent to the Survey coordinator, in 2005, EDAW, Inc., a Sacramento consulting firm working under contract to the U.S. Fish & Wildlife Service. All reports were then forwarded immediately by EDAW staff, typically via email, to us.
3. Make an intensive search for colonies before April 23 based upon a) previously known sites where tricolors were likely to be found, and b) contact with active birders, refuge personnel and others likely to have observed tricolors.
4. Visit all large colonies and, where colony chronology allows (i.e. where stage of breeding cycle ensures minimum disturbance to breeding birds), conduct line transects to count nests and eggs to allow for more precise end-of-season estimates of the number of birds attending colonies on the survey date and to estimate reproductive success. This method is applicable only to highly synchronous colonies, as otherwise excessive disturbance of breeding birds will result. Our criteria were met for all of the largest colonies except that at Merced NWR.
5. In the largest colonies, conduct a final, end-of-season transect to estimate of the number of nests at the colony to confirm previous breeding population estimates. Although we conducted these final estimates within days of the completion of breeding activities, the final transects could have been conducted up to three months after the colony site was abandoned.

The global population estimate is based upon all observations during the April Survey adjusted, where necessary, by our end-of-season estimates. Because half of all birds seen on all dates were in the 10 largest colonies, we were able to confirm via multiple methods the estimates of numbers for a large majority (76%) of the known population.

We were given access to survey results by agreement with Michael Green, United States Fish and Wildlife Service (USFWS) Regional Landbird Biologist, Portland, Oregon.

Locating colonies:

For the first time, the period of this study included two statewide surveys (April and June) of tricolor breeding colonies. We initially searched a large area of the San Joaquin Valley in a 600 km circuit, concentrating our efforts in areas where silage colonies had previously been established. Hamilton began his search in early March focusing on the silage producing areas in the San Joaquin Valley. All localities were visited at least weekly from early March through April in an attempt to avoid missing colonies destroyed by silage harvest before they were observed. We found four silage colonies – the only silage colonies to be reported by any observer during the 2005 field season. The silage at two of the four silage colonies was being actively harvested at the time of detection, destroying both. To estimate the 2005 population, we added our silage colony estimates to the estimates provided by participants in the April 2005 Surveys. Our observations continued until the breeding season ended, and included the post-June Survey interval. As with the April Survey, the size estimates of colonies that we studied were added to those seen by participants in the June Survey.

Documenting foraging habitats and foods taken:

1. Colonies were observed throughout the breeding season, beginning with incubation and ending when the first birds had fledged. The tri-annual Survey complemented our work but could not have been a substitute for it, because volunteers document colony characteristics only on single dates without tracing colony fates. We included some reports of foraging habitats provided by Survey participants known to be competent. We identified the foraging habitats of 84.6% of the April Survey birds and described the foraging habitats of 75.8% of all nesting tricolors located by all observers (the authors plus participants in the tri-annual Survey).
2. We documented and characterized tricolor foraging habitats by following foraging birds to their foraging destinations. We then compared those habitats utilized to all available habitats within the 6 km foraging radius of the birds.
3. We quantified the foraging behavior of birds at all of the largest colonies documented during the 2005 tri-annual Survey.
4. We emphasized observation and measurements at larger colonies as these make the largest contribution to tricolor productivity.
5. Incomplete entries for known colonies in Appendix I are the result of the reporting system developed by the Survey coordinator, EDAW. Survey participants were not requested to provide descriptions of foraging habitats, should any foraging have been observed, and there is no way to ensure the quality of any reports coming in from the 100+ volunteer participants.

Importance of dedicated field workers to the global population estimate:

Two large Kern County silage colonies, Poso 1 and the adjacent Poso 2, estimated to be a combined total of 122,000 birds on the April Survey date, account for nearly half of the 260,000 birds found during the April Survey. These colonies were substantially larger when they settled, but losses to blowdown of the silage substrate during periods of strong winds, estimated by our line transects as 20% at Poso 1, occurred after colony settlement. The Poso 1 colony was estimated to consist of 80,000 birds while the Poso 2 colony, approximately 2 km away, was estimated to contain 42,000 birds. If these colonies had not been found and protected prior to the Survey, the Survey estimate would have been 138,000, and would have seemed to have identified a substantial decline in the global tricolor population. Our discoveries, and the

subsequent protection of these colonies via silage buy-out, highlight the importance of full-time professional observers and we stress that in the absence of our observations in March and April, an erroneous global population estimate would have been derived. In addition, the huge reproductive output of these colonies would have been lost. It is unlikely, in the opinion of David Hardt, Refuge Manager at Kern National Wildlife Refuge, that the owners of Poso Creek Dairy will provide conditions suitable for tricolored blackbird nesting in the future (see Appendix VII, page 84).

Late season breeding:

Our own efforts, which utilized information from the June Survey, accounted for approximately 135,000 additional nesting birds, bringing an estimate of the number of late season breeding birds to 252,000, in approximate agreement with the April Survey. Since these birds were found over a period of several weeks this aggregate number cannot validly be compared to the early season 260,000-bird count. These additional birds serve again to highlight the essential observations to be made by a field team dedicated to tricolored blackbirds throughout the entire breeding season.

Tricolor breeding habitat potential:

To assess unused habitat, we need to identify the following categories of lands:

1. Grasslands and open grassy woodlands
2. Rice cultivation
3. Irrigated agriculture growing alfalfa and pasture crops
4. Suitable nesting substrates within 500 m of open water

The first three habitat types may be utilized by foraging tricolors during the breeding season only if one or more occurs together with suitable nesting substrate. The foraging habitats need to be large enough to accommodate foraging birds and the nesting substrate should be at lease one hectare in area and preferably larger. The forth habitat type may be utilized for settlement of a breeding colony only if water is available within 500 m of the suitable nesting substrate. All rice cropland is close enough to water and most irrigated agricultural operations provide water in the form of canals, ponds and other watercourses. Most grassland/rangeland lacks water, limiting the utility of this otherwise extensive habitat for tricolors. Where grassland and irrigated agricultural lands such as substantial tracts of alfalfa occur but there are no tricolors, suitable nesting substrate is missing.

## ACTIVE NESTING COLONIES

Terms of reference from agreement:

"…visit and describe all active nesting colonies…". The contractor will identify "…. locations of suitable habitats lacking Tricolor colonies in 2005."

Here we describe the active colonies observed by us, comment upon the colonies we did not see, and identify reasons for changes if these are known. In most cases, large (i.e. those with >10,000 breeding birds) colonies preclude nearby settlement. In these cases the change of a particular site from used to not used is attributed to inter-colony interactions; for example, at Delevan NWR the

colony in 2004 was located in Tract 17 but the 2005 colony was located in Tract 43, less than 2 km away.

A total of 260,307 breeding tricolors was observed during the April 2005 survey, up 162,352 from 2000. In 2005, there were 60,380 more tricolors found in silage than in 2000. Appendix I provides a summary of the breeding habitats of all colonies observed in 2005. We separate these data into five parts: 1) observations before the first survey, 2) observations during the first survey (April 22-24), 3) observations after the first survey but before the second survey, 4) observations during the second survey June 4-7, and 5) observations after the second survey.

Excluding silage, 139,427 tricolors were found in 2005 including a large (12,000 birds) colony at Lake Success, Tulare County, at a site not visited in 2000. Thus, except for the two adjacent Poso Creek, Kern County silage colonies, there was no substantial difference between the number of breeding birds found in 2000 and 2005. Missing these colonies would have had a major effect upon the quantitative and qualitative outcomes of the survey: a net population loss rather than a net population gain would have been reported in 2005. Based upon our observations and estimates at the Poso Creek colonies, we are reasonably certain that there were at least 170,000 fledglings produced by the Poso Creek colonies alone.

Search effect

While the April survey located approximately 260,000 adults, the June survey found only 116,711 birds. The difference between these figures suggests that an April survey may be more effective than a June survey in estimating the world population. We were not responsible for the systematic search of any particular area in June and cannot explain the failure of the June Survey to locate more than 40% of all tricolors. The June Survey also failed to locate any substantial number of fledglings despite the production of an estimated 170,000 fledglings by the Poso Creek colonies. The failure to account for these fledged birds is a significant concern, and illustrates that much needs to be done to fully understand the movements of birds during the breeding season. Even less is known about tricolor movements following the breeding season, despite the fact that such movements may have profound implications for management.

Incremental losses

There is typically much year-to-year variation in colony size, but too little work has been done on the multiple factors that may help to account for colony size to make any statement that seeks to explain this variation. Some variation may be due to inter-year movements of birds, but marked birds would be required to allow an estimate of inter-year movements among colonies. It is a reasonable, though not necessarily correct, assumption that if foraging habitat declines, numbers of birds at colonies using these foraging habitats will also decline. Where a steady decline or decline to extinction is identified, it is often possible to document simultaneous changes in foraging habitat adjacent to the breeding colonies and thus to infer that colony decline was caused by lack of sufficient adjacent foraging habitat.

An unambiguous example of colony loss is the harvest of silage in which birds have formed breeding colonies; Table 1 presents two examples of such losses. The harvest of the silage in which the birds had built their nests resulted in the total loss of both colonies. Such losses are

not only dramatic, but may seriously impact the annual reproductive output of the species, as in recent years, many of the largest colonies have been established in silage.

Table 1. Silage colonies observed and harvested prior to the April 24 Survey.

| Colony Name | County | Date Observed | Number of Birds | Fate |
|---|---|---|---|---|
| Deer Creek Dairy | Kern | 4/13/05 | 15,000 | silage harvested |
| Producers Dairy | Fresno | 4/12/05 | several thousand in 2005; 50,000 in 2004 | silage harvested |

## CHANGES IN COLONIES AND THEIR POSSIBLE CAUSES

Terms of reference from agreement:

Changes in colonies and their possible causes: "identify and quantify breeding habitat loss ….."

Substantially different weather conditions prevailed in 2005 than in 2000 and 2004, highlighted by the periodic rains that persisted throughout the spring and resulted in vigorous grass production, exceeding the capacity of livestock to consume it under rangeland conditions (Tom Schoene, cattleman; personal observation). Several differences reported here may reflect the impact of weather on tricolor breeding.

Possible causes of inter-year changes in colony size

1. Weather induced changes
2. Ephemeral colony formation (e.g., at least 33 thistle colonies in 2005)
3. Stable colony formation and increases in these colonies; e.g., Waegell (Sacramento County) over a period of several years (precise duration unknown)
4. Agriculture, urban development and related habitat losses
5. Deliberate habitat destruction

Weather induced changes and ephemeral colonies

In 2005, 41.1% of 473,992 breeding birds foraged on dry range compared with 10% of 402,000 birds in 2004. Irrigation agriculture supported 40% of all 2004 tricolors nesting in the Central Valley but only 18.8% in 2005. Dry years may concentrate nesting populations in close association with Central Valley irrigation agriculture.

The wet 2005 spring apparently provided foraging opportunities in grassland that has not been as suitable in 2004. Overall, twice as many birds were observed foraging in grassland in 2005 as were observed in 2004. All of the Sacramento County colonies in 2005 were associated with grassland foraging (although several of these also had supplemental foods provided via livestock feed). An estimated 12,275 breeding birds were observed in Sacramento County during the April survey in 2000, compared to 14,075 birds observed this year. Of these, an estimated 8,330 birds settled at a pond on the Waegell Ranch a few days after the April Survey. The imminent

collapse of the Sacramento County tricolor population, predicted by Cook and Toft (2005), was not supported by our observations nor by those of the Survey participants, although severe developmental pressures make the future of the tricolor in Sacramento County uncertain. Since most Sacramento county birds forage on dry grassland, supplemented by stored or provided grains, it is possible that the apparent collapse of the Sacramento County tricolor population between 2001 and 2004 resulted from exceptionally dry grassland conditions.

Rice was the foraging habitat of 49% of 2004 birds but only 40.1% in 2005. Rice ground could not be worked by growers until late in the spring in 2005 because of late spring rainfall. The large (120,000) Delevan NWR rice-based colony faded rapidly, probably due to black-crowned night-heron (*Nycticorax nycticorax*) predation. We observed no long-distance foraging there (maximum = 4 km). This has been a relatively unproductive colony given the number of birds that have recently settled there, and its potential as a productive colony appears to be limited by severe black-crowned night heron predation.

The percentage of birds nesting in silage was about the same in 2004 (22%) and 2005 (23%). But 75% of all foraging by silage colonies was in grassland, heavily supplemented by stored grains, in 2005, whereas no foraging occurred in grassland in 2004.

The wet winter and spring season produced an enormous migration of painted lady butterflies (*Vanessa cardui*) throughout the Central Valley and elsewhere. The hatching of eggs laid by the adults produced abundant and easily-captured larvae on thistles, sunflowers and several other plant species, and these caterpillars were a staple food provided to nestlings at several widely dispersed colonies (e.g., in Tulare, Yolo, and Merced Counties).

There were no ephemeral thistle-based colonies observed in 2004, but 33 such colonies were observed in 2005. We believe that this abrupt increase is due to a wet late winter and spring that led to rank thistle growth. Several of these colonies were small (<100 birds), contributing to the relatively small average size of 2005 colonies. More searches conducted by additional field personnel would likely have discovered additional small thistle colonies. The large year to year variance in number of colonies results in a concomitant large variation in mean colony size, thus, mean colony size has little value as an indicator of population change.

Apparent changes due to sampling effects

If only data from the April survey dates were compiled, rice would have been identified as comprising 12.4% of all foraging habitat. The settlement of 150,000 tricolors after the second (June) survey, all in rice foraging settings, changed that proportion to 40.1% of all breeding effort for the entire season. This result again illustrates the benefits of having a full-time, dedicated field team documenting tricolor behavior throughout its breeding range during the entire breeding season. A comprehensive description of the breeding and foraging ecology of tricolors cannot be derived from one or two surveys conducted during a 5+ month breeding season stretching from Kern to Colusa Counties.

Agriculture and development induced changes

Ongoing nesting habitat losses are resulting from increased agricultural water use efficiency, eliminating the substrate utilized by small colonies associated with ponds and water

spills. There are many steady losses of foraging habitat resulting from land use conversions, especially from rangeland and pasture to grapes and almonds. This is an environmentally significant and completely uncontrolled process.

Deliberate habitat or colony destruction

There have been numerous examples of deliberate breeding habitat destruction in addition to that summarized in Table 1, including:

1. Meridian, Sutter County (22,030 breeding birds in 2004): nesting habitat burned
2. Milton, Calaveras County: use of Roundup resulting in complete destruction of breeding habitat in some cases, reduction of breeding habitat in others

Some sites will not provide long-term habitat for tricolors, but the concept of waiting and maintaining reserve status is applicable to many sites not used in any particular year. Some of the kinds of changes that take place are noted in Table 2.

Table 2. Some tricolor habitat changes, their causes and their consequences for tricolors in 2004-2005.

**Colonies declining markedly (DM) or vanishing (V)**

| **Colony** | **Change** | **Reason(s) for Decline** | **Management** |
|---|---|---|---|
| WW Sag Pond | DM | long-term drying, reduced habitat 2002-2005 | wait, maintain reserve status |
| | DM | cattail lodged vulnerable raven predation | burn every three years |
| WW Little Lobo | DM | Few grasshoppers, predation | wait, maintain reserve status |

**Colonies ephemeral (E), founded (F) or reoccupied (RE) after absence of colonization**

| | | | |
|---|---|---|---|
| San Joaquin | F | Thistles become available | New ephemeral NWR acquire alfalfa easements |
| COC | RE | Burned 2 years ago | Colonized; burn every three years |

**New or newly discovered colonies in 2005**

| | | | |
|---|---|---|---|
| Ellsworthy marsh | F | Two 6,000 bird successful colonies | Acquire easement, recontour substrate eliminate night heron colony |
| San Joaquin River | E | 4,340 birds (3 colonies) | Ephemeral thistle, unavailable other years |

## REPRODUCTIVE SUCCESS

Reproductive success (RS, calculated as: (number of breeding birds) X (nests examined) X (2/3 [factor for number of females])) was determined at 15 colonies. Reproductive success for successful nests (RSS, calculated as (number of breeding birds) X (number of nests with contents/number of nests examined) X 2/3)) at 17 colonies (Appendix III).

Mean RSS ranged from 1.6 to 3.4. RS was determined for more than half of all birds known to breed in 2005.

Reproductive success for successful nests was 1.84 in four colonies adjacent to rice foraging. This is nearly identical to the value of RSS = 1.8 derived from these sites in other years. Rice RSS (175,000 breeding birds) averaged 1.7 and RS 0.3. Low RSS is typical of rice foraging birds and, due to night heron predation, low RS is also typical. In 2004, breeding at Delevan NWR tract 17, Colusa County resulted in the production of an estimated 141,000 fledglings. In 2005, we estimated only 35,000 fledglings from Delevan tract 43, yet the two colonies were approximately the same size. The Delevan tract 43 colony was unusually asynchronous: eggs hatched from May 23 through June 22. This asynchronous breeding made estimating reproductive success difficult because it was not possible to enter the colony without seriously disrupting numerous nesting attempts, especially of those nests containing 8+ day old young. Older nestlings may jump from their nests when disturbed, likely causing their deaths.

The relatively low production from colonies supported by rice foraging is due not only to heavy predation but also to low production by successful nests, a result found at other rice-based colonies during the past decade (Hamilton, pers. obs.).

A potentially significant finding is that the exceptional growth of grass caused by the late and persistent rains resulted in high productivity of several grassland-support colonies. For example, several colonies at the Wind Wolves Preserve in Kern County had relatively high reproductive success in 2005, suggesting that grassland foraging may result in high productivity, at least in years of exceptional precipitation.

# FORAGING

Terms of reference from agreement:

Foraging destinations and foraging behavior –"identify all habitats within the foraging radius of adults provisioning nestlings, and identify destinations by following flight lines leaving colonies to foraging areas, following the foraging birds to their foraging sites, and identify foraging habitat choices."

Foraging study methodology:

Few previous studies have examined the foraging of tricolors (Crase and DeHaven, 1978; Orians, 1961). Our observations from this study suggest that a foraging study lacking information about the stage of colony development will produce an ambiguous result. This is due to the fact that tricolor nestlings are obligate carnivores that require animal prey, whereas adults are omnivores that consume both animal and plant foods. This difference between adult vs. nestling feeding requirements has not previously been described. To correctly interpret reasons for foraging decisions, it is essential to correlate the stage of the breeding sequence with foods selected by foraging birds. Within large colonies, there may be cohorts of breeding birds at different stages of incubation and nestling development that entail differing foraging strategies. We determined the stage of development of birds in colonies both by entering colonies and by observing from the perimeter of colonies. The stages of colony development can be categorized as:

Assembly. Flocks assemble in the vicinity of potential nesting areas. Foraging is upon plant materials and opportunistically upon animal matter (Crase and DeHaven, 1978).

Settlement. *En masse* movements to and from nearby foraging areas, less than 1 km from the potential colony site.

Mating. Local foraging, song. No insect-dependent foraging.

Incubation. Short foraging flights. Aerial flights to capture insects when feasible. Incubation entirely by females. Not insect-dependent.

Early provisioning. Short distance at early stages of provisioning, both sexes. The role of polygynous males in provisioning more than one nest is not known. Insect dependent.

Late provisioning. Brood reduction occurs. Long distance flights up to 8 km may occur. Insect dependent.

Fledging and dispersal to crèches where fledglings may be provisioned. Both insect and plant food provisioned.

Settlement. At settlement foraging is close to the colony. This foraging can not, as previously suggested (Orians 1961; Payne 1969), only involve evaluation of the foraging sites to be used when adults are provisioning nestlings with insects, determined by this study to be predominantly two to four km from the colony. Early foraging in the later colonies was often for spilled or seed rice grains spread by air onto roads, highways, and rice checks. Settling birds may also feed on oat and barley heads at the milk stage. The late June 25,000-bird colony at Butte City never foraged beyond one km from the prospective nesting site; these birds ate spilled rice grains picked up along and adjacent to a highway. Similar foraging was also observed at the 120,000-bird colony at Delevan NWR.

There was a conspicuous utilization of stored grains by breeding adults throughout the Central Valley, from Stony Creek (Butte County) in the north to Poso Creek 1 and 2 (Kern County) in the south. The Poso Creek adults utilized the huge stored pile of cracked corn stored immediately adjacent to the Poso Creek 1 colony. The adults consumed these stored grains but foraged for animal prey that were required to feed to their nestlings.

Incubation. Males are absent from the colony during the day. Females make short foraging trips to oats and barley. In wetland settings, they may also fly-catch insects hatching from and then flying above the colony.

Provisioning. Nestlings are fed insects and occasionally other animal foods. They are not given plant materials before about 10 days (Crase and DeHaven, 1977; personal observations). We focused our foraging observations upon this interval.

Fledging. Fledglings may be fed dry seeds and other plant materials. If fed dry seeds, fledglings will also require water to maintain water balance.

Foraging observations

Foraging by cohesive flocks is characteristic in all habitats. Tricolors depart the breeding colonies in long, nearly single-file lines to forage as dispersed flocks in rice and grassland habitats but focus upon specific fields in mixed irrigated agriculture settings. Some cohesive flock foraging is facilitated by aggregation at dispersal centers near foraging sites distant from colonies, a previously unreported feature of this extremely gregarious bird.

Foraging behavior is temporally dynamic due both to changing food availability and abundance and to the stage of development of nestlings and fledglings. Foraging behavior is spatially dynamic due to changing abundance of prey and to the category of foods sought. Foraging may be limited to one or a few target locations, here called destinations. Irrigated fields and other sources of animal foods are specifically targeted up to 6 km (and in one case, 8+ km) from colonies (Fig. 1). Fields selected by foraging tricolors, especially those foraging for insects with which to feed their young, are typically those being actively irrigated, either by flooding or by overhead irrigators, and we infer that insects in these fields are particularly vulnerable to foraging tricolors.

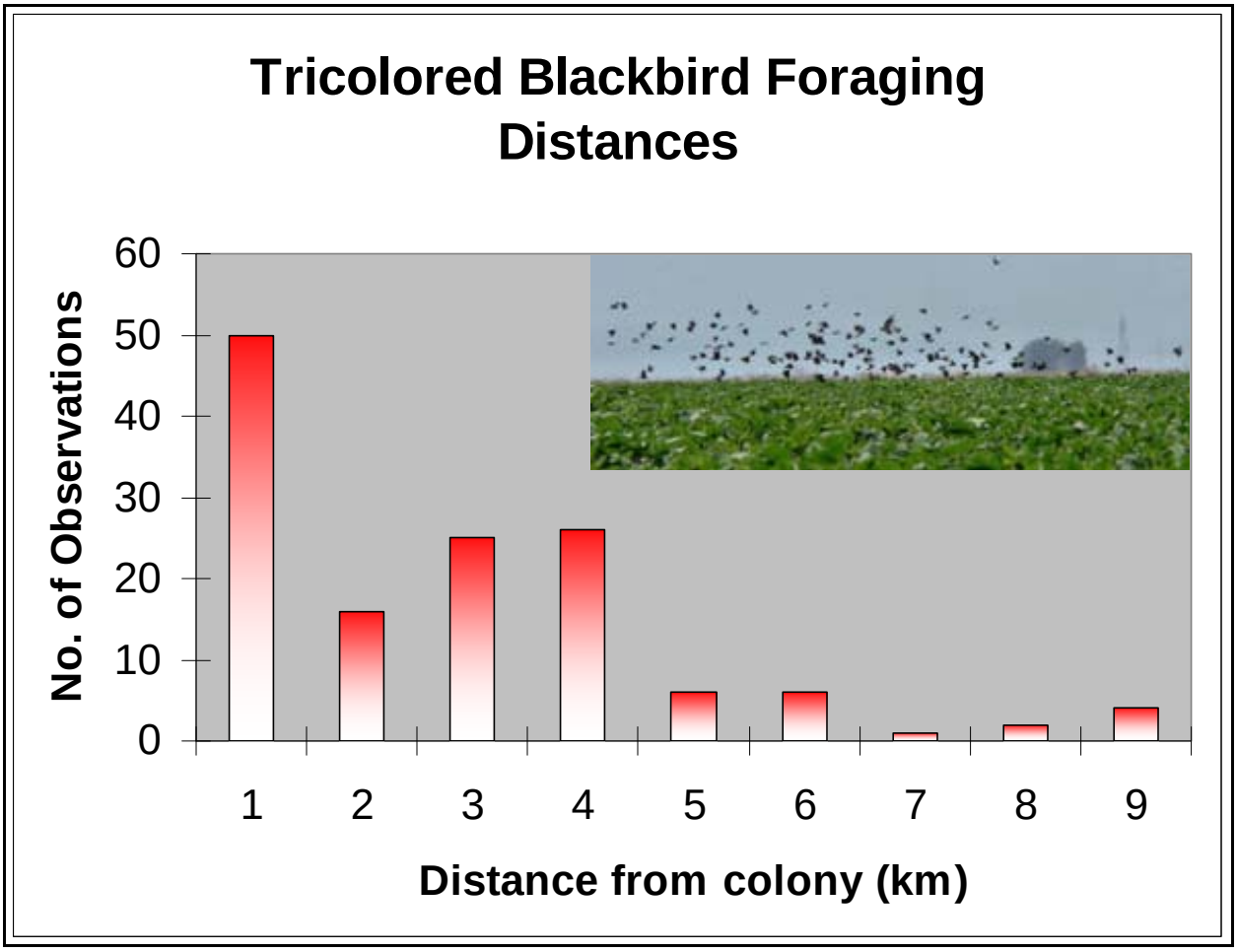



**Figure 1. Foraging Distances of Tricolored Blackbirds.**

Adult tricolors, when foraging for themselves, will consume the most easily obtained food; in many agricultural settings, this means the utilization of feed grains provided to livestock in feeding troughs and/or stored silage (e.g., cracked corn, sometimes available in huge quantities). Where such animal feeds are not available, as in colonies situated outside of livestock rearing areas, adults typically foraged close to the colony on abundant and easily-obtained foods such as spilled rice and unharvested grains.

