FARMING FOR BIRDS: ALFALFA AND FORAGES AS VALUABLE WILDLIFE HABITAT

C. Alex Hartman and Keiller Kyle[1]

ABSTRACT

Alfalfa and forage crops grown in California's Central Valley can be valuable habitat to wildlife, especially many bird species. Alfalfa supports some of the highest biodiversity amongst row crops, with many species using alfalfa to forage, nest, rest, and hide. Several bird species such as the White-Faced Ibis, Long-billed Curlew, and Swainson's Hawk are highly dependent on alfalfa to support them given the lack of native wetland and grassland habitat remaining in California. Forage crops are also important as breeding and foraging areas for species like the Tricolored Blackbird that has more than 40% of its world population currently nesting in California forage crops. Managing for wildlife is almost as important as the crop itself and many management practices in alfalfa and forage crops can significantly increase the value of the crop for wildlife. With alfalfa facing pressure to curb its water use and compete with higher value crops, it will be imperative for the public to know that alfalfa is not only essential to the agriculture economy but also for sustaining wildlife.

Key Words: alfalfa, habitat, white-faced ibis, long-billed curlew, Swainson's hawk, triticale, tricolored blackbird

INTRODUCTION

California has a rich and diverse biological heritage. Bird diversity is especially rich with some 642 species having been documented in the state (CBRC 2010). This diversity is supported, in part, by the myriad of habitat types found in California; from coastal estuaries and deltas, to inland wetlands and riparian areas, to deserts, oak woodlands and conifer forests, to the many agricultural habitats scattered throughout the state. Yet, changing land and water use, human population growth and urban expansion, as well as climate change-induced habitat loss threaten the persistence of many of these habitats and the birds that depend on them. Perhaps, nowhere are these threats more acute than among wetland and riparian habitats. California has lost approximately 91% of its historic wetlands, from an estimated 5 million acres in the late 1700s, to less than 500,000 acres remaining today (Dahl 1990). Most of this wetland loss has occurred in California's Central Valley. In the 1800s the Central Valley contained over 4 million acres of wetland habitat, supporting 20-40 million waterfowl, as well as hundreds of thousands of shorebirds and other waterbirds (CVJV 2006). Fewer than 205,000 acres of managed wetlands remain in the Central Valley today (CVJV 2006). Similarly, over 98% of historic riparian habitat in the Central Valley has been lost or degraded over the last 150 years (RHJV 2004). Flood control, drainage, water diversion projects and agricultural development all have contributed to loss of wetland and riparian habitats.

[1] C.A. Hartman (chartman@audubon.org), Shorebird Conservation Biologist, and K. Kyle (kkyle@audubon.org), Tricolored Blackbird Conservation Coordinator, Audubon California, 765 University Avenue Suite 200, Sacramento, CA 95825; IN Proceedings, 2010 California Alfalfa & Forage Symposium and Corn/Cereal Silage Mini-Symposium, Visalia, CA, 1-2 December, 2010. UC Cooperative Extension, Plant Sciences Department, University of California, Davis, CA 95616. (See http://alfalfa.ucdavis.edu for this and other alfalfa symposium Proceedings)

Today, birds living and moving through California must contend with a radically changed landscape, one where natural wetlands and riparian habitats have been largely replaced by various agricultural crops. Yet, many of these same working agricultural lands now play an enormous role in wildlife conservation by providing surrogate habitat for a wide range of species. Among the crops that have considerable beneficial qualities to wildlife, and in particular birds, is alfalfa.