The hatching of eggs results in an immediate shift to obligate foraging for animal prey. Foraging behavior exploits the most-abundant and most easily obtained foods that meet immediate dietary needs of nestlings. Animal matter is essential for 0-9 day old nestlings but grains and seeds are utilized by adults and > 9 day old nestlings. Animal prey fed to nestlings is diverse, including caterpillars of several Lepidopteran species, grasshoppers, aquatic larvae of water scavenger beetles (Coleoptera: Hydrophilidae), midges, beetles and other invertebrates.

Observations at Ellsworthy, Merced County showed that adults forage for seeds, in this case wheat, for older (i.e. 9 day old) nestlings and fledglings. Observations at Conaway Ranch, Yolo County confirmed that fledglings are fed seeds, in this case ripening sunflower seeds, by adults

away from the colony.

Our observations suggest that when foraging for themselves, adults rarely travel more than 3 km from breeding colonies, and frequently take advantage of super-abundant food resources at or near dairies (e.g., stored grains, cracked corn, livestock feed). Adults travel greater distances, occasionally up to 8+ km, in search of animal prey with which to feed their young. Foraging tricolors take the most available food. Where prey items are super-abundant and foraging birds are readily observed, we could identify prey items, but more commonly could only infer choices made by foraging adults. Foraging birds move rapidly and the prey selected may be relatively small and partly or completely covered by the bird's bill once captured. Many prey items reported by stomach analysis by Crase and DeHaven (1977) would not have been detected by our observation method.

Foraging distances:

We found destinations from the immediate vicinity of colonies to as far away as 8.6 km; however, most destinations are within 3 km of the colony (Figure 1). The mean maximum destination distance we observed for 20 colonies was 4 km.

Table 3. Maximum foraging distance from colony.

| **Author** | **Habitat** | **Distance** |
|---|---|---|
| Crase and DeHaven 1978 | not stated | 6.0 km |
| Hamilton 2003 | rice paddies | 6.5 km |
| This study | mixed shrub/grassland (*Atriplex* - noctuid larvae) | 8.6 km |
| This study | rice paddies | 4.0 km |

Importance of Preferred Foraging Habitats:

Small landscape features may have a disproportionate influence upon foraging behavior and, by inference, on productivity, and we found foraging tricolors to be highly selective in their choices of foraging substrate (Table 4).

At Delevan NWR, much foraging was directed to rice fields, which are the dominant land cover type, but a flooded 4.86-hectare alfalfa field 1.7 km from the colony was utilized by thousands of foraging adults. This single field was the only known alfalfa field within the 6 km foraging radius of the Delevan colony, and assuming a 6 km foraging radius, this field accounted for only 0.04% (4.86/11,310 ha) of the potential foraging area. Thus, only 0.04% of foraging effort would be expected here, yet during the course of the breeding cycle it accounted for many times expectation based upon suitable foraging area alone.

At Conaway Ranch, Yolo County. foraging adults traveled 3.5 km to a field of sunflowers to prey upon caterpillars with which to feed their young, and as the young fledged, they were lead to this same sunflower field and fed ripening seeds, yet this field was only 0.73 ha in area, .006%

of the total foraging area (assuming a 6 km foraging radius).

At Ellsworthy, Merced Country, adults foraged for several days 5.4 km from the colony in a 19.1 ha weedy field. This weedy field was only 0.17% of the total foraging area, yet for two consecutive days, this weedy field was the primary destination of thousands of foraging birds.

A weedy field containing prickly lettuce (*Lactuca viminea*) 6 km from the 6,000-bird Ellsworthy cattail colony was heavily utilized for two successive days for the butterfly larvae found there, while intervening fields were ignored. Once the caterpillar abundance in this field declined, the intervening fields and nearby alfalfa fields were principal foraging sites.

The shifting destinations and highly variable productivities, both within and among breeding seasons, of foraging habitats utilized by breeding tricolors preclude determination of the exact spatial requirements of foraging habitats surrounding colonies. The 6,000 birds at Ellsworthy used about 275 hectares of alfalfa equaling 22 birds/hectare, but their foraging was not confined to alfalfa fields. Far more work needs to be done to be able to quantify the foraging habitat requirements of tricolored blackbird breeding colonies.

Our study found that small, highly productive patches are disproportionately heavily utilized as foraging habitats and, in combination with suitable nesting habitat, may provide much of the food to support nearby tricolor colonies, especially the animal prey required by nestlings. In several of the intensively-studied colonies, alfalfa was the preferred foraging habitat, but sunflower fields, prickly lettuce and some weedy fields may also be heavily utilized for adults foraging for animal prey, and may thus play a disproportionately large role in the productivity of tricolor colonies. In general, any plant, cultivated or uncultivated, may be disproportionately heavily utilized by foraging tricolors if it provides the animal prey, mostly caterpillars in 2005, that they require to feed their nestlings.

These observations suggest that a patchwork of protected foraging habitat can support large tricolor colonies. Such a patchwork may facilitate the easement acquisition process and together with lands protected by a miscellany of existing land use easements and public lands provide for the long-term maintenance and productivity of tricolor colonies in an agricultural setting.

Additional Foraging Considerations:

Grassland foraging occurs on dry and green grazed and ungrazed rangeland. Destinations changed frequently over a period of days. It appears that tricolors can find sufficient food to provision some nestlings in most grasslands and weedy fallow fields. All unirrigated grassland, whether grazed or ungrazed may, if sufficiently extensive, support foraging tricolors, especially during relatively wet years.

Tricolors aggregate when feeding, giving the impression that patches of food are being exploited. However, we never observed patchiness in the distributions of animal prey, and we believe that the apparent patchiness of food is an illusion - another manifestation of extreme sociality. Flock foraging may also help to flush animal prey, making it more vulnerable and thus more easily captured by foraging birds.

Foraging birds do not utilize all potential foraging habitat equally. Birds will forage disproportionately heavily in irrigated cropland while simultaneously ignoring adjacent hay fields, including recently cut hay. This observation was somewhat surprising, given that many other species of birds, especially herons and egrets and some raptors (e.g., Swainson's hawks (*Buteo swainsoni*) and White tailed kites (*Elanus leucurus*), will forage extensively in recently-mowed hay fields.

We stress that all row crops, nut tree crops, and vineyards are ignored by foraging tricolors and thus do not present potential foraging habitat. We found no utilized patches of foraging habitat that could not accommodate foraging by hundreds of birds for several hours and most colony members often utilized particular patches for several days.

Our foraging observations are summarized in Table 4.

Table 4. Summary of Foraging Observations.

| 2005 Survey | Foraging Substrate | Number of Birds | Total | Percent of total |
|---|---|---|---|---|
| | | | | |
| **April survey** | Grassland | 174,572 | | 73.5% |
| | Irrigated ag | 62,770 | | 28.4% |
| | Rice | 300 | 237,642 | 0.1% |
| | Unknown | 17,865 | 255,507 | |
| | | | | |
| **April late** | Grassland | 134,000 | | 87.0% |
| | Irrigated ag | 2,000 | | 13.0% |
| | Rice | 0 | 15,400 | 0.0% |
| | Unknown | 3,495 | 18,895 | |
| | | | | |
| **June Survey** | Grassland | 9,510 | | 12.1% |
| | Irrigated ag | 28,940 | | 36.9% |
| | Rice | 40,000 | 78,450 | 51.0% |
| | Unknown | 32,961 | 111,411 | |
| | | | | |
| **June late** | Grassland | 100 | | 0.1% |
| | Irrigated ag | 6,000 | | 3.8% |
| | Rice | 150,000 | 156,100 | 96.1% |
| | Unknown | 250 | 156,350 | |
| | | | | |
| **All season** | Grassland | 197,582 | | 40.5% |
| | Irrigated ag | 99,710 | | 20.4% |
| | Rice | 190,300 | 487,592 | 39.0% |
| | Unknown | 54,571 | 542,163 | |

## GIS Analyses

Terms of reference from agreement:

"The contractor, at its Information Center for the Environment laboratory, will enter field data into a …GIS…for analysis and will produce maps of locations of tricolor breeding colonies in 2005, locations of 2005 foraging routes and areas, locations of suitable habitats lacking tricolor colonies in 2005, and locations at which breeding habitat has been lost."

### Assumed Foraging Radius

Our GIS analyses are based upon an assumed foraging radius of 6 km – this is the distance to which nearly all foraging flights are confined (Figure 1), and so best describes the land characteristics encountered and utilized by birds during the breeding season. We have analyzed two land characteristics within a 6 km radius of breeding colonies: land cover and land ownership.

### Land cover

Land cover within the foraging radius of breeding tricolors was analyzed using the Central Valley Habitat Monitoring (CVHM) layer produced and maintained by the Bureau of Land Management, Sacramento, 2003 version (the most current version available in late summer, 2005). Within a GIS, we placed buffers with a 6 km radius centered on those colonies that we studied intensively and then mapped these circular areas against the CVHM layer to estimate the percent land cover types within the foraging radius of breeding tricolors. The CVHM uses the California Wildlife Habitat Relationships system of land cover types. The results of these analyses appear as Appendix IV and are summarized below in Table 5.

Table 5. Summary of G.I.S. Analysis of W.H.R. Land Cover Classes within the Foraging Radius of Intensively Studies Colonies.

| Colony Name | County | Total % Ag. | Total % Urban | Total % Other |
|---|---|---|---|---|
| Acre Farms | Colusa | 86.6 | 0.2 | 13.2 |
| Capital Outing Club | Colusa | 88.5 | 0.2 | 11.3 |
| Christman Bottom | Merced | 85.5 | 0.5 | 14 |
| Conaway Ranch | Yolo | 79.3 | 13.8 | 6.9 |
| Delevan NWR | Colusa | 76.1 | 0 | 23.9 |
| Elder Creek | Sacramento | 20.9 | 24.8 | 54.3 |
| Ellsworthy | Merced | 58.3 | 1.1 | 40.6 |
| Lake Success | Tulare | 8.7 | 0.8 | 90.5 |
| Little Lobo | Kern | 0 | 0 | 100 |
| Merced NWR | Merced | 72.1 | 0 | 27.9 |
| Poso Creek | Kern | 48.4 | 0 | 51.6 |
| Sacramento River Levee Road | Yolo | 73.9 | 11.5 | 14.6 |
| Solano Landfill | Solano | 55.6 | 0.8 | 43.6 |
| Stony Creek | Glenn | 92.4 | 1.3 | 6.3 |
| Waegell | Sacramento | 27.1 | 7.1 | 65.8 |

Table 5 emphasizes the fact that the breeding colonies of tricolored blackbirds typically exist as small islands in a sea of agriculture, and this pattern is evident throughout its breeding range in

the Central Valley. This table, of course, presents but a snapshot of what is, in reality, a most dynamic process, with continuing losses of potential breeding and foraging habitats to agriculture and urbanization. The figure for urbanization for the Conaway Ranch colony in Yolo County, for example, underestimates the true value, as a major new development is under construction as of 2005/2006 within the foraging radius to the west and will further reduce the amount of potential foraging habitat.

As is examined more closely elsewhere in this report, all agriculture is not "created equal" in the eyes of tricolors, as some crops, especially alfalfa, sunflowers, and rice were heavily utilized by foraging tricolors in 2005, and silage has recently become a major nesting substrate. Additionally, stored and spilled grains are a primary food of adults at many colonies. A most worrisome trend, however, is the conversion of previous annual crops to perennial grapes and nut trees, as the former may serve as primary foraging areas for adults seeking animal prey with which to feed themselves and, more importantly, their young, while the latter is not potential foraging habitat. Thus, with each hectare of annual crops converted, a hectare of potential foraging habitat is lost.

Land ownership

To estimate the land ownership classes within a 6 km radius of colonies intensively studied in 2005, we used the same 6 km buffered areas and mapped these against the 2005 Public, Conservation, and Trust Lands (PCTL) layer developed and maintained by the California Resources Agency as part of its California Digital Conservation Atlas. The results of these analyses appear as Appendix V and a summary appears below as Table 6.

Table 6. Summary of G.I.S. Analysis of P.C.T.L. Land Ownership Classes within the Foraging Radius of Intensively Studies Colonies.

| Colony Name | County | Total % Public | Total % Private |
|---|---|---|---|
| Acre Farms | Colusa | 2 | 98 |
| Capital Outing Club | Colusa | 3 | 97 |
| Christman Bottom | Merced | 24 | 76 |
| Conaway Ranch | Yolo | 0.1 | 99.9 |
| Delevan NWR | Colusa | 18 | 82 |
| Elder Creek | Sacramento | 13 | 87 |
| Ellsworthy | Merced | 0 | 100 |
| Lake Success | Tulare | 14 | 86 |
| Little Lobo | Kern | 4 | 96 |
| Merced NWR | Merced | 21 | 79 |
| Poso Creek | Kern | 3 | 97 |
| Sacramento River Levee Road | Yolo | 36 | 64 |
| Solano Landfill | Solano | 10 | 90 |
| Stony Creek | Glenn | 2 | 98 |
| Waegell | Sacramento | 9 | 91 |

It is evident from Table 6 that lands surrounding most tricolor colonies are dominated by private property. In some cases, for example, the Waegell colony in Sacramento County, being situated

on private property may confer added protection, as the Waegell family has a strong environmental ethic and is highly protective both of its property and of the tricolors breeding in the small marsh supporting the breeding colony. In 2005, the Waegell colony was easily the largest of the remaining tricolor breeding colonies in Sacramento County, and as development pressures increase, it will play an increasingly important role in maintaining the tricolor in this portion of its range.

As with agriculture, not all private property is "created equal", both because of the potential protective measures taken by sympathetic landowners, but also because in some cases, the private landowner may be a conservancy or similar land conservation organization. Such is the case again with the Waegell breeding colony, where immediately across the highway to the north of the colony is the Sacramento Valley Conservancy's Vernal Pool Preserve: this property is not open to the general public and will in perpetuity conserve the vernal pools and other natural landscape features.

And as with the land cover summary analysis, the exact figures in any example of land ownership may change, as these analyses present a snapshot of a dynamic process, and especially in the case of tricolors, where efforts are underway to provide more secure breeding and foraging habitats, ownership classes may change with time. It is the provision of far greater amount of secure breeding and foraging habitats that is at the heart of our management recommendations, presented below.

## MANAGEMENT RECOMMENDATIONS

Terms of reference from agreement:

"A specific aim is to relate information about habitats, based upon habitat studies and experiments, to *specific management suggestions* at known colonies and potential colony sites where management action will have relatively-immediate effects." The contractor "…. will build upon an existing body of recommendations to suggest *management activities that can be immediately implemented."*

"Comprehensive overall and site-specific recommendations for further work and GIS-laboratory work, for creating and rehabilitating breeding habitat at specific locations, and for other conservation measures."

### GENERAL RECOMMENDATIONS

Management of grasslands:

In our field work in the Central Valley, we found extensive grassland habitat suitable for small to large colonies dependent only upon provision of a nesting substrate and water. There are vast undeveloped grasslands on both sides of the San Joaquin Valley. Dry grassland may provide the greatest opportunity to increase and enhance tricolor populations because it is in some areas relatively extensive, is widely distributed throughout the Central Valley, and is relatively inexpensive. Our work has demonstrated that grasslands often support productive breeding colonies, especially during years of above-average, and later than average, precipitation.

Preventing land use conversion will preserve the opportunity to increase the number of tricolor colonies. We recommend securing easements to prevent land use conversions to tree and vine crops and housing. We identify sites suitable for development as tricolor colonies. A selection could be made based upon (1) availability of sufficient water to support nettles, cattails and/or bulrushes or other spiny shrubs, and (2) opportunity to use government or conservancy land to reach the needed size of the foraging area.

It further follows that allocation of limited management and recovery funds are best spent determining where to buy easements, improve suitability of existing habitats and create new habitats, rather than on the long-term buyouts of vulnerable silage colonies and their management. Silage colonies are an essential component of tricolored blackbird productivity, as by far the largest reproductive output achieved in 2005 was that from the two Poso Creek colonies. But we stress that a too-great dependence of productivity upon nesting in silage on private property is a precarious management scheme, and urge that silage colonies be conserved in the short term while simultaneously moving from silage-dependence to breeding colonies situated on protected areas surrounded by productive, protected foraging habitats. Only when the species' most productive colonies occur on permanent breeding habitats surrounded by permanent foraging habitats or on private property with a commitment by the landowners to tricolor conservation will the species' future be secure (see also Appendix VII, page 84).

Specific steps to enhance breeding at grassland impoundments:

1. Increase the amount of emergent vegetation behind impoundments
2. Maintain water on this vegetation until at least June 15
3. Contour the bottom of the impoundment to enhance the area suitable for strong emergent vegetation. Improper contouring of bottoms frequently limits the dimension of emergent vegetation and, hence, colonies, far below their potential.

The third of these recommendations is the most difficult to implement because those managing small impoundments seek to manage water so that it will persist for livestock, fishing, recharge enhancement and aesthetic values. The contours that are most effective for tricolors are less efficient in retaining water because the ratio of water stored to surface area decreases with water volume.

Banding:

Many questions about tricolored blackbird ecology remain, and many of these questions can only be answered by studying marked birds; thus, we strongly advocate the implementation of a comprehensive, long-term banding study. A study of a population containing marked birds of known age and natal location would yield much valuable information on movements within and among breeding seasons (including that between the Southern California and Central Valley populations), longevity, survivorship, site fidelity, and numerous others. Although we did not emphasize during our field efforts the discovery of marked birds, we observed five banded birds while conducting our field investigations in 2005. These birds were apparently banded in 2000 at Wind Wolves, and our few observations from 2005 suggest that banded birds would be readily observed by competent field personnel, yielding important insights. We recommend a

significant banding effort focused on birds that are actively fledging from the largest colonies – in 2005, this would have meant banding birds as they fledged from the huge silage colonies in Kern County.

Dedicated Tricolor Researcher:

Given the recent, current, and likely future importance of silage nesting to tricolor conservation, the need for communication among multiple agencies and private landowners, the large number of still-unanswered questions, and the continuing precarious existence of the species in most parts of its range, it is essential that an experienced biologist dedicated to tricolored blackbird research be in the field from Mid-March through April. Although some assistance from National Wildlife Refuge staff can be anticipated, the area to be searched is too large, and the conflicts of Refuge staff with other essential tasks too great, to rely exclusively upon Refuge staff to survey for and identify tricolor settlement. As tricolored blackbirds can easily be confused with the far more abundant and ubiquitous red-winged blackbird (*Agelaius phoeniceus*), and both can utilize similar habitats at the same time, we recommend that only an experienced, competent field biologist be hired and trained to do this essential work. (See Appendix VIII).

Active Habitat Management:

Given the dearth of existing tricolored blackbird breeding habitat, especially in secure locations, it is essential that all potential habitat be conserved and managed in a way that will maximize its attraction to and use by tricolors. One criterion for active management is the management of water levels in ponds and/or reservoirs. To sustain a tricolor breeding colony, pond and reservoir edges must retain some shallow water edges that will persist at least through July. In addition to benefiting tricolors, such management will also accommodate breeding by yellow-headed blackbirds (*Xanthocephalus xanthocephalus*), white-faced ibises (*Plegadis chihi*), least bitterns (*Ixobrychus exilis*), several species of herons, and other desirable and showy species. The wildlife edge will, on large impoundments, require a trivial commitment of space and water. The wildlife benefits are disproportionately large especially for birds like tricolors that use this space and settle in colonies that will exploit hundreds or thousands of adjoining terrestrial areas at no public cost and in most cases will provide grasshopper and other herbivorous insect control.

## SPECIFIC RECOMMENDATIONS

Terms of reference from agreement:

Our recommendations are based upon the required criterion “that they are achievable now and that they add to the security of tricolors”. These are specific on-the-ground actions that we believe could immediately benefit tricolors. We list our recommendations in priority order.

Managing coyotes at silage buyout colonies:

One of the concerns expressed during discussions of the 2005 Poso Creek buyout was the potential for predation to eliminate a colony in silage that had already been purchased. We (Refuge Manager David Hardt and Hamilton) were reluctant to commit to protect a colony because of our disappointment of the previous year, when coyote predation caused huge losses at silage colonies in Fresno and Tulare counties. Historically, large colonies penetrated by coyotes have suffered heavy losses (San Luis in 1995, TeVelde in 2003 and 2004, Producers Dairy in

2004, and others). Predators were not a problem at the extraordinarily productive Poso Creek colonies in 2005. Nevertheless, the potential for nearly complete losses to mammalian and other predators may impede efforts to implement protective actions.

One possible management action is to immediately surround a bought-out colony by an electric fence. In the agricultural settings where silage colonies occur, the problem of grass and brush interference with an electric fence should be minimal. The fence could be strung quickly if able laborers are available. As an example: the perimeter of Poso Creek Dairy Colony 1 was 7707 feet = 467 rods. Figure on 12 40-rod units. The cost of fencing this unit with electric mesh (according to 2002 information) is 7707/16.5 = 467 rods (@ 40 rods cost $620) is 467/40X620 + $600 energizer = $7838. The second colony was about half as large. Figure on $12,000 plus labor to protect a $50,000 investment at two colonies plus some management time.

This may seem like an extravagance, but our 2005 experience has been that a predator-free colony can be enormously productive and a brilliant management success. The numerous examples of heavy predation in silage colonies recommend such "extreme" measures, and if not via fencing, then we recommend that other alternatives to reducing or eliminating mammalian predation be implemented on future silage colonies.

Studying ways to reduce black-crowned night heron predation

In the later breeding season in the marshes in the northern portions of the Sacramento Valley, heavy losses due to predation by black-crowned night herons are virtually an annual event. If predation by night herons could be reduced or eliminated, productivities of these colonies could be greatly increased.

Scale Issues:
The effective management of tricolors requires evaluation and planning on a large geographic scale. Since tricolors choose to settle in large colonies, habitats capable of accommodating large colonies need to be identified and protected. A 25,000-bird colony requires 4-5 hectares of compact nesting substrate or a bit more if some parts of the nesting substrate are not suited for nesting because emergent plants are too thin or are immature. The large marsh-based colonies likely represent as close to the primeval tricolor nesting association as can be created, but tend to be vulnerable to huge losses due to predation by black-crowned night herons (with possible additional losses to raccoons). However, when the rate of predation is low, these marsh-based colonies tend to be spectacularly successful, and we believe that unless there are greater problems (lower reproductive success) associated with larger than with smaller colonies, large colonies should be encouraged and allocated all the nesting site space they will use. In the case of the Waegell (Sacramento County) colony, there were nests built to the absolute edges of suitable habitat, and we considered this site to be hyper-saturated during the 2005 breeding season. We advocate both the protection and enhancement of existing marshes utilized by tricolors and the provision of marshes in the southern San Joaquin Valley (especially Kern County) to attract tricolors away from ephemeral and vulnerable silage.

The utilization of emergent marsh vegetation by nesting tricolors is seen by some as a conflict with other priorities; for example, the California Waterfowl Association (CWA) has opposed the

petitions to list this species as threatened under both State and Federal Endangered Species legislation. The CWA position is based not upon the welfare of a threatened species but upon a perceived impact on marsh productivity to the favored (waterfowl) species and a desire to maximize waterfowl hunting yields.

Multispecies management:

Plans may result in failure to consider scale issues on a global basis. While there is nearly universal agreement that landscapes should be managed on a multispecies basis, the need to identify species of special concern and their management requirements has led to counterproductive overall management decisions. There are relatively few sites that perennially support large tricolor colonies, and even fewer of these may support additional breeding birds. In these critical sites, additional settlement by tricolors should be encouraged, even if there is a possible detriment to other species. Conflicts with other species should be minimal in those cases where the numbers of individuals of the other species are small and they are not high priority species. We cite one important example of a management decision made to the detriment of tricolors: the Hemet, Riverside County EMWD artificial wetland. This wetland was changed from high quality tricolor habitat to multispecies configuration and this change resulted in the utilization of the renovated marsh by several heron species, including the black-crowned night heron – the tricolored blackbird's most serious avian predator. The increased diversity of species was viewed by management as an advance but resulted in a dramatic degradation of conditions for the largest tricolor colony in southern California.

The PRBO and FWS prioritized lists of species needing management attention will facilitate management decision making. The basic rule is that when local conditions favor success of a difficult to manage species, take advantage of the bounty and avoid rearranging the habitat being used by the target, successful species in favor of other habitats in other nearby places or in the case of relatively common and uncompromised species at some distant location.

A related question arises in connection to the Southern California population of tricolors. It is known that the population of tricolors in Riverside County is resident, as opposed to those in the Central Valley that are itinerant. If the Southern California population of tricolors is resident, as seems likely, this increases the likelihood that the Southern California population is genetically distinct from the more widely-distributed Central Valley (and more northern) population. We strongly suggest that tricolors in southern California be managed as though they are genetically distinct and that emergency measures be taken to conserve this population. A formal genetic study of the two populations is urgently needed to assess the question of genetic distinctiveness.

UNUSED SUITABLE TRICOLOR HABITAT

Terms of reference from agreement:

> The contract requests "the location of suitable habitats lacking Tricolor colonies in 2005."

Changes in Regional Populations:
Were there suitable nesting sites that were unoccupied in 2005? This is a question best addressed by examining the numbers of colonies in a well-studied area across a long interval. We identify habitat characteristics of three large regions where tricolors have a documented history of breeding, all long-observed by USFWS and others. Tables 5a,b, and c present summaries of all colonies observed during a greater than decade interval.

Table 7a. Occupancy of colony sites in the Colusa Basin (144,500 ha – 357,000 acres) in 1994, 2000, 2004 and 2005.

| Year | Number of Colonies* | Numbers of Birds |
|---|---|---|
| 1994 | 9 | 147,300 |
| 2000* | 8 | 89,000 |
| 2004 | 4 | 159,500 |
| 2005 | 5 | 202,400 |

*Second brood and second settlements at the same site are combined into a single colony in this analysis.

Only 2 of the 21 colonies in the Colusa Basin repeated in the same location in the years reported here. There were, in addition, 19 other sites occupied in other years in this area between 1993 and 2003 that were not occupied during any of these three target years. Most of these sites were only occupied once. The increases in 2004 and 2005 are entirely accounted for by settlement of large colonies on Delevan NWR.

Table 7b. Occupancy of colony sites in the Grasslands Wildlife Management Area, Merced County (68,800 ha – 170,000 acres, Fig. 3) between 1994, 2000, 2004 and 2005. Boundaries of the Grasslands Wildlife Management Area and map of the complex including ownership status are contained in a map produced by the Biological Staff, San Luis NWR Complex, Los Banos, California (foldout 1, attached).

| Year | Number of Colonies | Numbers of Birds |
|---|---|---|
| 1994 | 13 | 139,200 |
| 2000 | 6 | 54,980 |
| 2004 | 6 | 72,900 |
| 2005 | 15 | 35,235 |

The 1994 summary included a 105,000-bird colony in silage, emphasizing the occasional role of single large colonies in determining local and regional abundance. The 2004-2005 year-over-year change in number of colonies reflects the presence of thistle colonies, not present in 2004.

Table 7c. Occupancy of colony sites in the Wind Wolves Conservancy, Kern County (40,485 ha – 100,000 acres) between 2000, 2004 and 2005.

| Year | Number of Colonies | Numbers of Birds |
|---|---|---|
| 1994 | no data available – managed as private cattle ranch | unknown |
| 2000 | 7 | 3,650 |
| 2004 | 9 | 10,015 |
| 2005 | 6 | 10,750 |

*The changes made between 2000 and 2005 include fences to exclude cattle from springs, burning lodged cattails and protection of watercourses in ravines that would be destroyed by free-ranging cattle. Wind Wolves remains a working cattle ranch.

With the exception of silage we found little suitable habitat unoccupied by tricolors. Saturated nesting habitats, located at widely separated sites, including the large colonies at the Poso Creek Dairy in Kern County (142,000) and the Waegell colony (8,335) in Sacramento County, suggest that a source-sink habitat relationship of productive and persistent failure of tricolors in certain habitats is not the main process leading to the decline of the tricolor population. Instead, our observations of saturated habitats suggest that the tricolor decline is based primarily upon losses of breeding habitats (Appendix II). The Wind Wolves colony continued to increase until 2004. Observations there also suggest that suitable habitat is saturated. We conclude that all habitats satisfying tricolor habitat requirements in suitable form were occupied by tricolors in 2005. Our answer to the question of occupancy of suitable sites is that all suitable sites were either occupied at some time during the breeding season or were in the foraging shadow of occupied sites. There are thus large areas in agricultural and grasslands where tricolor settlement is likely to occur if the missing habitat component(s) are provided.

UNUSED, UNSUITABLE OR INADEQUATE TRICOLOR HABITAT

Small colonies of unprotected status:

Under current laws and policies, small tricolor colonies isolated from protected areas are at the mercy of all forms of development. Protection of these sometimes especially attractive habitats now lies solely with local governments.

Echo Canyon, Kern County. Pepperweed whitetop, *Lepidium spp*, an introduced invasive plant, destroys suitability of wetland habitat for use by tricolors. At Wind Wolves in 2003, *Lepidium* growth was overwhelming a potentially rather productive patch of nettles (*Urtica*) nesting habitat in Echo Canyon, Wind Wolves Conservancy. At the request of Hamilton, David Clendennen, manager of the Wind Wolves Preserve, initiated in summer, 2003 an active *Lepidium* management program by spot spraying the herbicide Telar[@]. As a result of these efforts, the Echo Canyon nettles were almost *Lepidium*-free by 2005, and supported a 1600-bird breeding colony.

Alfalfa easements. Our intensive field studies in 2005 documented the extreme importance of small landscape features to tricolor foraging and productivity. We want to highlight the apparent dependence upon fields of alfalfa in the maintenance and production of several widely-dispersed colonies and strongly recommend that existing alfalfa fields not be converted to perennial crops. Alfalfa is a preferred foraging habitat of tricolors, especially of those birds foraging for animal prey while provisioning their young, whereas perennial crops offer no foraging opportunities. It is especially important to conserve alfalfa fields in close proximity to existing tricolor colonies. Considering the vigorous and uncontrolled trend towards large-scale planting of woody perennial crops is in progress in the Central Valley, we recommend that easements be negotiated with landowners to conserve alfalfa production in order for the existing agricultural regime to persist.

Large colonies under government management:

We recommend the active management of large protected areas capable of supporting one or more large tricolor colonies since many of the existing large colonies are established in ephemeral, relatively difficult-to-locate, and privately-owned silage fields. The active management of large colonies on secure habitats will help to stabilize regional tricolor populations and allow the birds to establish new colonies in restored and/or enhanced habitat elsewhere in the southern San Joaquin Valley.

Where active management results in moving conditions away from those suitable for tricolor breeding, formerly productive protected areas can be made less so. Appendix VI documents changes from suitable to unsuitable tricolor conditions at Grasslands Wildlife Management Area, Merced County (68,800 ha), and several additional examples are briefly described below.

Merced NWR, Merced County. Existing silage and thistles eliminated or reduced, not actively managed, resulting in a relatively productive colony of 40-60,000 birds nesting in thin cattails subject to heavy night heron predation between 2002 and 2004. This is the best routinely available large tricolor nesting site, but needs annual active management. This ca. 20 ha field is only 25% used because of uneven vegetation. One solution is to actively farm half of Farmfield 3 site, planting and managing triticale as if it were a commercial crop, to attract a large tricolor colony because it deflects large numbers of birds from agricultural silage nesting (Hamilton 2004). This should be fenced if necessary to eliminate coyote predation.

Gallo, Merced County, San Luis NWR. An estimated 105,000 birds nested in silage here in 1997, accounting for the high survey outcome that year. The silage field was subsequently converted to floodplain management and cropping was abandoned, resulting in the irretrievable loss of excellent tricolor nesting substrate.

Hemet EMWD, Riverside County. This habitat, consisting of cattail and bulrush marsh, was deliberately created as a wetland for wildlife in 1994, colonized by tricolors in its first year, and by 1997 supported 35,000 dairy and alfalfa dependent tricolors. Miscellaneous changes in the configuration of this wildlife facility reduced the tricolor population to zero in 2005 (T. Paulek, State Refuge Mgr., pers. comm.)

O'Neill Forebay, Merced County. Managed by CDFG, Los Banos. Himalaya blackberry copses surrounded by open grassland provided attractive and a relatively predator-free setting. This was an earlier configuration, producing high reproductive success. These copses died when water was unmanaged and dissipated before reaching this string of shrubs. Tricolors continue to nest at O'Neill Forebay, but the 9000-bird settlement in 2004 produced almost no fledglings (RS = 0.04). Losses were to California Jays (*Aphelocoma californica*), Yellow-billed Magpies (*Pica nuttalli*) and Swainson's Hawks. Reconstruction of Himalaya berry copses in the open and likely to attract tricolors and to be productive. This site has no reasonable limit to water.

Toledo Pit, Tulare County. Four adjacent 40-acre water retaining ponds, one of them often flooded to up to 3 feet, hosted over 50,000 tricolors per year in the 1990s prior to initiation of USFWS management. These birds found suitable foraging in the surrounding dairy lands – alfalfa and silage in particular. While we do not know the arrangements made with the Tulare Water District to take over management of these ponds for tricolors (pers. comm. David Hardt, Appendix VII), we do know that since initiation of Government management there have been only sporadic small colonies attracted to this site. Extensive suitable habitat no longer exists. USFWS has invested heavily in this project and needs to make a deal to buy canal water or increase pumped water capacity. This site is in the middle of hundreds of thousands of irrigated acres. However one of the limitations is that it is not near a water outlet source and when irrigation ditch water arrives it may be insufficient in quantity or too late for tricolor breeding. This site, laid out in a quartered 160-acre block, holds water that may be unused in most years. The two westerly blocks both support tricolors when there is water. The southeasterly block hosts thousands of shorebirds when temporarily flooded. This is a classic case of use of water for agricultural purposes while important wildlife uses are ignored (see also Center for Biological Diversity, 2004).

With the exception of the Toledo Pit, all but one of the above examples of lost colonies is recoverable and could be funded within existing agency management plans.

San Jacinto Wildlife Area. Develop and secure the San Jacinto Wildlife Area tricolor habitats. This site is owned by the State of California, attracts 2/3 of all southern California tricolors and is in the path of development. It is the centerpiece of the Riverside County Multispecies Conservation Plan which depends upon the identifying and connecting of separate areas of biological and regional distinctiveness. We identify the several units of the San Jacinto Wildlife Area as our first restoration and management priority because this area now accommodates by far the largest population of breeding tricolors in the rapidly dwindling southern California tricolor subpopulation (10,000 breeding birds vs. 7000 individuals for all of the rest of southern California combined). Action at San Jacinto needs to be considered on an adaptive management basis that would include reconfiguration of nesting habitat in cattails and acquisition of easements to protect foraging habitat.

Mystic Lake. Riverside County. The physical setting of this area centers on this ephemeral lake

which varies greatly in size due to highly variable rainfall. Nesting sites for tricolors include expanses of cattails on the several waterfowl hunting clubs immediately adjacent to the San Jacinto Wildlife Area, a 4-acre expanse of cattails near the San Jacinto Wildlife Area headquarters and expanses of spiny upland weeds.

Actions suggested:

1. Identify to the Riverside County Multispecies Conservation Plan our determination that tricolors in the San Jacinto Wildlife Area and its immediate vicinity are the first priority in our management analysis.
2. Take the same action with the local NRCS (USDA) office. Robert Hewett at that office in now actively lobbying for agricultural easements in the dairy area north of the San Ramon Expressway and adjacent to the San Jacinto Wildlife Area (Robert.Hewett@CA.USDA.Gov) Tel 951 654 7139.
3. Determine the genetic status of the southern California tricolored blackbird population in collaboration with Professors Brad Schaffer and William Hamilton, UC Davis and Tom Paulek, Manager San Jacinto Wildlife Area. The determination will be based upon adult males taken at breeding sites at the respective geographic locations to facilitate the description of a new taxon should that be necessary. Should the southern California population be found to be genetically distinct the conservation priority allocated to the remaining southern California population will escalate dramatically and require further revision. Regardless of the outcome, consider the SOCAL tricolor population as a treasured geographic population at least as important to maintenance of California biodiversity as the California Willow Flycatcher (*Contopus sordidulus*) and Bell's Least Vireo (*Vireo bellii*).
4. Evaluate with Tom Paulek the possibility of expanding pond #1 near the headquarters of the San Jacinto Wildlife Area from the current allocation of four acres of cattails to all cattails, about 10 acres. This site is favored by tricolors for settlement but is not large enough to accommodate a 25,000-bird tricolor colony.

Ramona Grassland, San Diego County. Enhance tricolor breeding habitat at the Ramona grassland by reshaping the bottom of the runoff pond and fencing to exclude cattle from the majority of the pond. Easement access to this property as been acquired by the Nature Conservancy. Cattle operations continue.

Grasshopper Sparrow Reserve, San Diego County. Establish breeding habitat at the CDFG grasshopper sparrow reserve in southern San Diego County. Development of open water and a nesting substrate, probably bulrushes, may require substantial water development expense and excavation costs. This would not be incompatible with other projected uses of this property including management for upland game birds and protection of grasshopper sparrows.

Laguna Seca, Monterey County. No birds nested here in 2005. This publicly owned colony site is urban and picturesque. A high priority for public opportunity to view an active tricolor colony, this is a great and productive colony in good times and the heart of Monterey County tricolors. CDFG needs to prevent land use conversion by culvert or other changes in water use management while the site is recovering from the torrential 2004

runoff. It is possible that the importance of this colony site and its component habitat is not known to local land/water/highway planners and managers.

Lake Success, Tulare County. The grasslands surrounding this large and stable (at least since 1993, probably far longer) colony foraging habitat need to be secured. This is Army Corps of Engineers property and Mike Green believes that there is some threat of flooding this site as a source of mitigation monies. But this colony and its habitat will not be replaced without many elapsed years. We suggest grassland conservation easements on the surrounding grassland to at least 3.5 km from the colony site. If the site is flooded nettles can be moved to a comparable position in riparian draws, but this can only be done by backhoe transfer of mature plants.

# MANAGEMENT SUGGESTIONS

Wisdom from the trenches:

(Our goal should be) to "maintain large and small breeding colonies throughout the state on a variety of habitat types. To meet (Mike Green's USFWS) SMART criteria, we need to specify breeding colony locations and foraging areas to be protected or specify a number to be protected per county in the next five years and figure out what it will cost. This could be accomplished through grants, easements, fee acquisitions and development or enhancement of public lands. Most of the colonies which I have stumbled upon or that have historically occurred in my area (Kings, Fresno, Tulare, Kern counties) in recent years are relatively small and utilize sloughs or small ponds such as gravel quarry ponds with foraging occurring on adjacent uplands (annual grass grazing lands.) …. The smaller colonies are threatened as grazing lands are being developed to rural communities and permanent crops." (Tim Kroeker, CDFG biologist, email to tricolored blackbird working group, July 26, 2005)

In his final sentence Kroeker identifies a problem for maintaining many wildlife species in California: the inexorable human population increase and consequent development of housing, business and agriculture, all steadily eroding the remaining breeding and foraging habitats that tricolors require. Kroeker's plan is a good one and if implemented would shift tricolor prospects from steady decline to steady. But it would require listing the species and a battle on over 100 fronts to be successfully implemented.

Kroeker's thoughtful and informed ideas suggest that what he wants is what all of us involved in tricolor conservation want but have no hope at all of achieving because California's population will double in 15 years. We build upon Kroeker's ideas and take advantage of one of the most useful discoveries emerging from the last 14 years of tricolor studies - that most tricolors breed in very large colonies. If the sites where these large colonies occur can be protected by a combination of mechanisms, including the acquisition of easements, these largest colonies may form the core of efforts to enable tricolors to persist in spite of the precipitous decline and fragmentation of natural places in California.

## A 100-YEAR PLAN

The conservation of the tricolored blackbird will rest upon an active, annual program of field monitoring and research by qualified biologists to detect and protect all of the largest colonies as well as to a commitment to enhance breeding opportunities by providing additional secure breeding substrate and conserving foraging habitats throughout its range.

Any plan designed to ensure the persistence of tricolored blackbird must take into account both the short-term "emergency room" needs of the species as well as the longer-term requirements to provide greater opportunity for breeding and foraging on secure habitats. In the short term, all existing tricolor breeding colonies should be conserved, especially the larger colonies that may be the most productive. In the case of very small colonies, i.e. those consisting of 100 or fewer birds, it may be impractical to attempt to adhere to a "no loss" criterion, but loss of breeding, and also foraging, habitat is believed to be the single most important factor causing the decline in the species as well as the largest impediment to future population increases. In the present as well as

the recent past, to protect all of the largest colonies means protecting all silage colonies through an active program of detection, buyout, and active management should predators (especially coyotes) pose a problem. This requires an annual effort to survey a subsample of all known larger, as well as additional likely, colony sites, with an emphasis on early-season (mid-March through April) field work by experienced biologists in the southern portions of the breeding range (San Joaquin Valley). The fates of all larger colonies should be annually monitored and documented. An emphasis is simultaneously required in Southern California (Riverside County on south), as this population is in dire straits and may be genetically distinct.

In the medium term, additional secure breeding habitats must be provided in the southern San Joaquin Valley to move the birds off of the silage and on to permanent, protected breeding substrates, while continuing existing efforts to monitor larger colonies throughout the state.

In the long term, all larger colonies should occur on secure habitats adjacent to secure foraging habitats throughout the range of the species.

The maintenance of tricolor breeding and foraging habitats requires a plan to provide for the ever-changing characteristics of the tricolor habitat landscape.

1. Over a decade of research demonstrates that, on average, 70% of all tricolors nest in the 10 largest colonies each year. In consecutive years, tricolors repeatedly nest in ideally situated nettles copses, Himalaya blackberry thickets, silage, and marshes. They do not use the same site for nesting but do use the same foraging habitats year after year. These few exceptionally large colonies, in combination with adjacent large foraging spaces, are the core resource for reproducing tricolors. We propose focusing protective efforts on these colony sites and their associated foraging lands. The proposed sites are relatively distant from urban centers and in many cases are already owned or managed by the government or by conservation oriented interests.
2. The core of our plan emphasizes the provision of new breeding habitat in portions of the species range where it is currently lacking, and the wise management of existing, secure nesting habitat to enhance its productivity by means of known practices, as described below. Our plan seeks to increase the capacity for these sites to support additional numbers of birds and enhances their prospects for successful reproduction by managing (not killing) predators. Predators, especially coyotes and black-crowned night herons, have been demonstrated to severely reduce reproductive output in colonies throughout the state, and by controlling tricolor predators, it is reasonable to expect a doubling of reproductive output from formerly relatively unproductive colonies.
3. We suggest a variety of methods to secure habitats, including the purchase of easements from willing sellers to stabilize and, in as many cases as practical, to enlarge the amount of secure foraging habitats. Where protection of foraging habitat through easement acquisition is not economically feasible, alternatives must be identified where both the breeding and the foraging habitats are secured. There are currently too few such secure sites capable of supporting large colonies. It is pointless to spend limited resources on doomed habitats, even if they are highly productive for a few years.
4. In 2005, our best estimate suggests that there are about 300,000 tricolors. While this number appears to reflect an increase in the population over the population low in the 1990s, we

believe that this is far too few tricolors to sustain the species in the long term. To accommodate even the present number of nesting birds in the long term, we need nesting places sufficient to support 600,000 nesting attempts = about 400,000 nests, at a dozen colony sites. We consider this to be the minimum number of birds for which secure nesting and foraging habitats should be provided.

5. At present, several colonies are associated with dairy operations, and the active management of these associations may be essential to maintain the tricolor in the short-term. We propose that as long as the lack of secure nesting habitats requires nesting in ephemeral, insecure silage, funding incentives be established to make the silage colonies acceptable and attractive to both the birds and the landowners. However, we stress that silage nesting is seen as perpetuating the precarious status of the species, and strongly urge management actions concentrating on the provision of new nesting habitats in the southern San Joaquin Valley to attempt to move the birds off of silage and on to secure, permanent breeding habitat. As long as the birds nest in silage, these silage colonies should be detected and conserved through an active monitoring, research, and management program.
6. We recommend the steady accumulation of foraging habitats by the acquisition of easements to prevent land use conversions from agricultural operations that are compatible with tricolor breeding and foraging to those that are incompatible with nesting tricolors. There is no huge expenditure associated with any of these purchases: the most common easement acquisition would be the purchase of rangeland and alfalfa fields in order to maintain existing agricultural land use.

Below we describe specific sites in known, productive regions. We identify any steps suggested to secure surrounding habitats, estimate the capacity of each to accommodate nesting birds, and suggest management activities.

Grassland sites, San Luis Obispo Co:

Sites to purchase outright:

1. Toledo Pit, Tulare County (potential for 30,000 birds). 160 acres, USFWS has existing agreement with Tulare Water District, needs $200,000 investment now
2. TeVelde Ranch, Tulare County (potential for 40,000 birds). Acquire easement to adjacent breeding habitat. $20,000?
3. Poso Creek Dairy, Kern County (122,000 birds nested in silage in 2005). Acquire wetland near easements, manage water. $200,000

Sites to develop wetland, foraging habitat secondary consideration:

1. Producers Dairy, Fresno County (50,000), develop on state-owned wetland near
2. Solano County landfill south of Dixon (1,000 birds nested here in 2005). Recontour bottom of existing tricolor breeding marsh to enlarge area of cattails. $150,000
3. Grasshopper Sparrow State Reserve, San Diego County Grassland - No Tricolors have ever nested here. Reconnaissance with CDFG (potential for 5,000 bird colony?). This is a research proposal.

Sites for easements to maintain access to foraging:

1. Dry land and alfalfa near San Jacinto NWR

2. Dry land near Ramona Grassland, San Diego County

Sites to secure or to purchase minor easements:

1. Capital Outing Club, Colusa County (35,000). Rice easements needed.
2. Acre Farms, Colusa County (20,000) (alternate to Capital Outing Club). Rice easements needed. In both cases agreement to eliminate or cage *Arundo* to prevent breeding by black-crowned night herons.
3. Wind Wolves Preserve (potential for 10,000 birds)
4. Delevan NWR (potential for 70,000+ breeding birds)
5. Waegell Farm, (an estimated 8,330 birds bred here in 2005) Sacramento County
6. Lake Success, (potential for 14,750 breeding birds) Tulare County
7. Merced NWR, Merced County (5,000+ birds in nettles & thistle)
8. Milton, Tehama County

Sites dispersed and largely unmanaged:

Meridian, Sutter County. (35,000) Agreement to maintain habitat.

## OUTREACH

Terms of reference from agreement:

"Supply outreach materials including reports, publications, and public education to ….."

1. Those with lands hosting colonies and to those that may potentially host colonies
2. Public land-management agencies with new/additional nesting habitat
3. Academic Institutions

Education/outreach materials required:

Prepare a brochure to provide information on tricolored blackbirds, including an aid to identification that will help to distinguish the tricolor from the several bird species with which it could be confused. The brochure might also include an estimate of relative abundance as well as small range maps of all species. Such a document is badly needed for a variety of purposes, and is essential for meetings with landowners and agency staff.

The birds to be illustrated in the brochure include:
Adult male tricolor
Adult male redwing, Central Valley
Adult male redwing, southern California, Nevada, Oregon
Adult female redwing
Adult female tricolor
Adult male cowbird
Adult female cowbird
Adult male Brewer's blackbird
Adult female Brewer's blackbird
Grackles – both sexes
Yellow-headed Blackbird – both sexes

Tricolor coordinator activities:

See Appendix VIII, page 85, for our suggestions for the proposed Tricolor Coordinator position.

# LITERATURE CITED

Center for Biological Diversity. 2004. Petition to list Tricolored Blackbird under the State and Federal Endangered Species Acts and Request for Emergency Action to Protect the Species. Center for Biological Diversity. 31 pp.

Cook, L F. and C. A. Toft. 2005. Dynamics of extinction: Population decline in the colonially nesting Tricolored Blackbird *Agelaius tricolor*. Bird Conservation International 15: 73-88.

Crase, F. T. and R. W. DeHaven . 1977. Food of nestling Tricolored Blackbirds. Condor 79: 265-269.

Crase, F. T. and R. W. DeHaven. 1978. Food selection by five sympatric California blackbird species. Calif. Fish and Game 64:255-267.

Hamilton, W. J. III. 2003. Current policies and programs affecting Tricolored Blackbird (Agelaius tricolor) restoration. Pp. 201-207. In: Faber, P. M., California Riparian Systems: Processes and Floodplain Management, Ecology and Restoration. 2001. Riparian Habitat and Floodplains Conference Proceedings, Riparian Habitat Joint Venture, Sacramento, CA.

Hamilton, W. J. 2004. Management implications of the 2004 Central Valley Tricolored Blackbird survey. J. Central Valley Bird Club. Vol 7 (2,3) pp 32-46.

Mittermeier, R. A. P. Robles Gil, C.G. Mettermeier, T. Brooks, M. Hoffman, W.R. Konstant, G.A.B. Fonseca, and R.B. Mast. 2003. Wildlife Spectacles. CEMEX-Agrupación Sierra Madre-Conservation International, Mexico, 324 pp.

Orians, G.H. 1961. The ecology of blackbird (Agelaius) social systems. Ecological Monographs 31:285-312.

Payne, R. B. 1969. Breeding seasons and reproductive physiology of Tricolored Blackbirds and Redwinged Blackbirds. Univ. Pub. Zool. 90. U. C. Press, Berkeley. 115 pp.