In California, alfalfa is grown on almost one million acres. Although grown throughout the state, the majority is grown in the Central and Imperial Valleys. Particularly in the San Joaquin Valley, alfalfa has essentially taken the place of historic wetland habitat and provides important feeding and resting areas for many bird species. Although alfalfa does not host the avian biodiversity observed on wetland or riparian habitats, in California it is without equal among row crop agriculture in its bird species diversity (Figure 1). Indeed, only rice, the pantheon of agricultural crops valuable to wildlife, supersedes alfalfa in its bird species diversity. Alfalfa is valuable to birds in several ways. First, as a direct food source; granivorous birds such as White-crowned Sparrows (*Zonotrichia leucophrys*), Golden Crowned Sparrows (*Zonotrichia atricapilla*) and Horned Larks (*Eremophila alpestris*) consume newly planted seeds and seedlings (Clark 1976). Second, as habitat for the invertebrate prey of many birds; alfalfa fields often support an abundant and diverse invertebrate prey base, including insects, spiders, mites and earthworms. As a legume, alfalfa may be particularly good habitat for earthworms, an important food source for many birds. Alfalfa contributes nitrogen to the soil, and high nitrogen promotes earthworm growth (Evans and Guild 1948) and increases their protein content (Stribling and Doerr 1985). More abundant and protein-rich earthworms is one hypothesis for preferential use of alfalfa over other irrigated crops by some waterbirds (Bray and Klebenow 1988). Third, alfalfa often supports an abundant small mammal community that is exploited by various birds of prey. Because these small mammals consume the alfalfa crop, these birds of prey provide a pest-control service to the alfalfa grower. Lastly, the physical structure of the alfalfa plant itself provides many birds with cover from predators as well as a substrate for nesting. However, frequent cutting changes the amount and structure of vegetation used by many birds for nesting and also destroys nest, eggs and adult birds (Frawley and Best 1991, CPIF 2000). As a result, alfalfa may not always make for particularly productive nesting habitat.

CASE STUDIES

As noted above, there are a number of ways in which alfalfa fields in California are valuable to birds. Here we present case studies detailing the relationship between alfalfa farming and three iconic California bird species.

White-faced Ibis. The White-faced Ibis is a large (500g) marsh bird recognized by its long legs and long decurved bill. It breeds locally in California's Central Valley, southern Idaho and the Great Basin, as well as interior Mexico, and winters in southern California, the Gulf Coast, Mexico and Central America (Ryder and Manry 1994). White-faced Ibis breed colonially at inland, shallow marshes with islands of emergent vegetation. In California, major wintering areas include the Sacramento, San Joaquin, Coachella, Imperial and Colorado River Valleys (Shuford et al. 1996). Like many wading bird species, White-faced Ibis extensively use irrigated agricultural lands for foraging habitat. Alfalfa, in particular, provides important foraging habitat

for White-faced Ibis. In Nevada's Lahontan Valley, alfalfa fields provide the primary feeding site for a regional colony of 3,000 to 9,000 breeding pairs, where they exploit a rich earthworm prey base that come to the surface following inundation (Neel 1999). In the Coachella Valley-Salton Sea-Imperial Valley area, the vast majority of the thousands of White-faced Ibis appeared to forage in irrigated agricultural lands, particularly alfalfa and wheat (Shuford et al. 1996). Christmas Bird Count data indicate that the number of White-faced Ibis wintering in southern California increased during the 1980s and 1990s, with the exception of the San Diego area. Here White-faced Ibis numbers experienced a decline, a result thought to be related to the termination of alfalfa growing and abandonment of moist agricultural land in the Tijuana River Valley (Shuford et al. 1996).

In large part due to the lack of remaining natural habitats, White-faced Ibis have become increasingly dependent on the foraging habitat provided by irrigated alfalfa. Compared to other agricultural habitats, White-faced Ibis show great affinity for alfalfa. In a study examining White-faced Ibis use of and preference for agricultural crops in Carson Lake, Nevada, investigators found that ibis foraged in alfalfa 86% of the time in early summer and 100% of the time in late summer (Bray and Klebenow 1988). Unlike other crops examined, which included pasture, wheat, oats and corn, alfalfa was the only crop type where ibis use was greater than the availability of the crop on the landscape (Bray and Klebenow 1988). Moreover, on four occasions, White-faced Ibis were found only in flooded alfalfa, despite adjacent grain fields being flooded at around the same time (Bray and Klebenow 1988).

Irrigated fields, and in particular alfalfa, can be valuable feeding sites for White-faced Ibis. In fact, Ryder and Manry (1994) argue that increased planting of alfalfa is a major reason for an increase in White-faced Ibis populations in the West. Bray and Klebenow (1988) propose that where historical White-faced Ibis feeding habitats have been diminished, flood irrigated crops could be maintained or even created to benefit ibis, and that the predominant crop should be alfalfa.