Appendix I. Tricolored Blackbird Breeding Colonies Observed in 2005.

| County | Colony Name | Date | Number of Birds | Nest Substrate |
|---|---|---|---|---|
| **PRE-SURVEY** | | | | |
| Kern | Poso 1 | 3/30 | 100,000 | triticale |
| | Deer Creek Dairy | 4/13 | 15,000 | silage (harvested) |
| Fresno | Producer's Dairy | 4/12 | unknown | silage (harvested) |
| | | | | |
| **APRIL SURVEY** | | | | |
| Alameda | Broadmoor Pond | 4/23 | 200 | cattail |
| Calaveras | Rock Creek Rd. | 4/21 | 30 | Himalaya blackberry |
| Contra Costa | Byron Airport | 4/24 | | |
| El Dorado | Latrobe Road Colony 1 | 4/22 | 200 | Himalaya blackberry |
| | Latrobe Road Colony 2 | 4/22 | 50 | Himalaya blackberry |
| Fresno | Producer's Dairy | 4/23 | 30 | mustard/mallow/barley |
| | Pixley NWR, Deer Creek | | 500 | thistle |
| | DWR/DFG NE finger of reservoir | 4/24 | 10 | cattail/willow/*Atriplex* |
| | Panoche Road, Panoche Valley | 4/24 | 60 | tall exotic grasses/ag |
| | Panoche Road, Panoche Valley | 4/24 | 100 | tall exotic grasses/ag |
| | Yuba Ave./Hwy. 180 | 4/23 | 80 | wheat |
| | Phelps Pond | 4/22 | 600 | cattail |
| Kern | Canebreak ER | 4/22 | 1,500 | Himalaya blackberry |
| | Lake Isabella | 4/22 | 90 | nettles |
| | Hafenfeld Ranch | 4/22 | 1,200 | cattail/bulrush |
| | Tule Rd. | 4/23 | 4,000 | bulrush |
| | El Pato Loco Duck Club pond | 4/22 | 600 | cattail |
| | Garces Hwy./Kern NWR | 4/22 | 500 | cattail |
| | Wind Wolves - Sag Pond | 4/22 | 250 | cattail |
| | Wind Wolves - Echo Canyon | | 1,600 | nettles |
| | Wind Wolves - Echo Flat | 4/22 | 350 | nettles |
| | Wind Wolves - Westgate | 4/22 | 30 | nettles |
| | Wind Wolves - Little Lobo | 4/22 | 4,000 | nettles |
| | Wind Wolves - Muddy Creek | 4/22 | 600 | nettles |
| | Wind Wolves - Santiago Springs | 4/22 | 4,000 | nettles |
| | Kristofik nettles | 4/22 | 75 | nettles |
| | Two Cottonwoods | 4/22 | 200 | nettles |
| | Bonnie's Pond | 4/22 | 300 | cattail |
| | Spanish Spring Canyon | 4/22 | 3,000 | nettles/willow |
| | Poso I | 4/24 | 80,000 | silage (triticale) |
| | Poso II | 4/21 | 40,000 | silage (triticale) |
| | Kern R. Bridge/ I-5 | 4/22 | 2,500 | nettles/mesquite |
| | Kern Water Agency Well | 4/22 | 4,000 | nettles/mesquite |
| | Bakersfield Groundwater Recharge | 4/22 | 75 | nettles |
| | Bakersfield Groundwater Recharge | 4/22 | 100 | nettles |
| | Bakersfield Groundwater Recharge | 4/22 | 70 | nettles |
| | Bakersfield Groundwater Recharge | 4/22 | 60 | nettles |
| | Bakersfield Groundwater Recharge | 4/22 | 40 | nettles |
| | Bakersfield Groundwater Recharge | 4/22 | 60 | nettles |

| | | | | |
|---|---|---|---|---|
| | Bakersfield Recharge E basin 6 | 4/22 | 250 | nettles/mesquite |
| | Bakersfield Recharge E basin 13 | 4/22 | 500 | nettles/mesquite |
| | Kern NWR Unit 1 | 4/22 | 4,000 | cattail |
| | Kern NWR Fowler Canal | 4/22 | 302 | cattail |
| | Kern River Channel #1 W of Kern NWR | 4/26 | 305 | tamarisk |
| | Kern River Channel #2 W of Kern NWR | 4/26 | 850 | tamarisk |
| Los Angeles | Edwards AFB Branch Park pond early | 4/22 | 800 | cattails |
| | Gorman Post Rd LA#1 | 4/23 | 100 | nettles/lettuce |
| | Holiday Lake Neenach | 4/22 | 500 | cattail/bulrush |
| | Holiday Lake LA#2 | 4/23 | 1,000 | bulrush/cattail |
| | Fairmont Res LA#3 | 4/23 | 200 | unknown (no access) |
| | Munz Ranch Aqueduct LA#4 | 4/23 | 500 | nettles/lettuce |
| | Lake Palmdale LA#5 | 4/23 | 2,000 | cattails |
| Madera | Madera I | 4/24 | 900 | thistle |
| | Milktime Dairy | 4/24 | 800 | silage |
| | Madera II | 4/23 | 600 | milk thistle |
| | Millerton Rd Hwy. 145 /Hwy 211 | 4/23 | 200 | milk thistle |
| | Rd. 29 to Eastman Lake | 4/24 | 60 | thistle |
| | Avenue 26 | 4/24 | 400 | sandbar willow |
| Merced | Stevinson, 2nd Ave. | 4/24 | 2,000 | blackberry/elderberry |
| | Le Grand Mine | 4/19 | 600 | Milk thistle |
| | McNamara Rd. slough | 4/24 | 1,000 | bull thistle |
| | Ellsworthy | 5/09 | 6,000 | cattail |
| | Sparks Cattail no name | 4/23 | 300 | cattail |
| | Merced NWR - East Farmfield tour route | 4/23 | 9,000 | mustard/ bull thistle |
| | Merced NWR - Sandy Mush Rd. | 4/24 | 4,500 | milk thistle |
| | Basalt Rd. San Luis Res. NWR | 4/23 | 400 | nettles/thistle |
| Monterey | Fort Hunter Ligget/ Camp Roberts route | 4/22 | 30 | cattail |
| Napa | Pope Valley pond Juliana Vineyards | 4/22 | 300 | tule/blackberry |
| Riverside | San Jacinto Wildlife Area, Davis Unit | 4/24 | 10,000 | *Malva*/lettuce |
| | San Jacinto Wildlife Area, Potrero Unit | 4/22 | 500 | |
| | Perris Airport | 4/22 | 1,000 | mustard/thistle |
| | Lake Riverside Estates | 4/24 | 200 | cattail |
| | Diamond Valley Reservation | 4/24 | 500 | bulrush |
| Sacramento | Natomas Blvd. Sac./Sutter Co. line | 4/23 | 100 | Himalaya blackberry |
| | Rancho Seco Hadlesville Ck. at 104 | 4/22 | 100 | Himalaya blackberry |
| | LaTrobe/Wetzel-Oviatt Rd. | 4/22 | 250 | Himalaya blackberry |
| | Sloughouse | 4/22 | 500 | rose |
| | Clay Station/Willow Ck. | 4/22 | 5,000 | Himalaya blackberry |
| | Tudesco Ranch LaTrobe first | 4/23 | 175 | Himalaya blackberry |
| | Elder Creek Rd., west of Excelsior Rd. | 4/22 | 350 | blackberry/rose |
| | Knox Road near Florin Road | 4/24 | 400 | Himalaya blackberry |
| | Sunrise Ave. near Florin Road | 4/24 | 1,000 | Himalaya blackberry |
| | Latrobe Rd. 1.6 E of Jackson 16 | 4/22 | 200 | Himalaya blackberry |
| | Prairie City ORV Park at White Rock Rd. | 4/24 | 600 | Himalaya blackberry |
| | Sunrise between Florin & Hwy. 16 | 4/25 | 5,000 | thistle |
| | White Rock / Grant Line | 4/24 | 300 | Himalaya blackberry |
| | Hadlesville Ck. / Hwy 104, Rancho Seco | 4/22 | 100 | Himalaya blackberry |
| San Diego | Chihuahua / Temecula Creeks | 4/22 | | other |

| | | | | |
|---|---|---|---|---|
| | Mesa Grande Rd mile 4.2 | 4/22 | | blackberry/nettles |
| San Luis Obispo | Alamo Ck Bridge | 4/23 | 1,500 | cattail |
| | Estrella/River Rds pond | 4/22 | 300 | cattail/thistle/hemlock |
| | 3155 Creston Rd. | 4/22 | 400 | bulrush/cattail |
| | Carrizo Plain NW Chimineas Ranch | 5/14 | 2,000 | |
| | Cayucus State Beach | 4/24 | 10 | cattail |
| San Diego | Mesa Grande Rd. | 4/24 | 20 | Himalaya blackberry |
| | Bloomsberg Ranch/Mesa Grande | 4/24 | 200 | Himalaya blackberry |
| | Hwy 79/Mesa Grande Rd. | 4/24 | 75 | Himalaya blackberry |
| | Borrego Springs Country Club | 4/ | | cattail |
| Santa Barbara | Cuyama Dairy | 4/20 | 1,200 | *Malva* |
| | Grisingher Pond | 4/21 | 100 | nettles |
| | J.P. Oil Hwy. 166 | 4/20 | 1,000 | nettles/bulrush |
| | Cuyama R. Hwy 166 | 4/20 | 600 | cattail |
| Santa Clara | Del Puerto Canyon Rd. | 4/23 | 100 | cattail/bulrush |
| Shasta | Pittville - Beaver Creek Ranch | 4/21 | 20 | |
| Solano | Solano County Landfill | 4/22 | 1,000 | cattail |
| | Rush Ranch Spring Branch Grizzly Island | 4/22 | 1,000 | cattail |
| | Hwy. 113 S of Main Prairie Rd/Alamo | 4/25 | 800 | cattail |
| Stanislaus | Rock Creek near Milton | 4/22 | 5,500 | Himalaya blackberry |
| | Dunton Rd./Hoods Ck. | 4/24 | 1,450 | blackberry/nettles |
| | Sonora Rd./Littlejohn's Creek | 4/24 | 3,600 | Himalaya blackberry |
| | Crabtree North | 4/23 | 500 | thistle |
| | Crabtree South | 4/23 | 500 | Himalaya blackberry |
| | Diablo Grande Parkway | 4/23 | 230 | milk thistle |
| | Modesto Wastewater ponds | 4/23 | 400 | cattail |
| Tulare | Lake Success | 4/23 | 12,000 | nettles |
| | Hwy. 63 & Ave 368 Dairy | 4/22 | 2,500 | Milk thistle |
| | Cottonwood Ck Two Bridges | 4/22 | 3,500 | Milk thistle |
| | Boyd Road | 4/22 | 500 | Milk thistle/nettles |
| Tuolumne | Shopping Center Junction | 4/24 | 50 | Himalaya blackberry |
| | Brooks Ranch Rock R. Rd. | 4/24 | 150 | unseen |
| | Clay pit, Rock River Rd. Co. line | 4/24 | 50 | cattail |
| Yolo | Madison, Road 88 B | 4/24 | 2,770 | thistle 2 species |
| | Sunsweet Dryers | 4/22 | 300 | cattail |
| Yuba | Lower Blackwelder Lake, Beale AFB | 4/22 | 50 | Himalaya blackberry |
| | Miller Dam, Beale AFB | 4/25 | 150 | shrub?? |
| | Main Gate, Beale AFB | 4/25 | 50 | bulrush |
| | **Total** | | **260,307** | |

**APRIL LATE**

| | | | | |
|---|---|---|---|---|
| Calaveras | Old Dog Town Rd | 4/30 | 750 | |
| Fresno | Woodward Park | 5/10 | | thistle |
| Merced | Kelly Ranch, Bear Ck./San Joaquin River | | 500 | milk thistle |
| | San Luis NWR | 3/29 | | thistles |
| Madera | Millerton Rd./Hwy. 211 | | 4 | |
| Modoc | | 5/14 | 200 | nettles |
| | | 5/25 | 11 | nettles |
| Monterey | Robinson Canyon, Carmel | 4/30 | 30 | cattail |

| | | | | |
|---|---|---|---|---|
| Napa | Juliana Vineyards, Pope Valley Pond | | 30 | tule/blackberry |
| Sacramento | Florin Road near Bradshaw Road | | 750 | |
| | Waegell | 4/29 | 8,330 | bulrush |
| | Douglas Blvd., Sunrise and Jaeger | | 200 | thistle |
| San Bernardino | CIM Chino Prison | 5/16 | 2,000 | thistle |
| San Luis Obispo | Carizzo Plain | 5/31 | 2,000 | cattail |
| Santa Clara | Del Puerto Canyon Rd. Pond | 5/08 | 70 | |
| Siskiyou | unnamed colony | 5/03 | 700 | cattail |
| | unnamed colony | 5/20 | 1,000 | other |
| Solano | Solano County Landfill | 5/14 | 3,000 | cattail |
| Yolo | Road 92B, Willow Spring Ck. | 5/17 | 100 | Himalaya blackberry |
| | **Total** | | **19,675** | |

**JUNE SURVEY**

| | | | | |
|---|---|---|---|---|
| Alameda | NW Altamont Pass/ Dyer Rd. | 6/04 | 30 | thistle |
| | SW Altamont Pass/ Dyer Rd. | 6/04 | 25 | thistle/hemlock |
| Calaveras | Airola Ranch west of Dogtown Rd. | 6/04 | 500 | Himalaya blackberry |
| Colusa | Delevan Field T43 | 6/03 | 40,000 | cattail |
| Contra Costa | Vasco Rd. | 6/03 | | |
| Fresno | Ashlan | 6/04 | 250 | thistle |
| Glenn | SE Ivory Mills Rd | 6/03 | 640 | cattail |
| | Stony Creek | 6/08 | 2,000 | willows/*Arundo donax* |
| Kern | El Pato Loco Pond | 6/02 | 2 | |
| | Famoso Rd. | 6/02 | 50 | |
| | Edwards AFB Branch Park pond 2nd | 4/22 | 40 | cattails |
| | Bitter Creek NWR | 6/03 | 20 | nettles |
| Kings | Hwy. 41 Kings River north of Fremont | 6/03 | 5,000 | cattail/bulrush |
| Lake | Whalen Way, Lakeport | 6/03 | 175 | cattail |
| | NW Adobe Creek Reservoir | 6/07 | 60 | cattail |
| Lassen | Pittville Rd. s of Little Valley Road | 6/05 | 70 | bulrush |
| | Johnstonville Marsh Hwy. 395 | 6/03 | 125 | cattail |
| Los Angeles | Edwards AFB Branch Park pond 2nd | 6/07 | 40 | cattail |
| Madera | Hwys. 145/41 (Millerton Rd 2nd?) | 6/05 | 120 | thistle |
| Mendocino | Burris Lane, Potter Valley | 6/05 | 150 | cattail |
| | Rt. 20 E Fort Bragg @ mile 13.50 | 6/04 | 24 | cattail |
| | Fetzer Visitor Center Pond | 6/09 | 30 | cattail |
| Merced | Ellsworthy II | 6/02 | 6,000 | cattail |
| | O'Neill Forebay dam | 6/04 | 3,500 | cattail |
| | E. Farmfield, Merced NWR | 6/03 | 750 | milk thistle/mustard |
| | San Joaquin River levee 1 | 6/03 | 300 | milk thistle |
| | W Bear Creek unit at River | 5/27 | 40 | milk thistle |
| | levee north end E Unit | 6/02 | 4,000 | mustard/mixed thistle |
| | Kelly Ranch Levee | 5/27 | 500 | |
| | Salt Slough N Grasslands WA | 6/03 | 100 | |
| | China Island N Grasslands WA | 6/03 | 200 | |
| | Hussman Rd. south of Gustine | 6/04 | 15 | |
| | Basalt Campground Entrance Rd | 6/04 | 30 | thistle |
| | McNamara Road | 6/04 | 1,000 | thistle |
| | 2nd Ave. W Hwy. 165 N of Stevinson | 6/04 | 2,000 | Himalaya blackberry |

| | | | | |
|---|---|---|---|---|
| Modoc | Jones Lane of Hwy. 395, Alturas | 6/03 | 40 | other, ag |
| Monterey | Bradley Rd, Camp Roberts | 6/03 | 500 | milk thistle |
| | Camp Roberts 1 | 6/04 | 250 | milk thistle |
| | Camp Roberts 2 | 6/04 | 220 | milk thistle |
| | Fort Ord #22 | 6/03 | 200 | |
| | San Carlos Rd. Pond, Robinson Canyon | 6/03 | 40 | |
| | Old Stage Road | 6/03 | 200 | tules |
| Orange | Sand Canyon Ave / Hwy. 405 | 6/03 | 14 | cattail |
| Sacramento | Prairie City ORV Park | 6/05 | 100 | Himalaya blackberry |
| | Tudesco Ranch LaTrobe 2nd. | 6/05 | 30 | Himalaya blackberry |
| | Elder Creek Rd. #1 | 6/09 | 330 | Himalaya blackberry |
| | Elder Creek Rd., 1/2 mi W Excelsior Rd. | 6/04 | 700 | bulrush/blackberry |
| | Elder Creek Rd. #2 | 6/09 | 300 | Himalaya blackberry |
| | Elder Creek Rd. #3 | 6/09 | 1,600 | Himalaya blackberry |
| | Florin Road near Sunrise Ave. | 6/04 | 4,800 | thistle |
| | Haycock Rd. north Jackson Hwy. 16 | 6/03 | 1,500 | bulrush/thistle |
| San Bernardino | Hwy. 79 N of Mesa Grande Rd. | 6/05 | 20 | nettles |
| San Diego | Chihuahua / Temecula Creeks | 6/05 | 100 | other |
| | Hwy. 179 Vista Irrigation District Gate #2 | 6/05 | 200 | nettles/willows |
| | SW Hwy 79/ Mesa Grande Road | 6/05 | 30 | Himalaya blackberry |
| | Mesa Grande Rd. mile 4.2 | 6/05 | 100 | Himalaya blackberry |
| | Mesa Grande Rd. mile 4.2 | 6/05 | 300 | Himalaya blackberry |
| | Pond Hwy S2 mile 2.3 | 6/05 | 500 | bulrush |
| | E Ramona Pond, Los Banditos Rd. | 6/05 | 50 | bulrush |
| San Luis Obispo | 7.1 miles N of Rt. 58/Shell Roads | 6/03 | 800 | |
| | 7.7 miles N of Rt. 58/Shell Roads | 6/03 | 200 | |
| | 0.8 miles E of Rt. 58/Bitterwater Rd. | 6/03 | 150 | |
| | Camp Roberts - Chorro Ck. Pond | 6/08 | 75 | bulrush/cattail |
| | Camp Roberts - Bradley Rd./Salinas R. | 6/03 | 500 | |
| | Pond | 6/05 | 6 | bulrush |
| | Pond | 6/05 | 7 | bulrush |
| | unnamed colony | 6/05 | 50 | other |
| | S. Gillis Canyon Rd. | 6/03 | 10 | thistle |
| | Magdalena Dr./N. River Rd. | 6/03 | 500 | cattail |
| Santa Barbara | Foothill Rd., Cuyuma Valley | 6/04 | 100 | |
| | Cuyuma Dairy | 6/04 | 650 | |
| Siskiyou | Tule Lake NWR | 5/27 | 150 | nettles |
| | unnamed colony | 5/27 | 300 | nettles |
| | N. Stateline Rd. from Tulelake | 6/05 | 96 | Himalaya blackberry |
| Solano | Lynch Canyon Reservoir | 6/04 | 40 | bulrush |
| | Solano County Landfill | 6/05 | 80 | bulrush |
| | Grizzly Island Road, Suisun Marsh | 6/03 | 12 | cattail |
| Stanislaus | San Joaquin NWR levee middle E Unit #1 | 6/02 | 100 | milk thistle/mustard |
| | San Joaquin NWR levee middle E Unit #2 | 6/02 | 100 | milk thistle/mustard |
| | San Joaquin NWR levee middle E Unit #3 | 6/02 | 800 | milk thistle |
| | San Joaquin NWR N Christman Bottom | 6/02 | 4,000 | mustard/thistle |
| Tulare | Lake Success Gill Unit second | 6/03 | 1,000 | nettles |
| | Creighton Ranch | 6/03 | 600 | buttonbush/willow |
| Tulare | Toledo Pit | 6/03 | 500 | |

| | | | | |
|---|---|---|---|---|
| Yolo | Conaway Ranch | 6/03 | 7,500 | cattail |
| | Madison - Rd. 88B | 6/04 | 2,700 | thistle |
| | Sunsweet Dryers | | 800 | cattail |
| | Sacramento River Levee Road # 1 | 6/13 | 750 | mustard/bull thistle |
| | Sacramento River Levee Road # 2 | 6/13 | 2,000 | mustard/bull thistle |
| | Sacramento River Levee Road # 3 | 6/13 | 2,000 | mustard/bull thistle |
| | Glide Tule (Yolo Bypass) | 6/20 | 100 | buttonbush/willow |
| | Road 90B north of Hwy. 16 | | | |
| | Road 92B, Willow Spring Creek, Zamora | 6/02 | 225 | |
| Yuba | Plumas-Arboga | 6/04 | 6,000 | cattail/bulrush |
| | **Total** | | **112,811** | |

**POST-SURVEY**

| | | | | |
|---|---|---|---|---|
| Colusa | Acre Farms (1st breeding, failed) | 6/08 | 10,000 | cattail |
| | Acre Farms (2nd breeding) | 6/28 | 10,000 | cattail |
| | Capital Outing Club | 6/24 | 35,000 | cattail |
| | Delevan NWR, Field T43 | 6/03 | 80,000 | cattail |
| Glenn | Stony Creek | 6/08 | 6,000 | willows/Arundo |
| | Sacramento River Overflow (settlement) | | 15,000 | buttonbush/willow |
| Madera | China Garden | | 200 | |
| San Diego | Tule Lake | 7/06 | 50 | |
| Yolo | Glide Tule, 2nd breeding | 6/30 | 100 | bulrush |
| | **Total** | | **156,350** | |

Appendix II. Formerly occupied tricolor breeding colony sites that were unoccupied in 2005.

| **County** | **Colony Name** | **Year Last Occupied** | **No. of Birds** | **Reason why unoccupied in 2005** |
|---|---|---|---|---|
| Calaveras | Milton | 2003 | large | destroyed by Roundup® |
| | Milton HB | 2005 | ? | Fresh Roundup® damage. Small colony reported, checked by Hamilton 3 times, no birds found |
| Fresno | Panoche Reservoir | | | Riparian mix of *Atriplex* and cattail reduced to mud by cattle. |
| | Little Panoche Reservoir | | | Seems suitable at far edge; formerly occupied around edge |
| Kern | Costa Dairy | 2002 | 40,000 | silage; no birds; 10 km to Poso Creek colony |
| | Pixley | | | colony cut in 2004 |
| | near Pixley | 2004 | | silage, no birds |
| | Costa Dairy | | | silage, no birds (fide Dave Hardt) |
| | quarry near Kern NWR | | | checked, no birds; former site of small colony |
| | Sag Pond* | 2001 | 8,000 | burned, drought; pond dried, raven predation |
| Kings | Tulare Lake | | 25,000 | settlement only during heavy rainfall years; nests in tamarisk |
| Merced | Billy Wright Rd. | | | habitat overgrown by (lost to) *Lepidium* (white top) |
| Monterey | Laguna Seca | | | flooded; cattails lost |
| Sutter | Meridian | 2004 | 22,000 | nesting substrate burned |
| Tulare | former silage | | 5,000 | silage cut early |
| | Toledo Pit | 2004 | 1,000 | failed “restoration”, new configuration unsuitable for tricolors |
| | TeVelde Ranch | 2004 | 40,000 | checked on 3/30/05, seemed suitable, no birds present |
| San Joaquin | Lake Camanche | | | redwings present in 2005; overgrown by bulrush, little water |
| | | | | |
| | | | | |

* Subject of an in prep. paper, Hamilton, Clendennen, Talluto

Appendix III. Reproductive success in selected habitats.

| Site | N | N Succ | In prog | Failed | RS | RSS |
|---|---|---|---|---|---|---|
| **Dairies** | | | | | | |
| Producers Dairy | many | harvested | | | 0.0 | |
| Deer Creek Dairy | many | harvested | | | | 0.0 |
| Poso I 4/13 | 10 | 6 | 2 | 0 | 1.8 | 1.8 |
| Poso II 4/21 | 41 | | | | | 2.0 |
| **Mean** | | | | | **1.8*** | **1.9** |
| *excludes harvested colonies | | | | | | |
| **Wind Wolves Grassland** | | | | | | |
| Little Lobo 4/22 | 4 | 0 | 16 | 0.7 | 3.5 | |
| 4/27 | 20 | 8 | 14 | 0 | | 2.4 |
| Bob 4/27 | 30 | 4 | 2 | 24 | 0.36 | 2.5 |
| Echo (flat) 4/27 | 43 | 8 | 18 | 16 | 2.3 | 3.4 |
| Santiago Springs | 4 | | | | | 3.25 |
| Santiago Springs 4/22 | 7 | 0 | 21 | | 0.5 | 3.1 |
| W Gate 4/22 | 1 | 21 | 4 | | 4.0 | |
| **Mean** | | | | | **0.96** | **3.16** |
| **Agricultural Lands (excluding rice)** | | | | | | |
| Conaway 6/14 | 16 | 13 | 1 | | 2.6 | 2.8 |
| Yolo Causeway 6/4 | 38.48755 121.58806 | | | | | |
| | 17 | 13 | 1 | 2 | 2.5 | 2.8 |
| Yolo Causeway 6/4 38.42701 121.60909 | | | | | | |
| | 2 | | | | | 3.0 |
| Ellsworthy I 5/9 | 12 | 6 | 44 | | 1.7 | 2.7 |
| Ellsworthy II 6/2 | 13 | 2 | | | jumpers | 2.3 |
| Orland 6/20 | 47 | 7 | 30 | 10 | | 1.85 |
| **Mean** | | | | | | **2.10** **2.53** |
| **Rice** | | | | | | |
| COC 7/14 | 74 | 7 | 2 | 65 | 0.3 | 1.6 |
| Acre Farms 6/27 | many | 0 | 0 | all | 0.0 | |
| Acre Farms 7/18 | 72 | 9 | 0 | 63 | 0.22 | 1.6 |
| 7/18 Meese | 37 | 12 | 3 | 21 | 0.65 | 1.8 |
| Delevan 6/12 | | | | | | |
| 6/17 | 26 | 9 | 3 | 13 | 1.0 | 2.0 |
| 6/22 | 50 | 0 | 28 | 22 | no data | |
| 6/27 | 66 | 25 | 8 | 33 | 0.65 | 1.8 interior 7/6 |
| 54 | 7 | 3 | 44 | 0.08 | 1.6 | exterior 7/6 53 4 |
| 4 | 45 | 0.16 . | 2.0 | | | |
| **Mean Delevan (not weighted)** | | | | | | **0.43** **1.8** |
| **Mean all rice** | | | | | | **0.3** **1.7** |

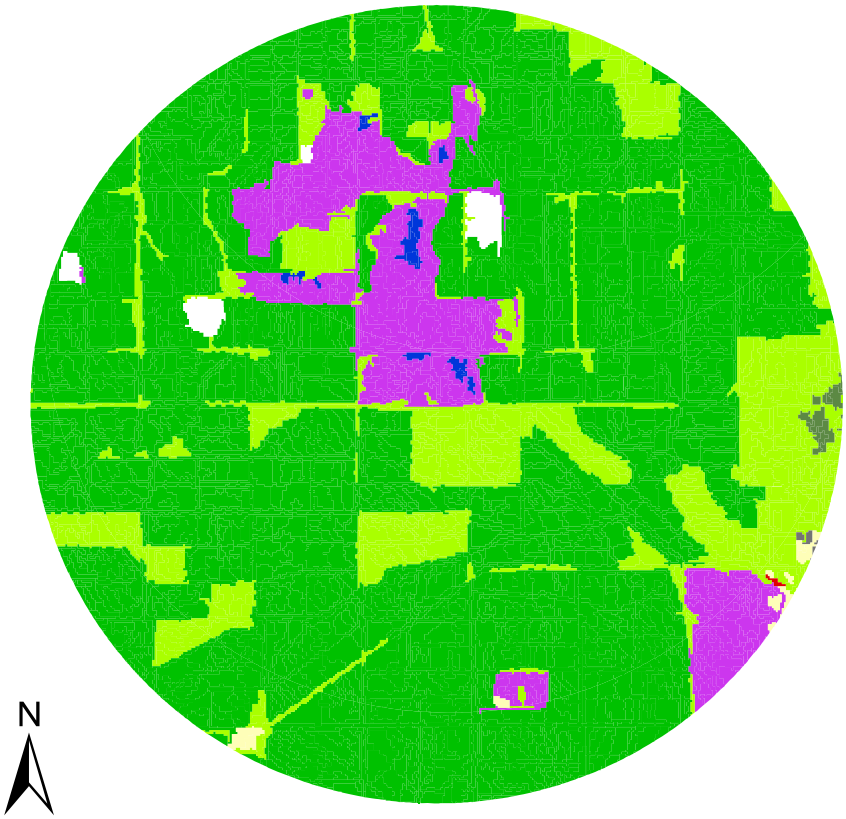
Appendix IV. GIS Analyses of land cover classes. Tabulated percent cover is presented first, followed by maps of the land cover classes within the foraging radii of studied colonies.

| **Colony Name** | **County** | **WHR Land Cover Class: % of Total Area** |
|---|---|---|
| Acre Farms | Colusa | Valley Foothill Riparian: < 0.1%<br>Urban: 0.2%<br>Annual Grassland: 0.3%<br>Orchard/Vineyard: 0.4%<br>Open Water: 0.4%<br>Unknown: 0.6%<br>Fresh Emergent Wetlands: 11.5%<br>Irrigated Cropland: 18.5%<br>Rice: 68.1% |
| Capital Outing Club | Colusa | Valley Foothill Riparian: < 0.1%<br>Urban: 0.2%<br>Annual Grassland: 0.3%<br>Orchard/Vineyard: 0.4%<br>Open Water: 0.4%<br>Unknown: 1.0%<br>Fresh Emergent Wetlands: 9.6%<br>Irrigated Cropland: 19.5%<br>Rice: 68.6% |
| Christman Bottom | Merced | Urban: 0.5%<br>Herbaceous - Undifferentiated: 1.2%<br>Fresh Emergent Wetlands: 1.6%<br>Annual Grassland: 4.1%<br>Open Water: 4.6%<br>Valley Foothill Riparian: 5.2%<br>Orchard/Vineyard: 10.1%<br>Irrigated Cropland: 74.2% |
| Conaway Ranch | Yolo | Barren: < .1%<br>Lacustrine: < .1%<br>Unknown: < .1%<br>Valley Oak Woodland: .1%<br>Mixed Ruderal Grass: .3%<br>Orchard/Vineyard: .5%<br>Fresh Emergent Wetland: .9%<br>Valley Foothill Riparian: 1.4%<br>Annual Grassland: 1.6%<br>Open Water: 2.5%<br>Urban: 13.8%<br>Rice: 15.6%<br>Irrigated Agriculture: 63.2% |
| Delevan NWR | Colusa | Valley Oak Woodland: < .1%<br>Herbaceous – Undifferentiated: .3%<br>Valley Foothill Riparian: .3%<br>Unknown: .6%<br>Open Water: 1%<br>Annual Grassland: 1.5%<br>Orchard – Vineyard: 4%<br>Fresh Emergent Wetland: 20.5%<br>Irrigated Cropland: 25.2%<br>Rice: 46.6% |

| Colony Name | County | WHR Land Cover Class: % of Total Area |
|---|---|---|
| Elder Creek | Sacramento | Fresh Emergent Wetland: < .1%<br>Herbaceous – Undifferentiated: < .1%<br>Orchard-Vineyard: < .1%<br>Unknown: .2%<br>Open Water: .3%<br>Barren: .4%<br>Irrigated Cropland: 20.8%<br>Urban: 24.8%<br>Annual Grassland: 53.4% |
| Ellsworthy | Merced | Unknown: < .1%<br>Valley Oak Woodland: < .1%<br>Barren: .2%<br>Urban: 1.1%<br>Open Water: 2.1%<br>Alkali Desert Scrub: 4.7%<br>Annual Grassland: 4.7%<br>Fresh Emergent Wetland: 28.7%<br>Irrigated Cropland: 58.3% |
| Lake Success | Tulare | Montane Hardwood: < .1%<br>Wet Meadow: .3%<br>Open Water: .7%<br>Urban: .8%<br>Montane Riparian: 1.4%<br>Orchard – Vineyard: 1.6%<br>Blue Oak Woodland: 4.2%<br>Lacustrine: 6.9%<br>Irrigated Cropland: 7.1%<br>Annual Grassland: 76.9% |
| Little Lobo | Kern | Barren: < .1%<br>Montane Riparian: .1%<br>Sierran Mixed Conifer: .1%<br>Coastal Scrub: .6%<br>Sagebrush: .6%<br>Mixed Chaparral: .9%<br>Blue Oak Woodland: 6.2%<br>Pinyon – Juniper: 8.7%<br>Annual Grassland: 82.7% |
| Merced NWR | Merced | Valley Oak Woodland: .1%<br>Orchard – Vineyard: .2%<br>Barren: .3%<br>Open Water: .6%<br>Valley Foothill Riparian: .9%<br>Fresh Emergent Wetlands: 2.6%<br>Annual Grasslands: 23.3%<br>Irrigated Cropland: 71.9% |
| Poso Creek | Kern | Urban: < .1%<br>Alkali Desert Scrub: .2%<br>Barren: .5%<br>Valley Foothill Riparian: .6%<br>Fresh Emergent Wetland: .7%<br>Orchard – Vineyard: 1.6%<br>Irrigated Cropland: 46.8%<br>Annual Grassland: 49.5% |

| Colony Name | County | WHR Land Cover Class: % of Total Area |
|---|---|---|
| Sacramento River Levee Road | Yolo | Lacustrine: .1%<br>Valley Oak Woodland: .1%<br>Valley Foothill Riparian: .4%<br>Riverine: 1.5%<br>Orchard - Vineyard: 1.6%<br>Open Water: 3.0%<br>Fresh Emergent Wetland: 4.0%<br>Annual Grassland: 5.5%<br>Urban: 11.5%<br>Irrigated Cropland: 72.3% |
| Solano Landfill | Solano | Barren: < .1%<br>Open Water: .4%<br>Urban: .8%<br>Perennial Grassland: 1.2%<br>Fresh Emergent Wetland: 1.3%<br>Annual Grassland: 40.6%<br>Irrigated Cropland: 55.6% |
| Stony Creek | Glenn | Riverine: < .1%<br>Rural Residential: < .1%<br>Valley Oak Woodland: < .1%<br>Fresh Emergent Wetlands: .2%<br>Open Water: .7%<br>Barren: 1.3%<br>Urban: 1.3%<br>Annual Grassland: 1.7%<br>Valley Foothill Riparian: 1.8%<br>Orchard – Vineyard: 35.8%<br>Irrigated Cropland: 56.6% |
| Waegell | Sacramento | Fresh Emergent Wetland: < .1%<br>Herbaceous – Undifferentiated: < .1%<br>Unknown: < .1%<br>Valley Foothill Riparian: < .1%<br>Barren: .3%<br>Open Water: .5%<br>Orchard – Vineyard: 3.8%<br>Urban: 7.1%<br>Irrigated Cropland: 23.3%<br>Annual Grassland: 64.9% |

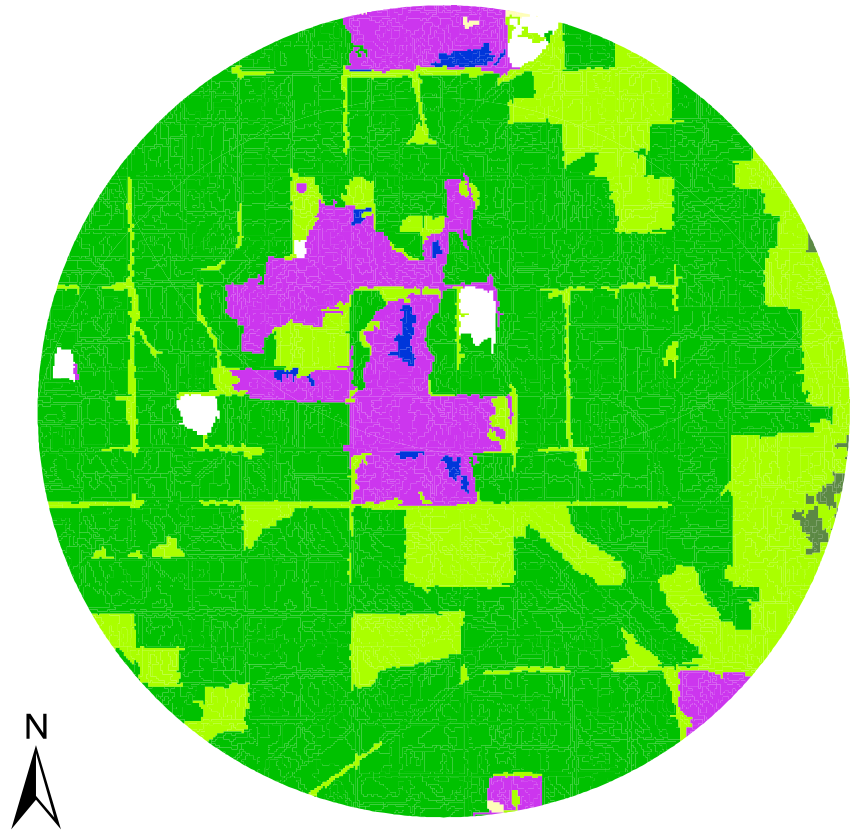
# Acre Farms 2 WHR Land Cover: 6 Km Radius of Breeding Colony




## WHR Land Cover Classes

- Irrigated Cropland
- Orchard/Vinyard
- Rice
- Open Water
- Valley Foothill Riparian
- Fresh Emergent Wetlands
- Annual Grassland
- Urban - Undifferentiated
- Not Mapped

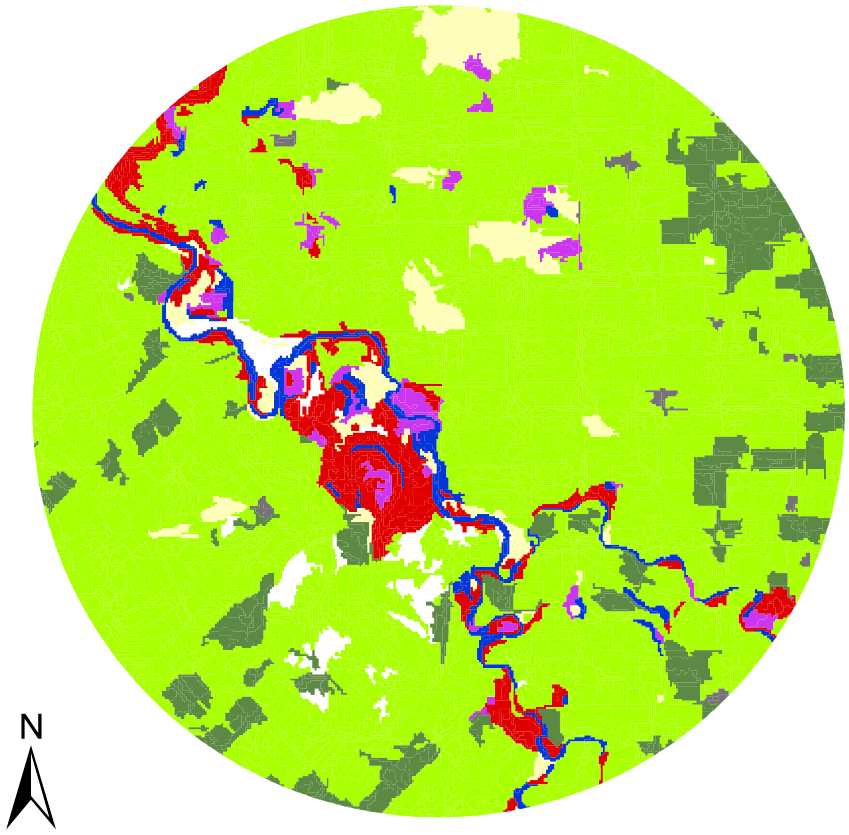
# Capital Outing Club WHR Land Cover: 6 Km Radius of Breeding Colony




## WHR Land Cover Classes

- Irrigated Cropland
- Orchard/Vinyard
- Rice
- Open Water
- Valley Foothill Riparian
- Fresh Emergent Wetlands
- Annual Grassland
- Urban - Undifferentiated
- Not Mapped

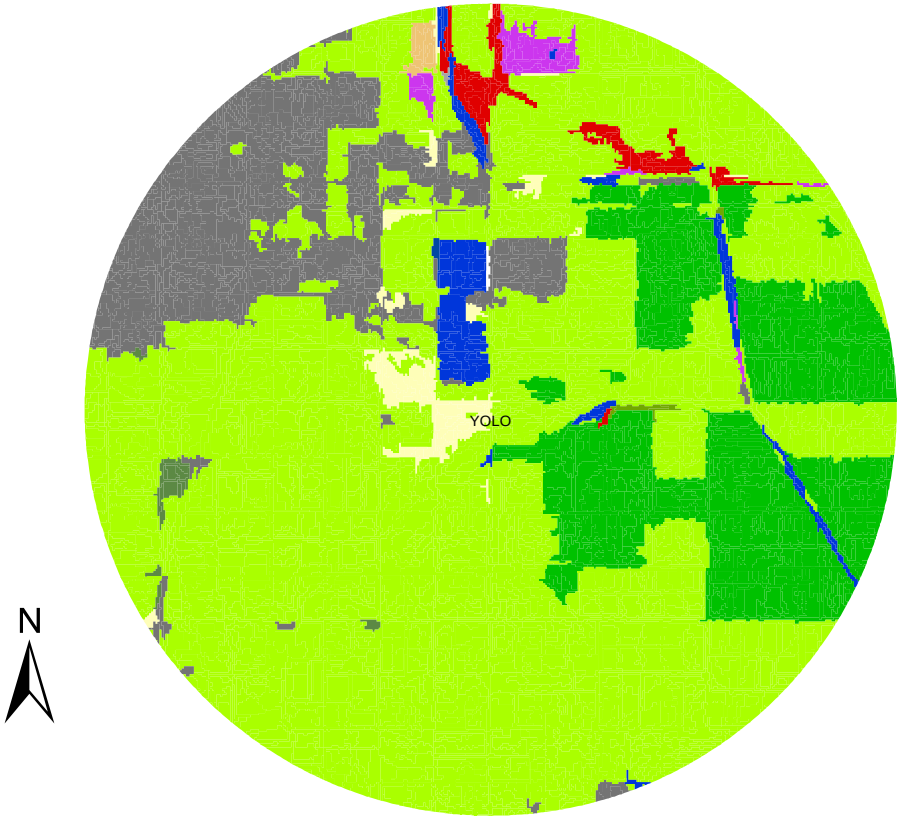
# Christman Bottom WHR Land Cover: 6 Km Radius of Breeding Colony




## WHR Land Cover Classes

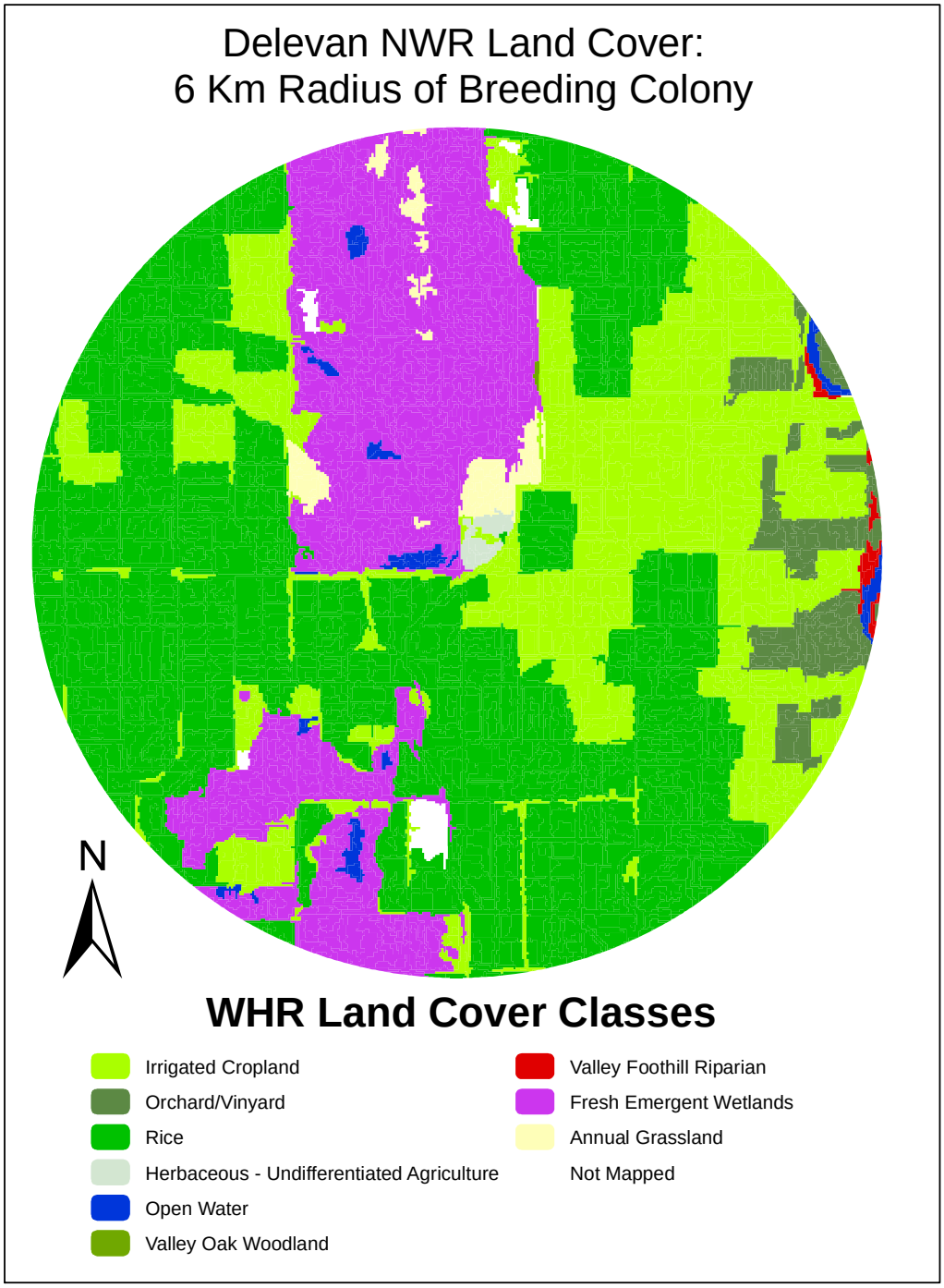
- Irrigated Cropland
- Orchard/Vinyard
- Rice
- Open Water
- Valley Foothill Riparian
- Fresh Emergent Wetlands
- Annual Grassland
- Urban - Undifferentiated
- Not Mapped

# Conaway Ranch WHR Land Cover:
# 6 Km Radius of Breeding Colony

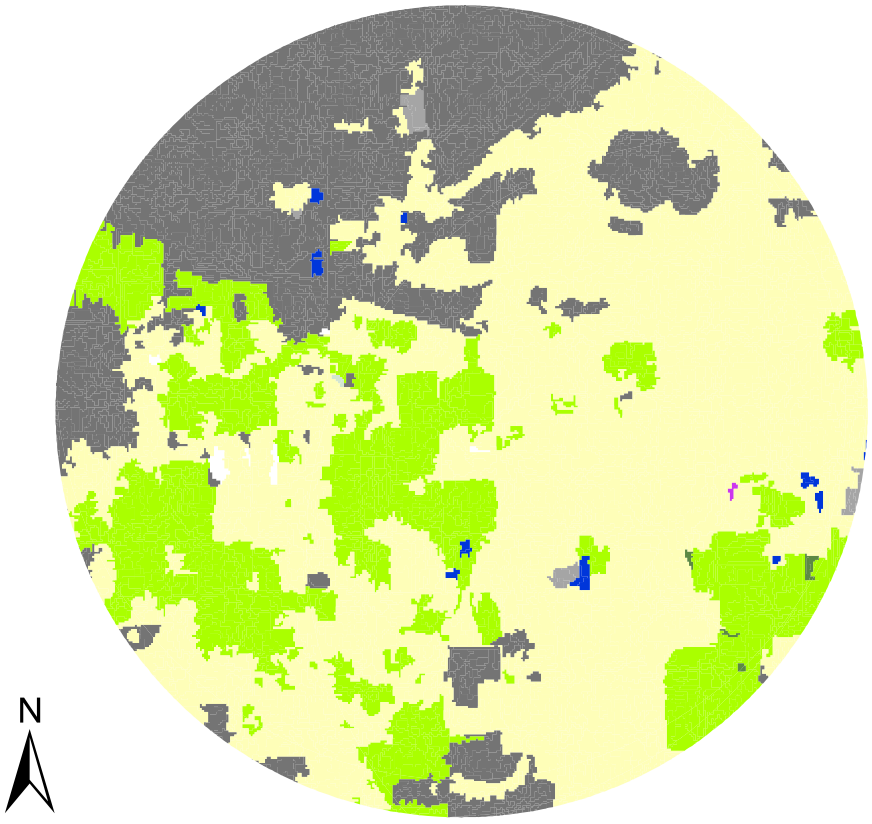



**WHR LAND COVER CLASSES**

- Irrigated Cropland
- Orchard/Vinyard
- Rice
- Open Water
- Lacustrine
- Valley Oak Woodland
- Valley Foothill Riparian
- Fresh Emergent Wetlands
- Annual Grassland
- Herbaceous - Undifferentiated
- Urban - Undifferentiated
- Barren
- Not Mapped


Delevan NWR Land Cover:
6 Km Radius of Breeding Colony
N
WHR Land Cover Classes
Irrigated Cropland
Orchard/Vinyard
Rice
Herbaceous - Undifferentiated Agriculture
Open Water
Valley Oak Woodland
Valley Foothill Riparian
Fresh Emergent Wetlands
Annual Grassland
Not Mapped

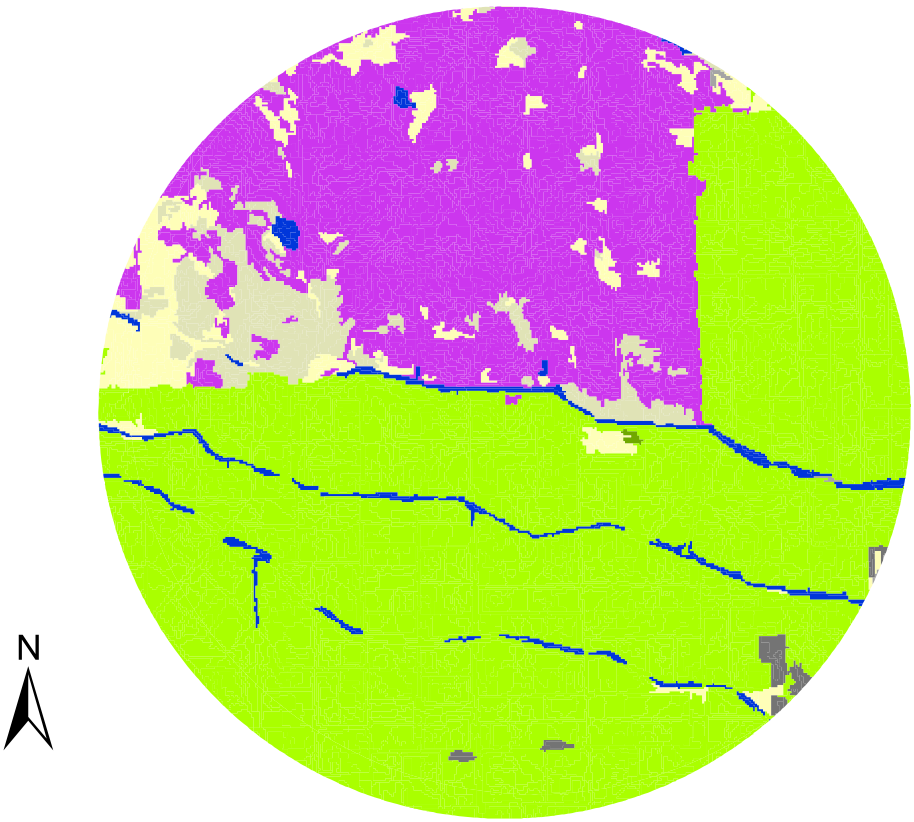
# Elder Creek 1 WHR Land Cover:
# 6 Km Radius of Breeding Colony




**WHR Land Cover Classes**

- Irrigated Cropland
- Orchard/Vinyard
- Herbaceous - Undifferentiated Agriculture
- Open Water
- Fresh Emergent Wetlands
- Annual Grassland
- Urban - Undifferentiated
- Barren
- Not Mapped