Long-billed Curlew. The Long-billed Curlew (*Numenius americanus*) is North America's largest shorebird (650g) and is also easily recognized by its long legs and very long and decurved bill. It is a species of conservation concern in the United States (USFWS 2002), an Audubon California watch list species, and has been designated as highly imperiled under both the U.S. and Canadian Shorebird Conservation Plans (Donaldson et al. 2000, Brown et al. 2001). Loss of habitat on the breeding and wintering grounds and a small global population size are primary reasons for these designations.

The Long-billed Curlew has a long and storied relationship with agriculture. Historically it bred throughout the prairies, where it utilized native grassland habitats for feeding, nesting and rearing chicks. Conversion of prairie grasslands into unsuitable row crop agriculture extirpated the curlew from much of its historic breeding range. Yet, curlews have also exhibited positive relationships with agriculture. In the Great Basin they have been found to breed in high densities and with moderate success in irrigated hayfields (Hartman and Oring 2009). In California, Long-billed Curlews now rely on working agricultural lands for much of their breeding and wintering habitat. In northeastern California, curlews breed in hay fields, irrigated pasture and

alfalfa fields. In the Central and Imperial Valleys, curlews inhabit a wide variety of agricultural lands including rice, pastureland and alfalfa.

Recent work by Audubon California and PRBO Conservation Science indicates that alfalfa fields are of enormous importance to Long-billed Curlews wintering in the Central Valley. Fall and winter curlew surveys were conducted throughout the San Joaquin Valley in September 2007, February 2008 and September 2008 (Shuford et al. 2009). The objectives of these surveys were to document abundance and habitat use of Long-billed Curlews in the Central Valley during the nonbreeding season. Overall, alfalfa was the primary habitat of curlews, accounting for 48%, 36% and 69% of curlew observations during the three surveys, respectively (Shuford et al. 2009). Alfalfa was the most used crop during both September surveys and second only to native pasture during the February 2008 survey. The reduced use of alfalfa in the February 2008 survey was thought to be the result of cessation of irrigation during the winter months. One alfalfa growing region that may be particularly important for Long-billed Curlews is the Delta region of Yolo and Solano Counties, where 8,874 birds in 49 flocks were observed in irrigated alfalfa fields and irrigated pastures during a single survey (Shuford et al. 2009). Much like with the White-faced Ibis, curlews and flood irrigated crops in California are now closely linked. Thus, alfalfa farming, particularly in the Central Valley, will most likely play a large role in the successful conservation of the species.

Swainson's Hawk. Swainson's Hawks (*Buteo swainsoni*) are a common sight in the Central Valley as they soar over agricultural fields hunting for voles and mice. They are a mid-sized hawk with long, pointed wings, a reddish to dark brown bib on their chest, and a noticeable white face around the beak and chin. They are renowned for their epic migration from breeding areas in the western U.S. and Canada to the vast grasslands of Argentina where they spend the winter. Most birds in California breed primarily in Sacramento, Yolo, and San Joaquin counties with smaller concentrations in Solano, Merced, Stanislaus, Colusa, Glenn, and Butte counties (Bradbury 2009). Swainson's Hawks are considered threatened in California due to their declining numbers; as much as a 90% reduction in population size in the 20th century (Bloom 1980). The current California population estimate is approximately 2,000 pairs (Anderson et al. 2006). Because of its dependence on agricultural crops for hunting grounds, changing land use in the Central Valley is the greatest current threat to Swainson's Hawks. Central to this is the conversion of valuable hunting grounds in row crops, hay, and pasture to less suitable orchards, vineyards, and urban areas. One crop that is especially important to Swainson's Hawks is alfalfa.