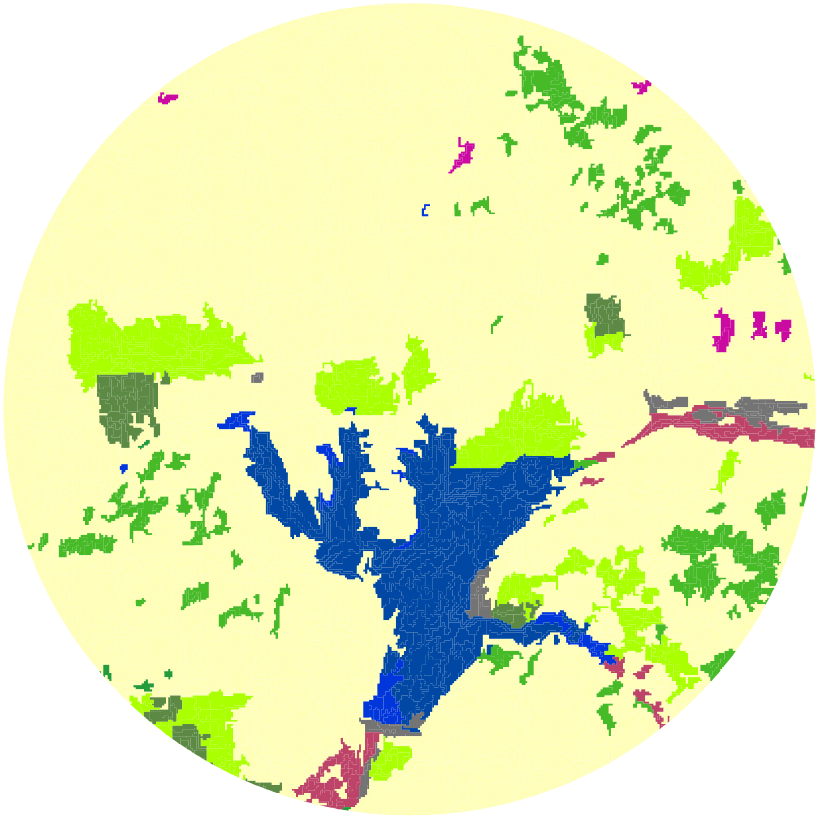
# Ellsworthy 1 WHR Land Cover:
# 6 Km Radius of Breeding Colony




## WHR Land Cover Classes

- Irrigated Cropland
- Open Water
- Valley Oak Woodland
- Fresh Emergent Wetlands
- Annual Grassland
- Alkali Desert Scrub
- Urban - Undifferentiated
- Barren

# Lake Success WHR Land Cover:
# 6 Km Radius of Breeding Colony

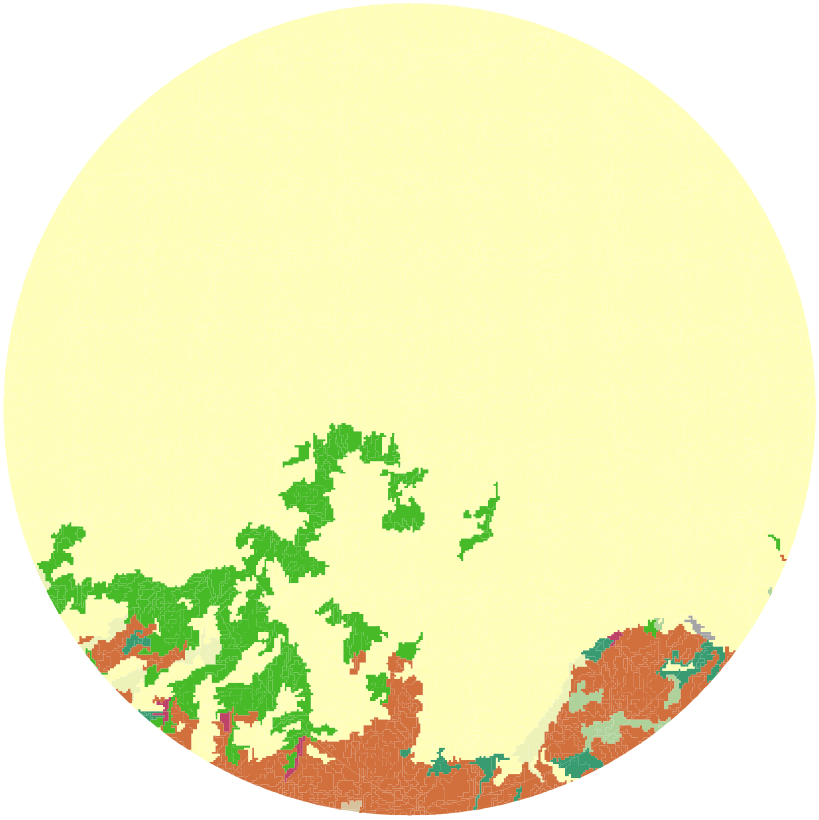


N

## WHR Land Cover Classes

- Irrigated Cropland
- Orchard/Vinyard
- Open Water
- Lacustrine
- Blue Oak Woodland
- Montane Hardwood
- Montane Riparian
- Wet Meadow
- Annual Grassland
- Urban - Undifferentiated

# Little Lobo WHR Land Cover:
# 6 Km Radius of Breeding Colony

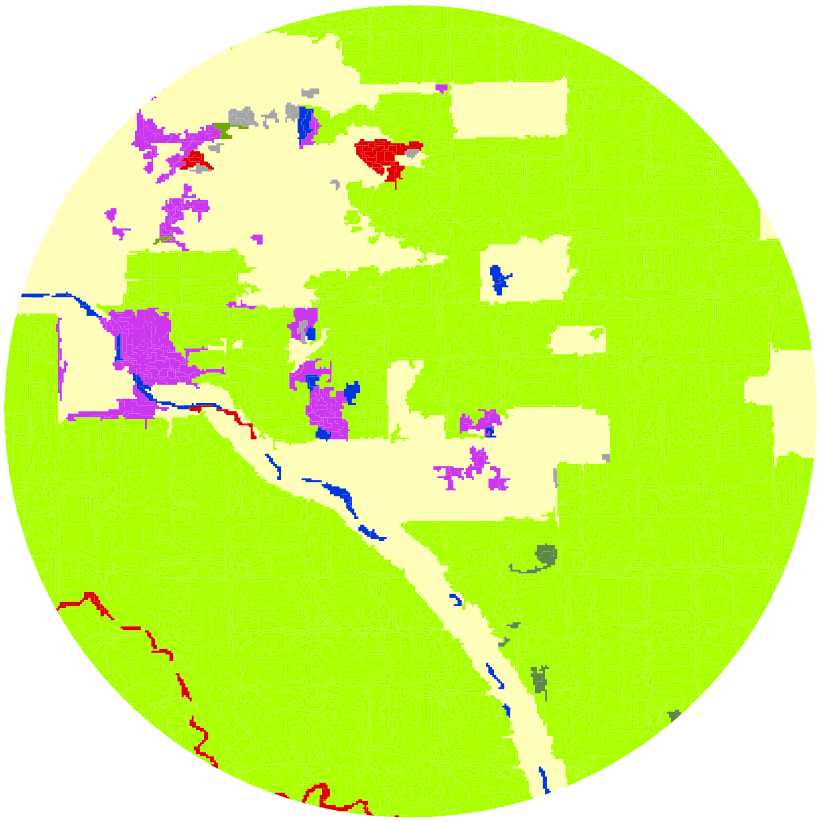


N

## WHR Land Cover Classes

- Pinyon - Juniper
- Sierran Mixed Conifer
- Blue Oak Woodland
- Montane Riparian
- Annual Grassland
- Coastal Scrub
- Sagebrush
- Mixed Chaparral
- Barren

# Merced NWR WHR Land Cover:
# 6 Km Radius of Breeding Colony

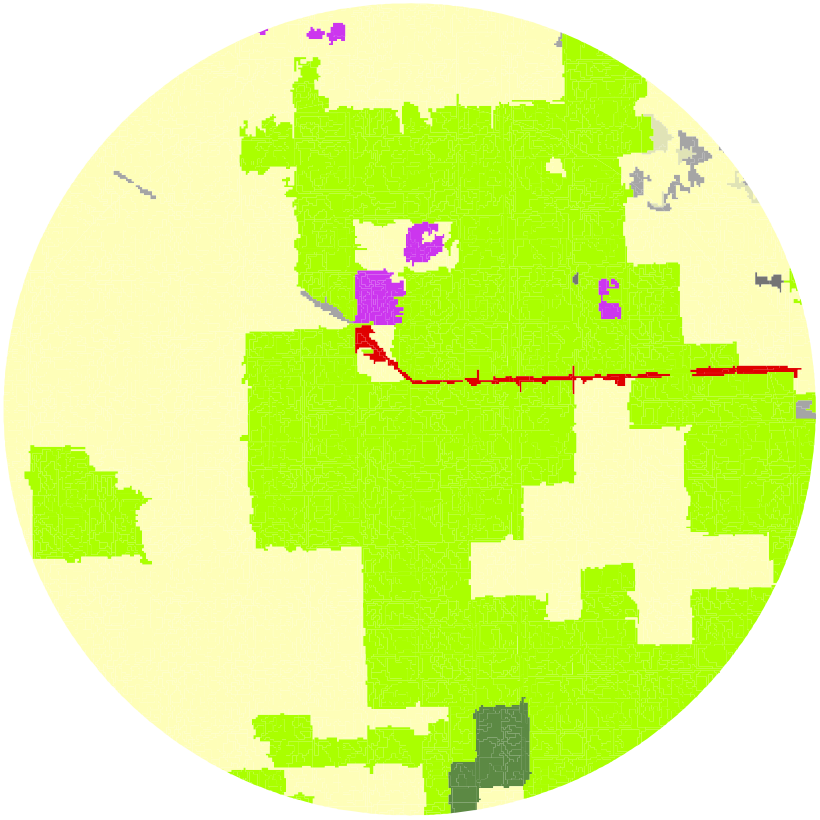


N

## WHR Land Cover Classes

- Irrigated Cropland
- Orchard/Vinyard
- Open Water
- Valley Oak Woodland
- Valley Foothill Riparian
- Fresh Emergent Wetlands
- Annual Grassland
- Barren

# Poso 1 WHR Land Cover:
# 6 Km Radius of Breeding Colony

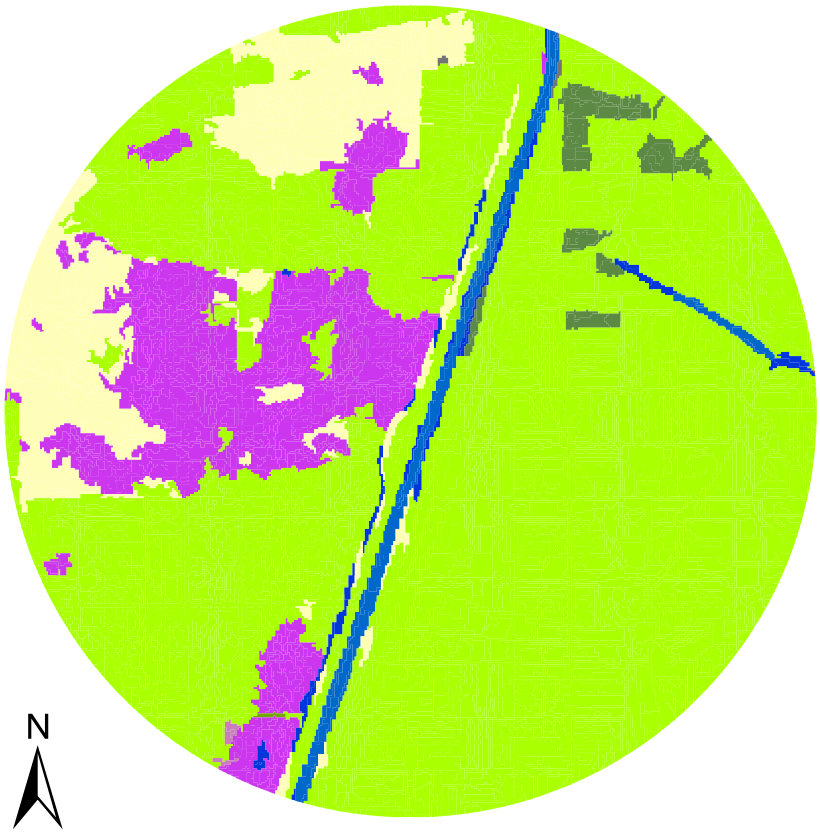


N

## WHR Land Cover Classes

- Irrigated Cropland
- Orchard/Vinyard
- Valley Foothill Riparian
- Fresh Emergent Wetlands
- Annual Grassland
- Alkali Desert Scrub
- Urban - Undifferentiated
- Barren

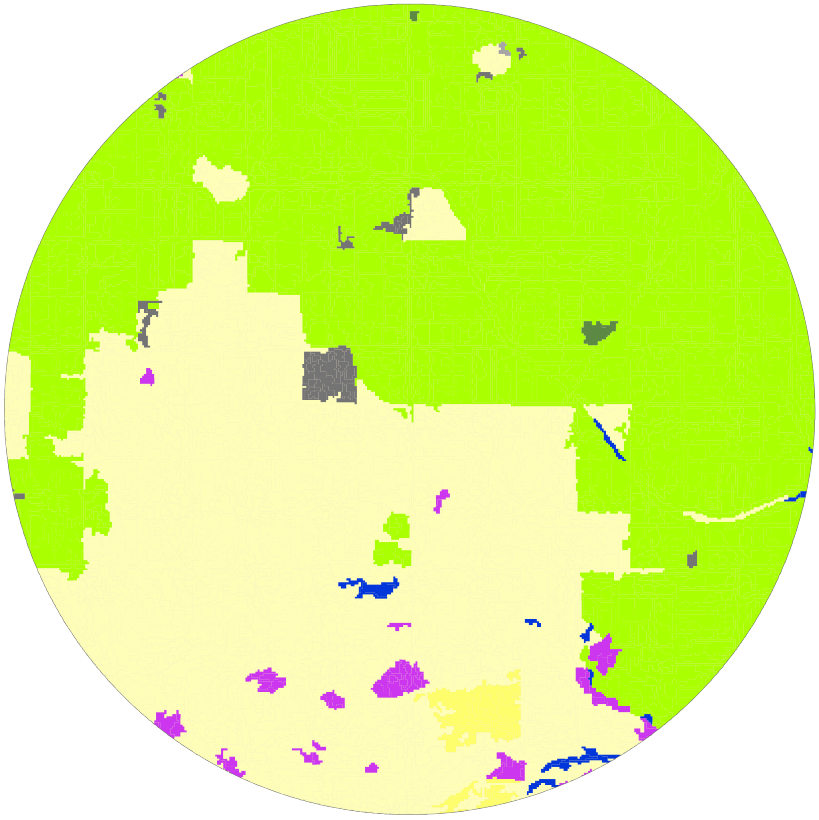
# Sacramento River Levee Road 2 WHR Land Cover: 6 Km Radius of Breeding Colony




**WHR Land Classes**

- Irrigated Cropland
- Orchard/Vinyard
- Open Water
- Riverine
- Valley Oak Woodland
- Valley Foothill Riparian
- Undifferentiated Emergent Wetlands
- Fresh Emergent Wetlands
- Annual Grassland
- Urban - Undifferentiated

# Solano Landfill WHR Land Cover:
# 6 Km Radius of Breeding Colony

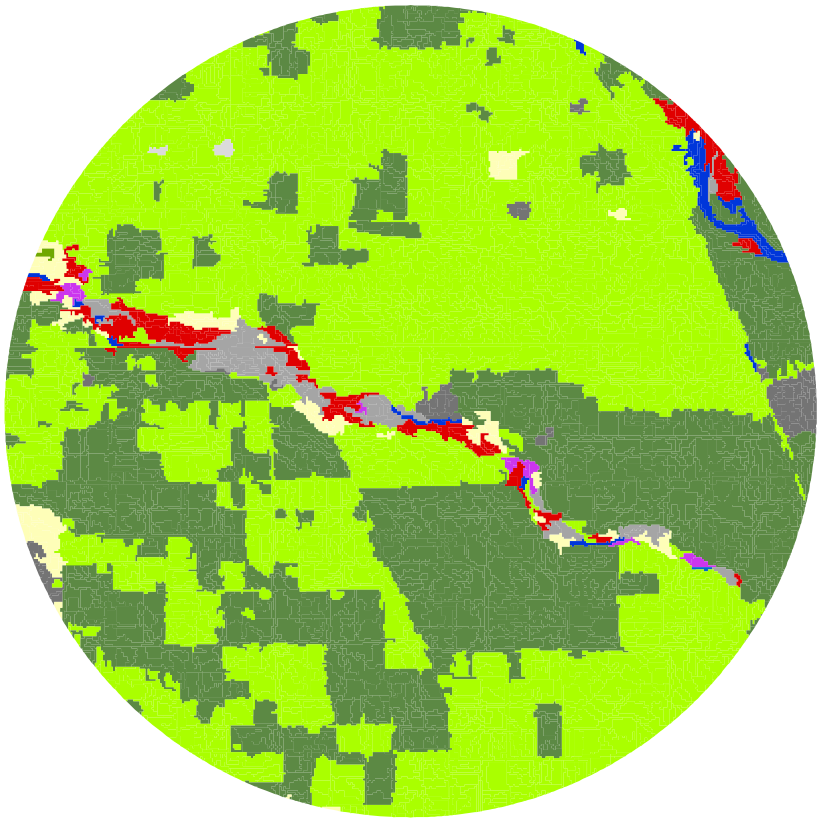


N

## WHR Land Cover Classes

- Irrigated Cropland
- Orchard/Vinyard
- Open Water
- Fresh Emergent Wetlands
- Annual Grassland
- Perennial Grassland
- Urban - Undifferentiated
- Barren

# Stony Creek WHR Land Cover:
# 6 Km Radius of Breeding Colony

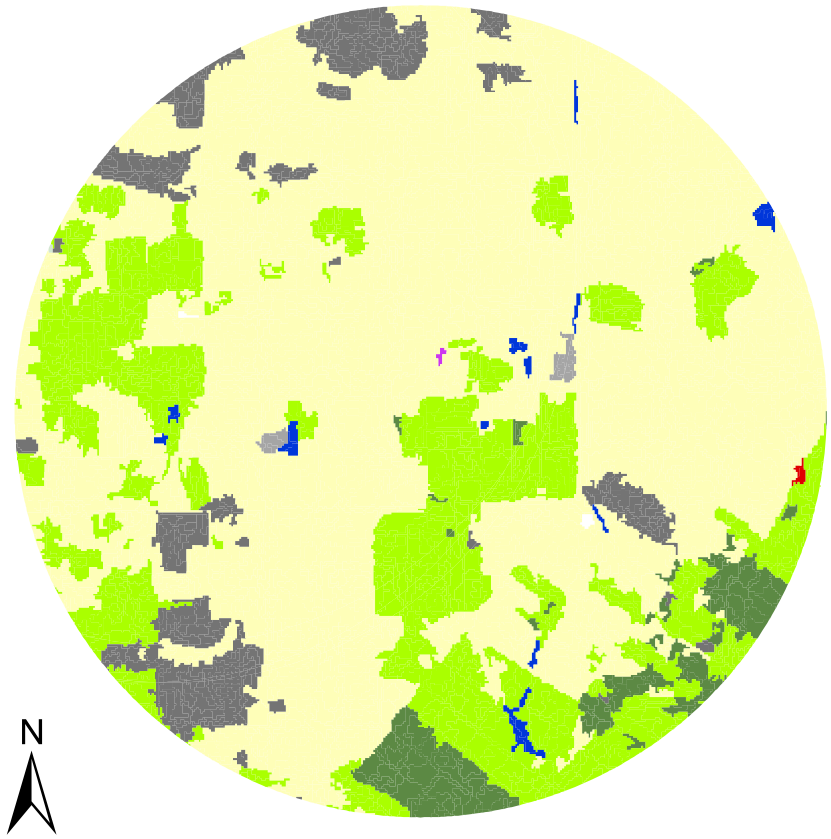


N

**WHR Land Cover Classes**

- Irrigated Cropland
- Orchard/Vinyard
- Open Water
- Riverine
- Valley Oak Woodland
- Valley Foothill Riparian
- Fresh Emergent Wetlands
- Annual Grassland
- Urban - Undifferentiated
- Barren
- Rural Residential

# Waegell WHR Land Cover:
# 6 Km Radius of Breeding Colony



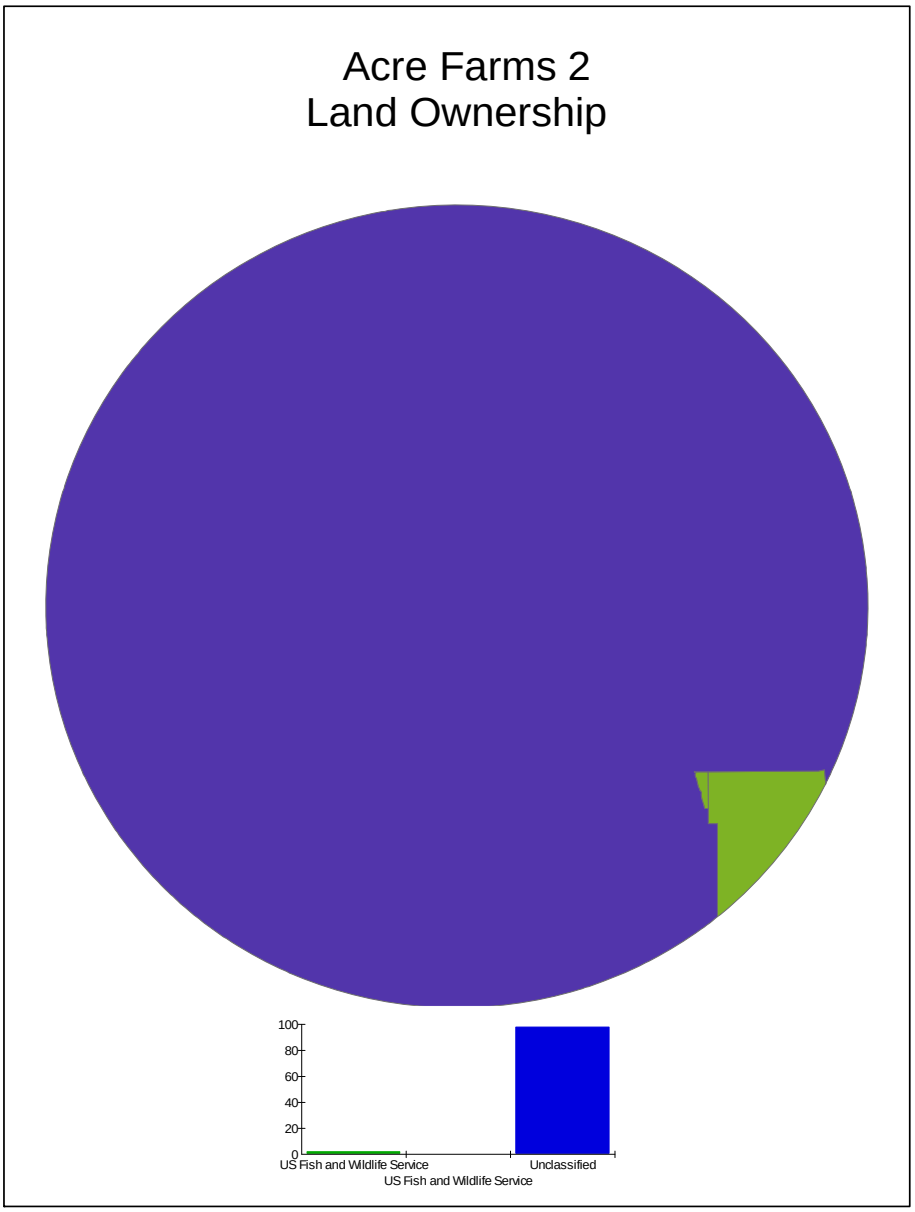

**WHR Land Cover Classes**

- Irrigated Cropland
- Orchard/Vinyard
- Herbaceous - Undifferentiated Agriculture
- Open Water
- Valley Foothill Riparian
- Fresh Emergent Wetlands
- Annual Grassland
- Urban - Undifferentiated
- Barren
- Not Mapped

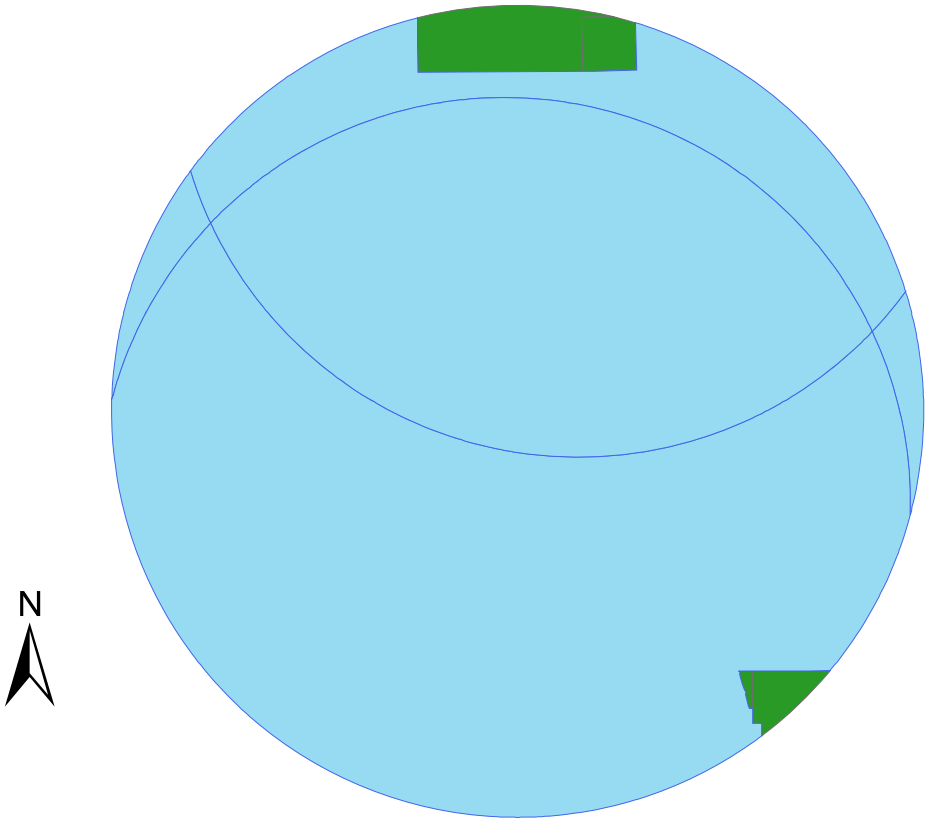
Appendix V. GIS Analyses of land ownership classes. Tabulated values of percent land ownership are presented first, followed by maps of land ownership.

| **Colony Name** | **County** | **Landowner: % of Total Area** |
|---|---|---|
| Acre Farms | Colusa | USFWS, Colusa NWR: 2%<br>USFWS, North Central Valley WMA: < 0.1%<br>Private Property: 98% |
| Capital Outing Club | Colusa | USFWS, Colusa NWR: 3%<br>Private Property: 97% |
| Christman Bottom | Merced | USFWS Merced NWR: 24%<br>Private Property: 76% |
| Conaway Ranch | Yolo | Ca. State Lands Comm.: <.1%<br>Private Property: 99.9% |
| Delevan NWR | Colusa | Ca. Dept. Fish & Game: <.1%<br>USFWS, Delevan NWR: 18%<br>Private Property: 82% |
| Elder Creek | Sacramento | Local Reuse Authority (Mather AFB): 13%<br>Private Property: 87% |
| Ellsworthy | Merced | Private Property: 100% |
| Lake Success | Tulare | DOD, Army Corps of Engineers: 14%<br>Private Property: 86% |
| Little Lobo | Kern | BLM: 2%<br>U.S. Forest Service: 2%<br>Private Property: 96% |
| Merced NWR | Merced | USFWS: 21%<br>Private Property: 79% |
| Poso Creek | Kern | Ca. Dept. Fish & Game: 3%<br>Private Property: 97% |
| Sacramento River Levee Road | Yolo | Ca. Dept. Fish & Game: 33%<br>Sacramento Port Authority: 3%<br>Private Property: 64% |
| Solano Landfill | Solano | DOD: .3%<br>University of California: .7%<br>Ca. Dept. of Fish & Game: 2%<br>The Nature Conservancy: 2%<br>Solano County: 5%<br>Private Property: 90% |
| Stony Creek | Glenn | USFWS: 1%<br>The Nature Conservancy: 1%<br>Private Property: 98% |
| Waegell | Sacramento | Local Reuse Authority (Mather AFB): 9%<br>Private Property: 91% |

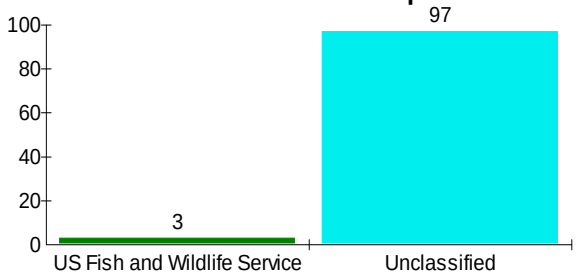
Appendix V (continued). GIS maps of land ownership. The category “unclassified” indicates private property according to the Public, Conservation, and Trust Lands (PCTL) coverage of the California Resources Agency’s California Digital Atlas.



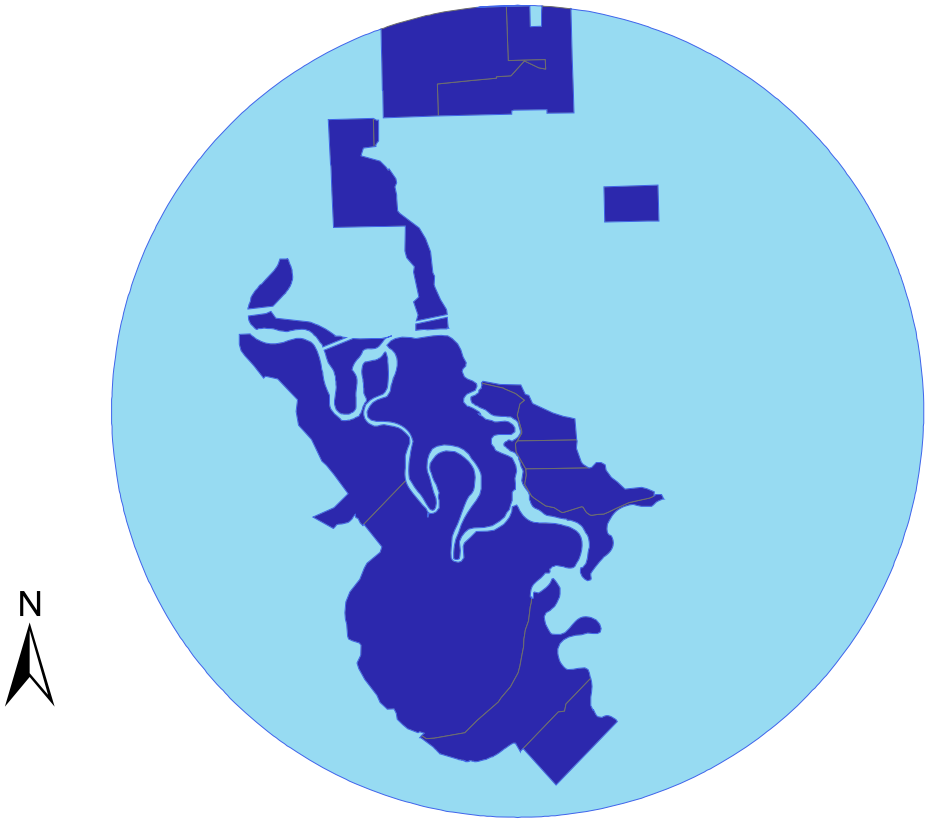
# Capital Outing Club:
# Land Ownership Within
# 6 Km Radius of Breeding Colony



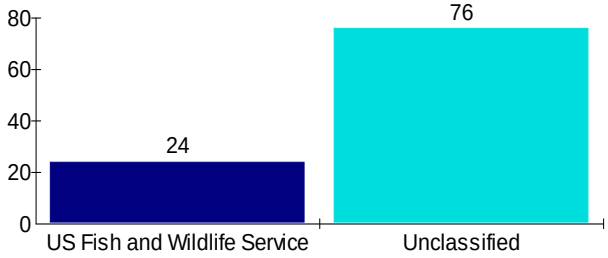

## Land Ownership



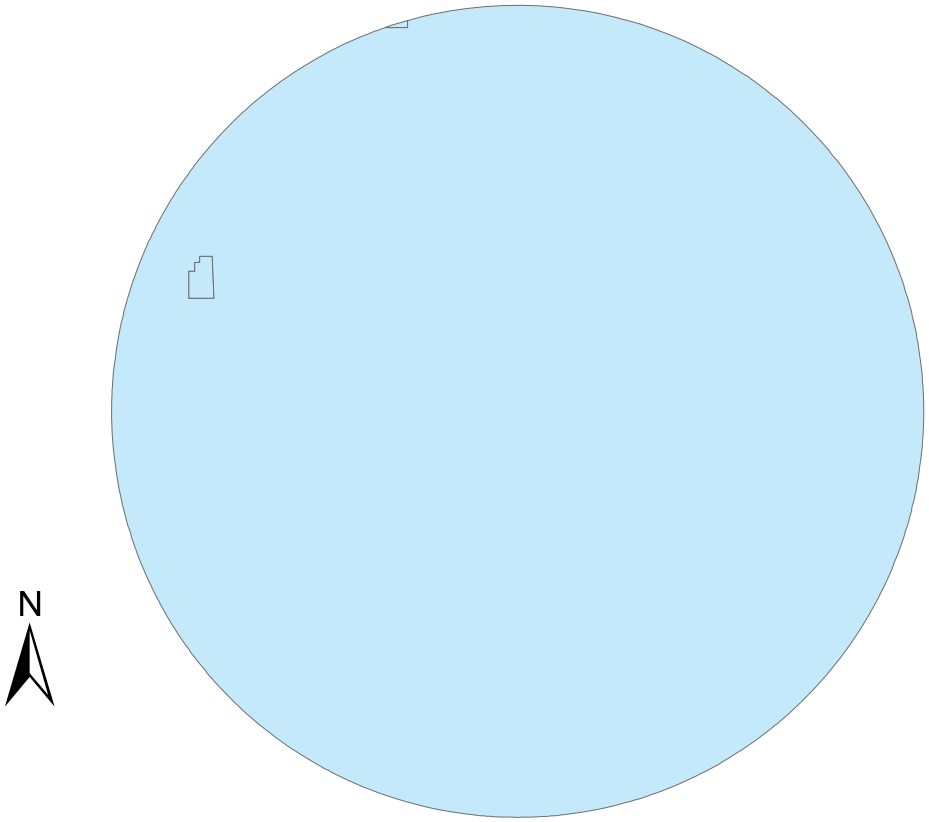
# Christman Bottom:
# Land Ownership Within
# 6 Km Radius of Breeding Colony



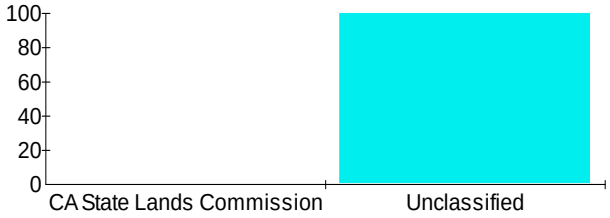

## Land Ownership



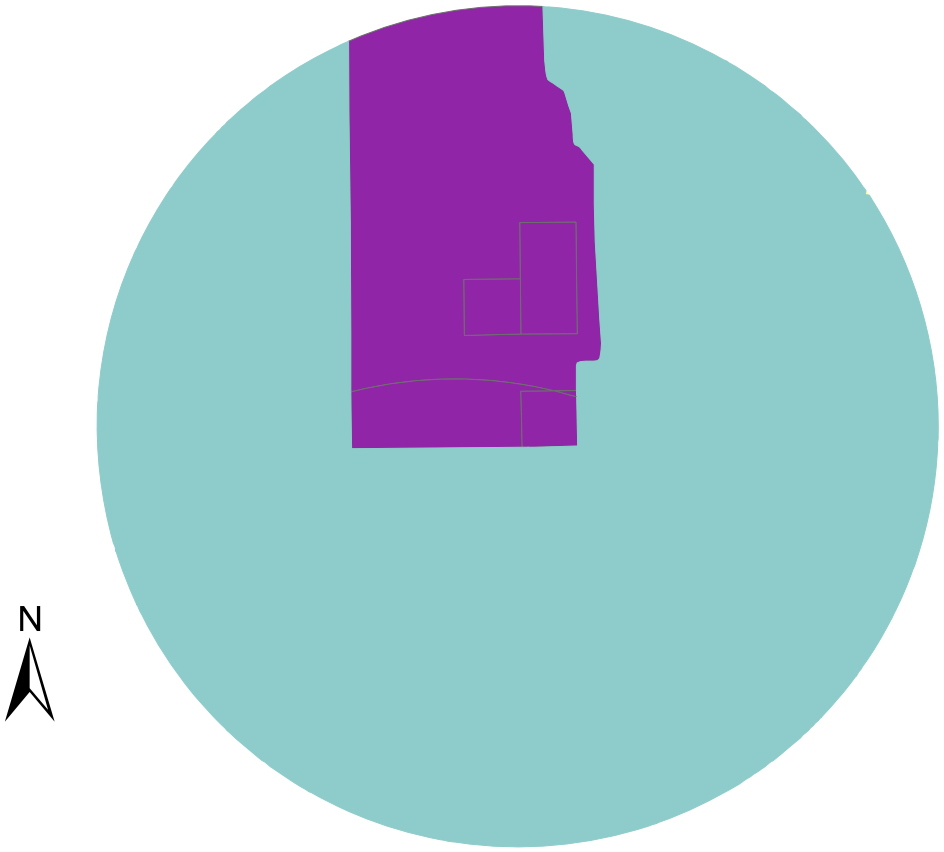
# Conaway Ranch:
# Land Ownership Within
# 6 Km Radius of Breeding Colony



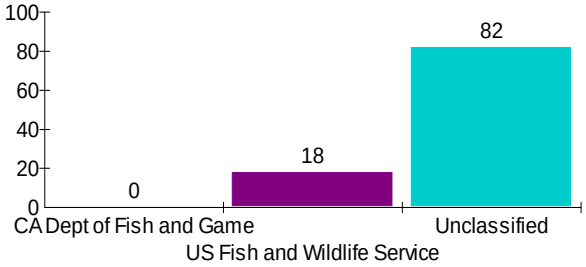

## Land Ownership



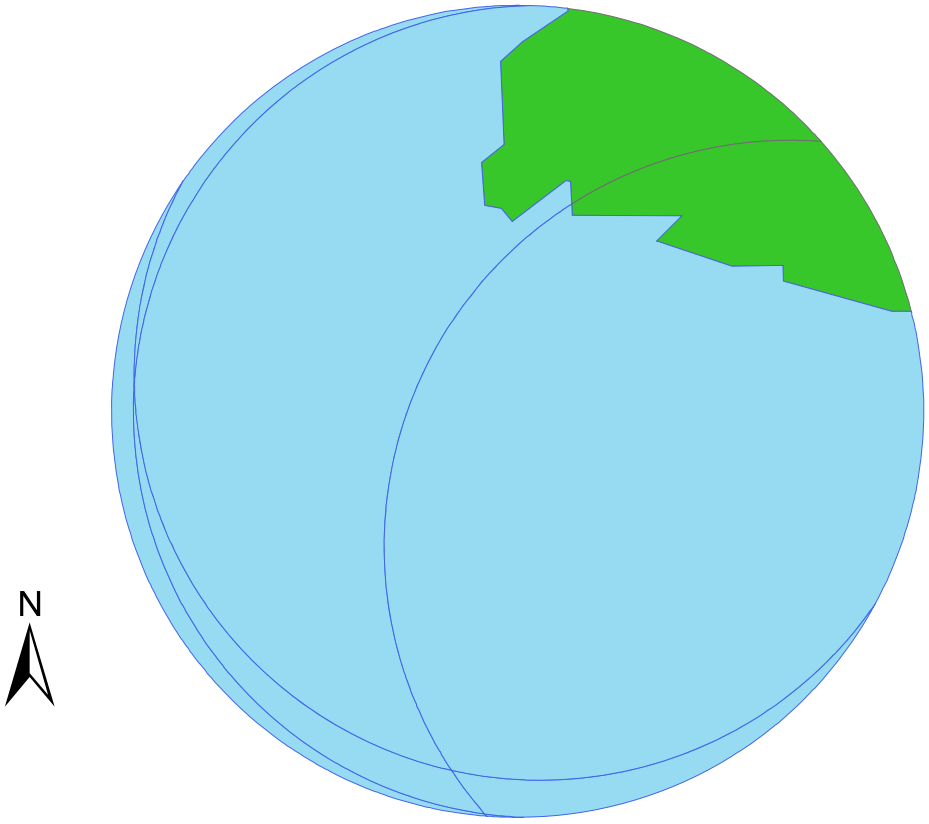
# Delevan Block 43:
# Land Ownership Within
# 6 Km Radius of Breeding Colony



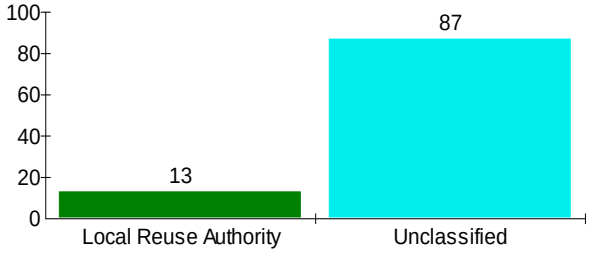

## Land Ownership



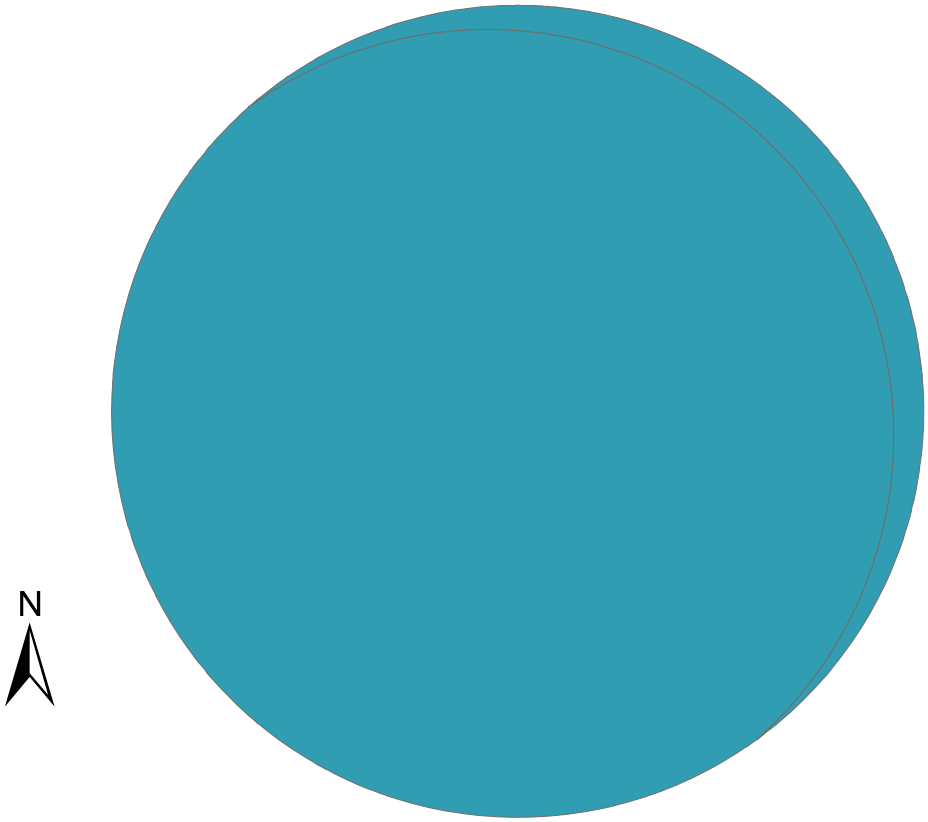
# Elder Creek 3:
# Land Ownership Within
# 6 Km Radius of Breeding Colony




## Land Ownership

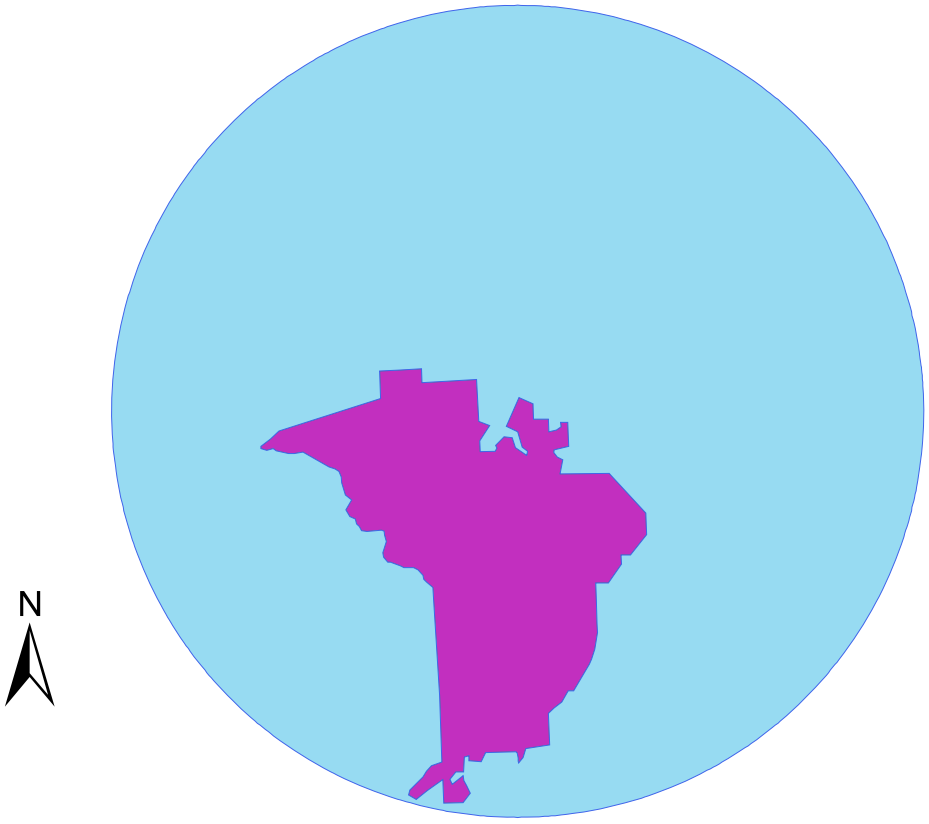


# Ellsworthy 2:
# Land Ownership Within
# 6 Km Radius of Breeding Colony

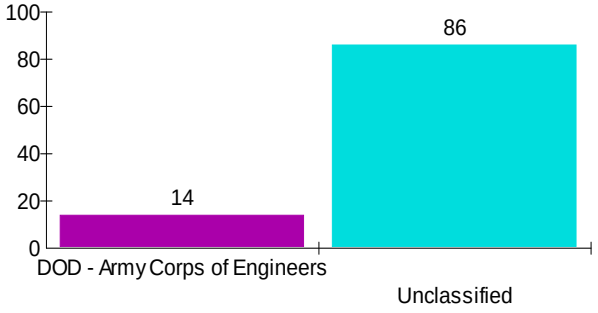



## Land Ownership

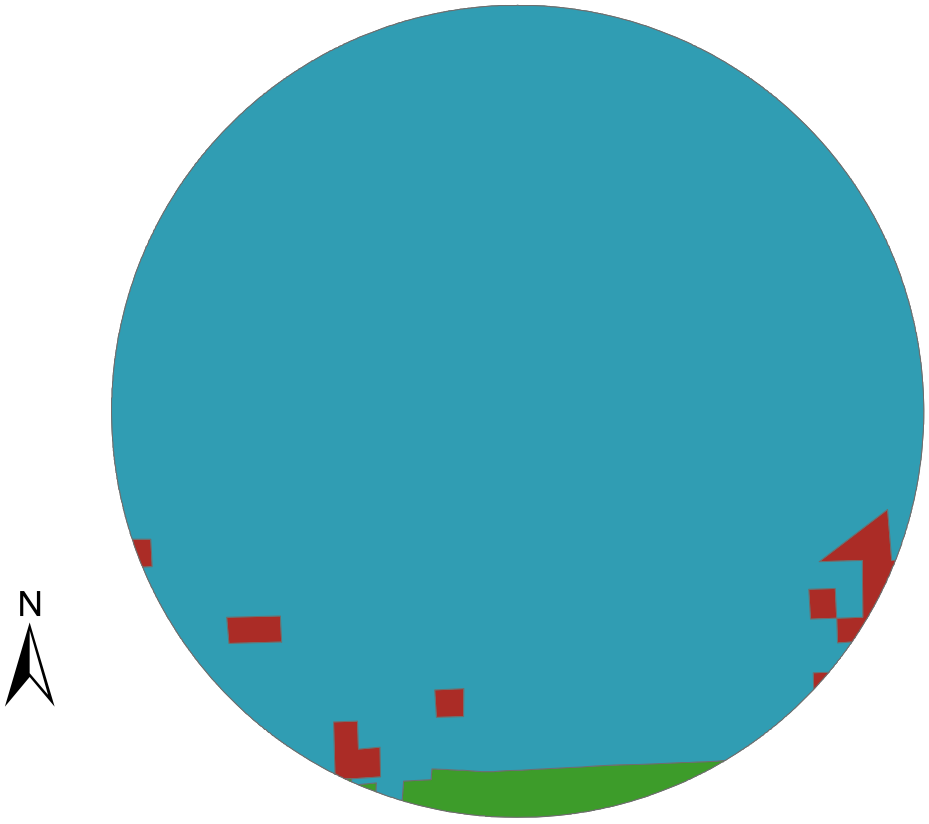
# Lake Success:
# Land Ownership Within
# 6 Km Radius of Breeding Colony



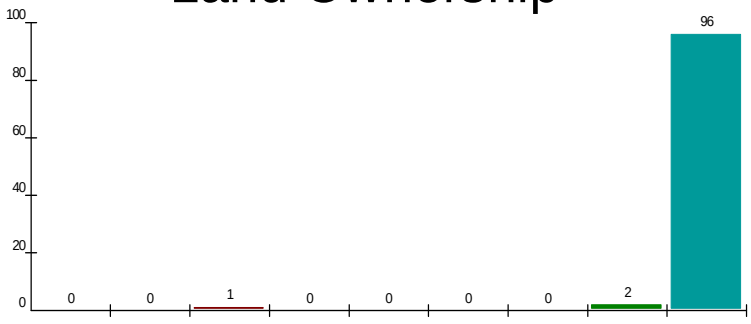

## Land Ownership



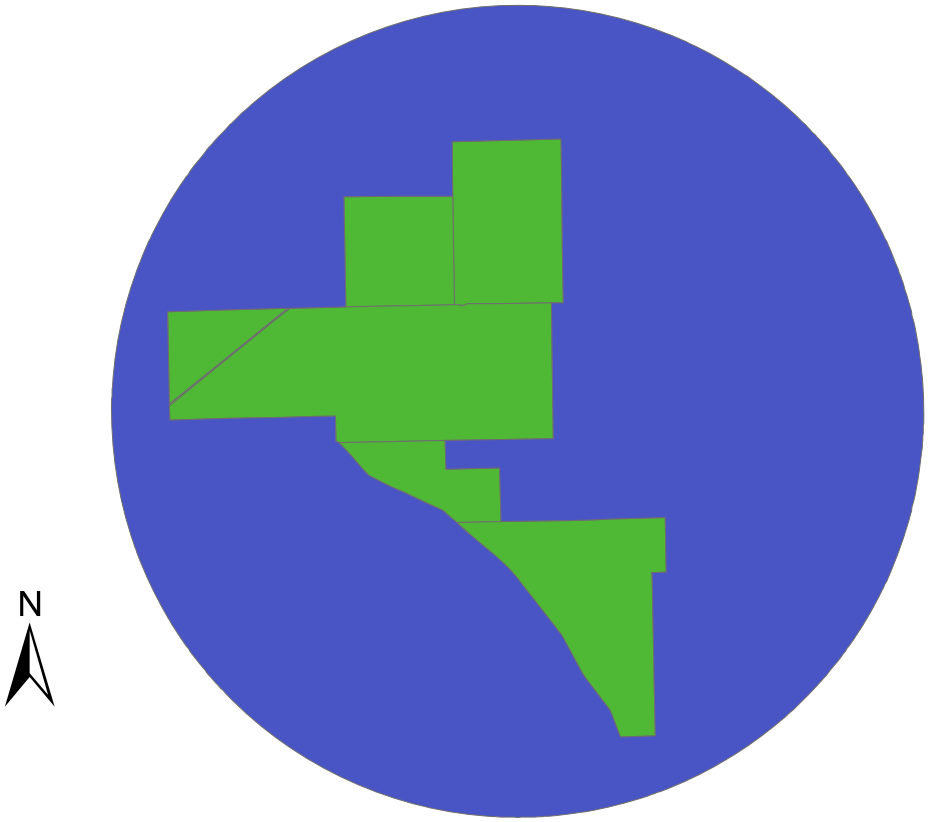
# Little Lobo:
# Land Ownership Within
# 6 Km Radius of Breeding Colony



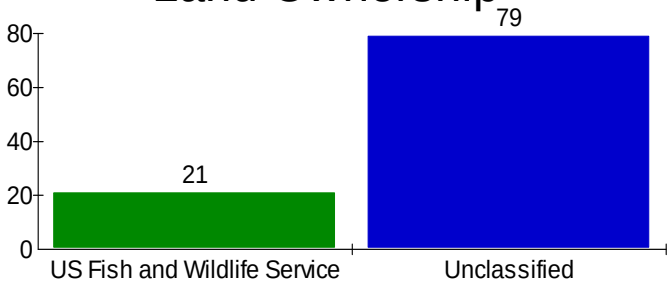

## Land Ownership



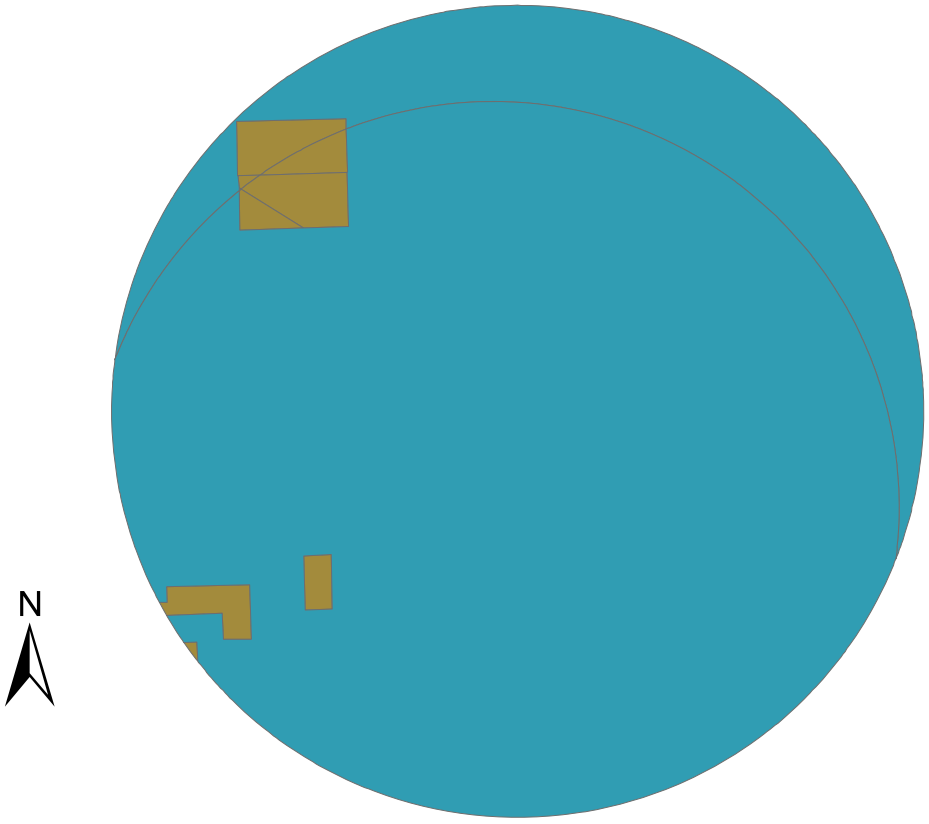
# Merced NWR:
# Land Ownership Within
# 6 Km Radius of Breeding Colony



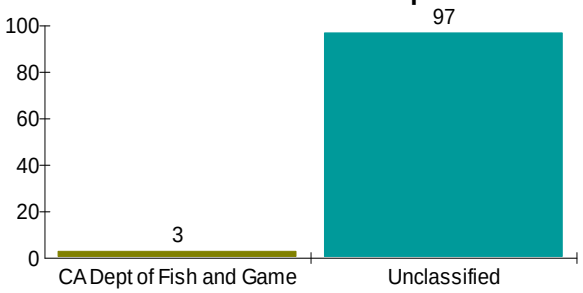

## Land Ownership



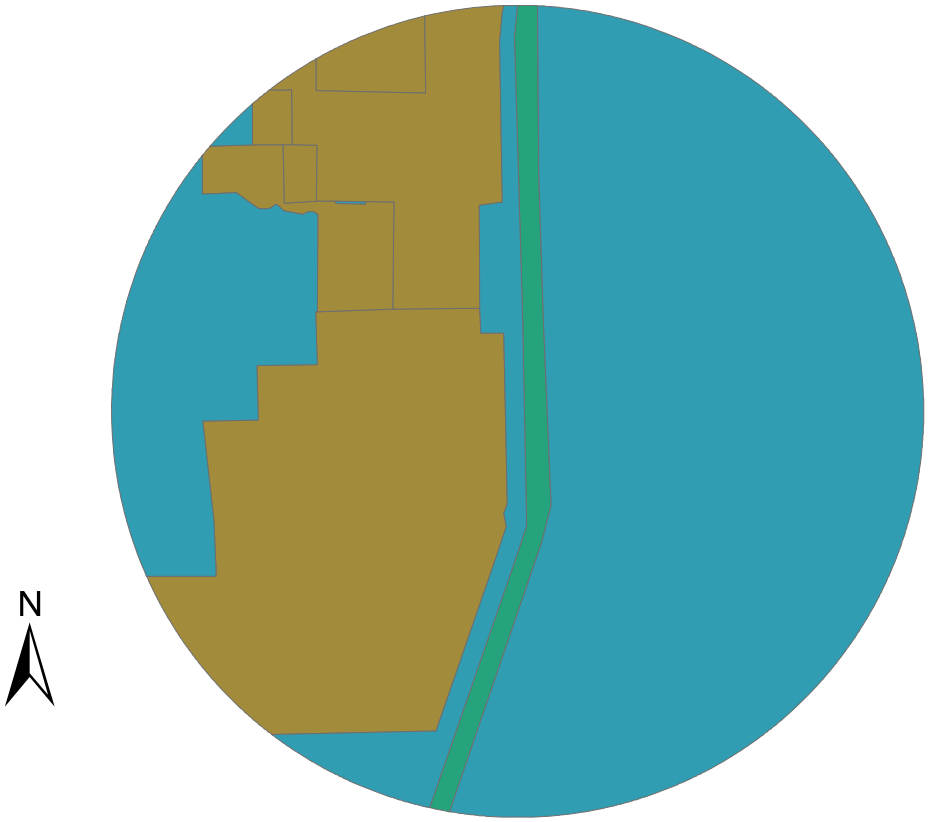
# Poso 1:
# Land Ownership Within
# 6 Km Radius of Breeding Colony



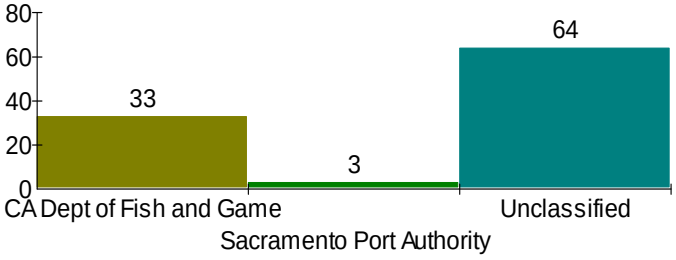

## Land Ownership



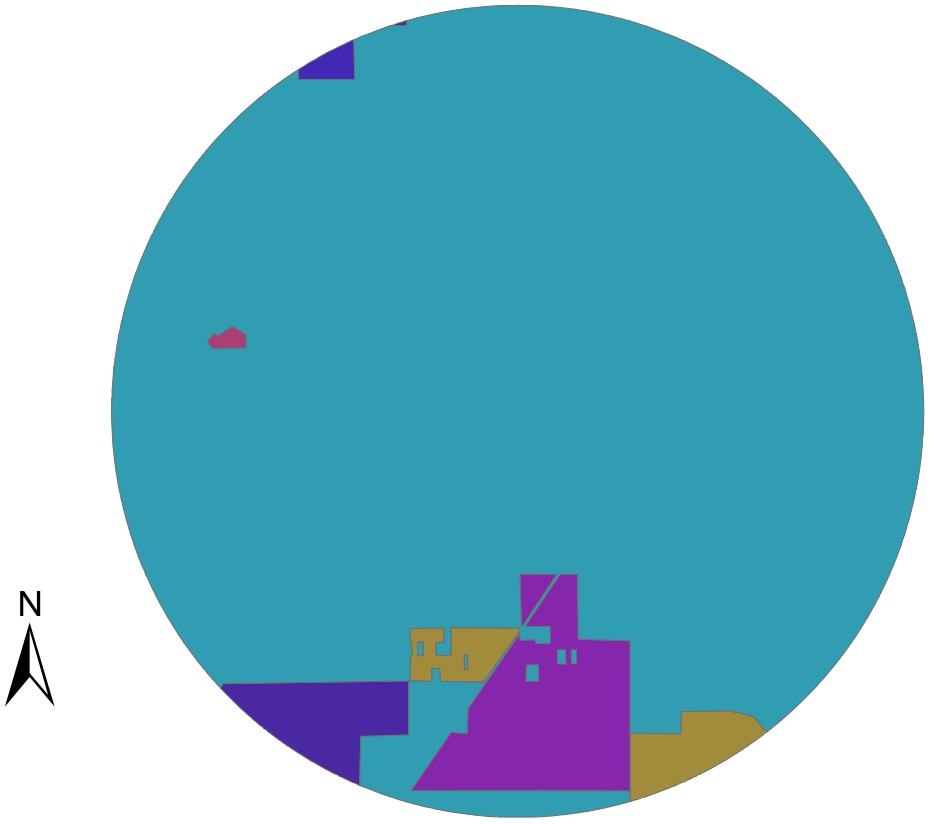
# Sacramento River Levee Road 1: Land Ownership Within 6 Km Radius of Breeding Colony



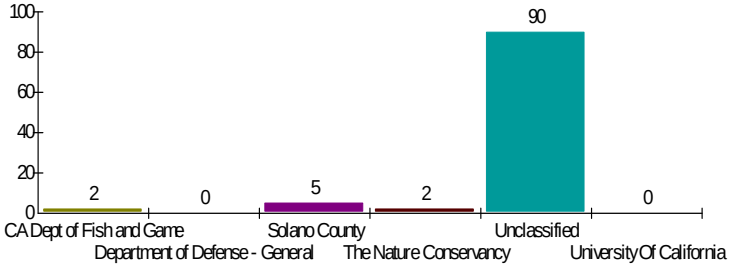

## Land Ownership



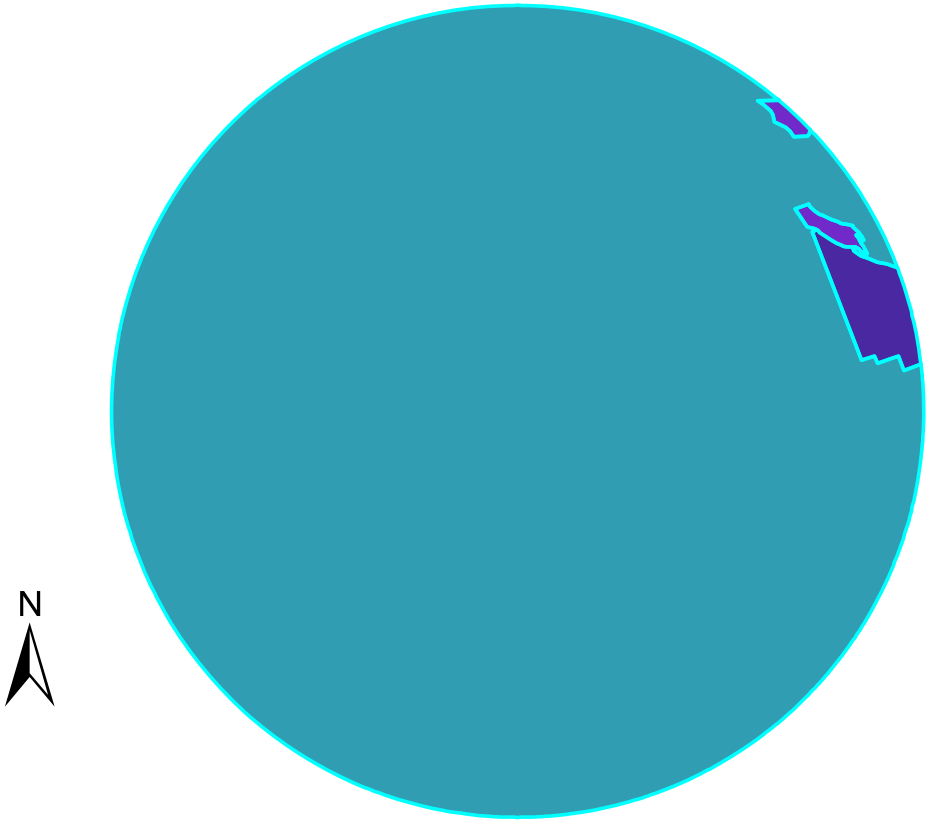
# Solano Landfill:
# Land Ownership Within
# 6 Km Radius of Breeding Colony



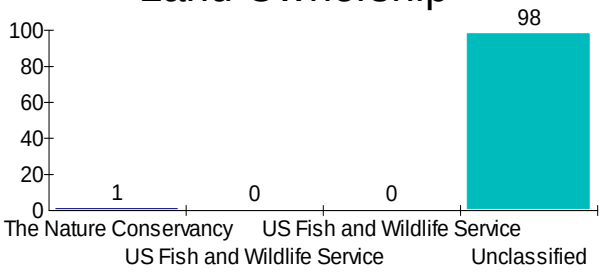

## Land Ownership



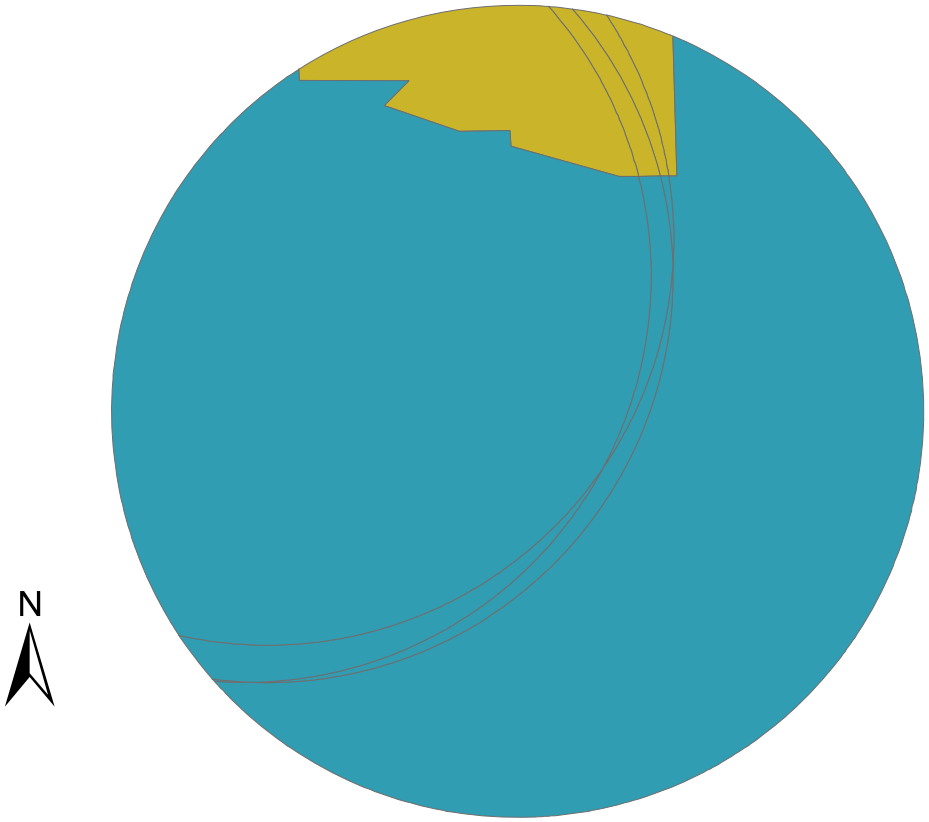
# Stony Creek:
# Land Ownership Within
# 6 Km Radius of Breeding Colony



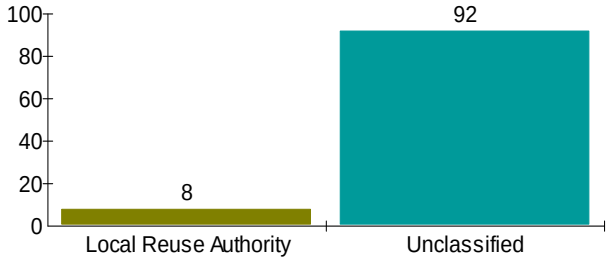

## Land Ownership



# Waegell:
# Land Ownership Within
# 6 Km Radius of Breeding Colony




## Land Ownership



Appendix VI. Changes at Grasslands Wildlife Management Area, Merced County (68,800 ha), from previous years. Data are for all known years.

| **Site** | **Historical maximum Population** | **2005** | **Possible reason for vacancy or cause of change 2005** |
|---|---|---|---|
| Gallo acquisition | 105,000 in 1994 | vacant | converted to wetland, no silage grown since1994 |
| Gun Club Road | | vacant | not investigated |
| Kesterson Lake | see notes | vacant | habitat change, management |
| Kesterson Windmill | see notes | vacant | habitat change, management |
| Bose Road | hundreds | vacant | view limited, trespass disallowed |
| Other small blackberry colonies (3) | | vacant | cotton replaces pasture in foraging arena |
| Arena Plains | | vacant | not examined 2005 |
| San Luis NWR | notes | vacant | Thistle, previously occupied, killed by herbicide |
| Winton Marsh | | vacant | Sparse bulrush, was thick cattail. (Management change?) |
| Red Barn | | vacant | bulrush, was cattail 100%, less/little water now |
| Meadowlark, Merced NWR(187) | | vacant | Adjacent thistle & mustard more attractive, in shadow of mustard colony in 2005 |
| Billy Wright | | vacant | Cattail blowout by flood, change riparian thistle to Lepidium |
| 205 Henry Miller Rd. | | vacant | changed foraging area, no Alfalfa |

Appendix VII. Email exchange between Bill Hamilton and David Hardt, Refuge Manager, Kern National Wildlife Refuge.

From: "Hamilton, Bill"<wjhamilton@ucdavis.edu>
To: <dave_hardt@fws.gov>
cc:
Subject: recommendations
11/21/2005 10:04 AM

Hi Dave,

I am compiling recommendations re tricolor management practices that can be implemented immediately.

In the petition by the Center for Biological Diversity they ragged on the Toledo Pit. It would be nice if it could be flooded to 2 feet. Is there any possible way that that can be done by enhanced pumping or water district supplement? I am sure both are possible so the question is what would these changes cost?

At Unit 1 we seem to be into a night heron impasse. Might it be possible to attack local heronries? Do you have other suggestions?

Poso Creek was a wonderful success. The water, location and corn were the cornerstone elements. Is this repeatable?

If you were prioritizing tricolor habitat management what would you suggest?

Quick answers may be good.

Thanks,

Bill Hamilton

From: Dave_Hardt@fws.gov
Sent: Monday, November 21, 2005 2:21 PM
To: Hamilton, Bill
Subject: Re: recommendations

Bill,

All are good questions, here are some answers that may not be as good.

Toledo Pit - We need to run these questions by Dan Vink at the Lower Tule ID but it appeared to me that the well was not able to maintain the water level in the one pond much higher than it was last year. My feeling is that we would need an additional well or supplement with some surface water if available. Surface water would be much cheaper if it were available since wells run approximately $200/foot in depth to drill. I don't know what the depth of the existing well is but it must be at least 400 feet deep.

Unit I and Herons - I'm not sure what the Service's position would be on killing herons on the refuge. I am having a station review/visit by my new supervisors in December and I can run this one up and see what comes back down. Outside of this type of control I'm not sure what else we can do on

the refuge to enhance the success of the colonies in Unit I. I would like to try a dense nesting cover planting adjacent to the refuge and see what kind of success it might have at attracting birds. I'm somewhat skeptical but it might be worth a try. Along these lines it would be interesting to monitor the success of the colonies in the Kern Water Bank to see if the herons impact them as well. We had herons, egrets and ibis all nesting within 200 yards of TCBB colonies.

Poso Creek Dairy - I have no idea what their plans are for this year. I can talk with them to see what their feelings are but my guess would be they will try to do anything they can to prevent a duplication of last years events. They worked with us but were not happy to have been the host of the colonies.

Prioritizing Mgt - Since the foothill colonies are subject to the whims of the weather there isn't much we can do to alter their success. That leaves us with the valley floor colonies. The refuge habitat will be there in its condition and with its faults regardless of what we do. Since the dairy operations appear to be very desirable to the birds then we might want to focus on those areas first since there might be something we can do there to ensure some success. If we can get the foundation in place I would like to approach a dairy operator such as Poso Creek or TeVelde and see if we could work with them up front to establish some prime nesting habitat and have the agreements in place so that it's not a last minute scramble to secure the colonies. This would make it a lot more palatable for the growers and maybe even encourage them to work with us in the future.

Just my thoughts.

Dave

David Hardt
Refuge Manager
Kern NWR Complex
661/725/2767 Fax: 661/725/6041

## Appendix VIII. The role of the tricolor coordinator.

During 13 years of tricolor observations and assistance to USFWS in managing tricolors, I (Hamilton) have often found myself in a position where I could not do what was necessary in the field to implement land use actions that would have benefited tricolors. I have also participated in implementation of some of my recommendations, several with satisfying outcomes.

There are now and will continue to be management conflicts observed during the long (March through July) breeding season. Some of these are so simply resolved the only requirement is that one be there and take time to talk with the owner. When I contacted Al Harter, Harter Land Company, last year through the California Farm Bureau concerning a tricolor colony along a canal on his property, he was unaware that he had any special wildlife on his vast Sutter County property. We spent an afternoon reviewing bird status with Mr. Harter, gave him a copy of the Sibley Field Guide to the Birds of North America, and established not only ongoing protection of his Himalaya blackberry colony site but also a valuable ally who could help us contact other growers in the Sutter rice country. These kinds of contacts are essential to forge productive partnerships and may be the most effective deterrent to the deliberate destruction of breeding habitat.

The tricolor problem is concentrated at specific spots because of the loss of so much breeding and foraging habitat and because of the birds' propensity to aggregate. Each season there are perhaps fewer than 20 actions that need to be taken on the spot (silage cuts, maintenance of proper water levels in marshes, walk through counts to determine attendance at large colonies, defining boundaries of fields to be cut or not cut, detection of silage colonies, others). These actions do not exceed the scope of what one person can do.

If, in addition, we wish to implement conservation actions, this full time person, at times other than the March 15 – July 30 breeding season, is well situated to work with one or more restoration projects during the rest of the year.

The tricolor coordinator may not be able to solely conduct original research because many of the most important actions the employee described above would take involve interactions and negotiations with people during the breeding season, i.e. at the same time that research would be conducted.

1. Maintain contact with owner/operator(s), USFWS and CDF&G to further manage the target silage colonies and to determine their fate, cost and to supervise the biological aspects of implementation,
2. Every grower wants to know when they can get back into their fields. This can be projected but we often find that a safe return can be made earlier than projected.
3. Maintain a database of all tricolor colonies and a website. This includes maintaining records between surveys including personal observations and contacts with known professional observers.
4. Contact corporate owners to discuss conservation opportunities on large properties (Boswell Ranch, Tejon Ranch, foothill ranchers in the San Joaquin Valley). This involves maintaining individual contact with several operators/managers, owners, wives, children and others.
5. Maintain tricolor database and constantly update it, including scale of property use and ownership. Integrate files into statewide databases.
6. Organize once/3-years survey. Contact professional observers a year before the survey and do as much pre-survey work as possible.
7. Avoid duplication/overlap of contacts with owners, an action that may antagonize them and cause them to believe that they have a serious environmental problem, leading in some cases to deliberate habitat destruction.
8. Maintain contacts with Farm Bureau, Agricultural Commissioners, and other property owner organizations to eliminate negative interactions between the person(s) described here and the agricultural community.
9. Help identify the best (size, cost, likelihood of success, endurance, and productivity) of restored and/or managed colonies. Maintain contact with these developments with the respective managers. Continue to implement priority restoration as funds and partners become available.
10. Organize the identification flyer and distribute it.
11. Organize meetings that address and have the potential to solve specific needs
12. Organize field trips to enhance the opportunity for the public, birders, officials and interested government people to see colonies when they are at their showiest.

13. Continuously seek priority restoration projects and outline them to the respective owners/operator. Meet with an advisory panel to verify that the sequence of efforts meets needs and priorities.