With the widespread loss of native grasslands and draining of wetlands in California, alfalfa has become the essential hunting grounds for the Swainson's Hawk in the Central Valley. While they will hunt for mice and voles in many other crop types including tomatoes, sunflowers, irrigated pastureland and wheat (especially during harvest), alfalfa provides a long-term, stable habitat for prey and good hunting conditions year round (Estep 1989). The optimal time for Swainson's Hawks to use alfalfa is when prey is easily accessible, especially after a cutting or irrigation and when field vegetation is less than 15in tall (Swolgaard et al. 2008).
Swainson's Hawks rely heavily on the current agriculture landscape in the Central Valley to provide adequate hunting grounds and safe nesting sites along riparian corridors. Although less preferred, they also will nest in single, isolated trees or in farmyards with large, mature trees.

Swainson's Hawks typically nest within a few miles of quality hunting grounds, but will fly up to 13 miles from their nest to hunt (Babcock 1995). Without suitable nesting habitat nearby, even prey-rich agricultural fields, such as alfalfa, will not support Swainson's Hawks. For instance, the San Joaquin Valley grows more than 50% of the approximately 1 million acres of alfalfa in California but does not have a large population of Swainson's Hawks due to a lack of available nesting trees.

The conversion of row crops such as alfalfa into orchards and vineyards is one of the major threats to the Swainson's Hawk because orchards and vineyards provide very low quality hunting grounds. In Sacramento County Swainson's Hawks foraged 12 times more often in alfalfa and grazed grasslands than expected given the available acreage. Conversely, orchards and vineyards, which dominated the landscape (40% of the area), were under utilized by the hawks, presumably due to lack of or inaccessibility of prey (Swolgaard et al. 2008). Many conservation groups advocate for the preservation of a heterogeneous agriculture landscape that includes alfalfa and row crops and limited vineyards and orchard to maintain healthy Swainson's Hawk populations. Urbanization of the rural landscape is also a significant threat as Central Valley cities, some of the fastest growing in California, continue to expand their boundaries further out into the surrounding agricultural lands. Preservation of open space and limiting city sprawl will be critical to keep Swainson's Hawks soaring throughout the Central Valley.

OTHER FORAGE CROPS AND TRICOLORED BLACKBIRDS

The Tricolored Blackbird (*Agelaius tricolor*) is North America's most colonial landbird, forming some of the largest nesting colonies on the continent. They are found almost exclusively in California with small populations breeding in Oregon, Washington, and Mexico. They breed colonially, with some nesting colonies exceeding 60,000 birds. Since the early 20th century, the majority of the population has nested in the Central Valley of California (Figure 2), where it utilizes a variety of substrates to nest in both wetlands and upland habitats. Because most of the Central Valley wetlands have been drained and replaced with agricultural crops, the Tricolored Blackbird has had to cope with a novel landscape of row crops, vineyards, and nut trees that are largely unsuitable. They have adapted to this new landscape and are now found to nest in triticale grain fields (× *Triticosecale*), Himalayan blackberry (*Rubus armeniacus*) patches, and milk thistle (*Silybum marianum*) as well as in native wetland and upland habitats. The Tricolored Blackbird's adaptation to the altered landscape of the Central Valley is demonstrated by the observation that 65% of the population now nest in agricultural or upland areas rather than wetlands (Kelsey 2008).

As the cultivation of triticale for forage has grown over the last 15 years, Tricolored Blackbirds have colonized these fields in large numbers. In 2008, 86% of the world's Tricolored Blackbird population nested in the San Joaquin Valley and over 40% nested in triticale fields (Kelsey 2008). What attracts Tricolored Blackbirds to triticale is unknown. However, characteristics of triticale, such as a strong stem, tall, vertical growth, and large monoculture stands, may be functionally equivalent to the large, historical cattail marshes that once dominated the landscape. Tricolored Blackbirds also are strongly associated with dairy farms where they can find numerous insects and a permanent water source (Beedy and Hamilton 1999, Hamilton and Meese 2005, Meese 2006). The proximity of most triticale fields to dairies also may make them

attractive nesting sites to Tricolored Blackbirds. Tricolored Blackbird colonies nesting in triticale have been quite productive in rearing young. Many Tricolored Blackbird colonies nesting in triticale fields range from 40,000 to 60,000 birds in an 80 acre area, and can produce tens of thousands of young (Meese 2008). Yet, conflicts with harvest timing pose a significant threat to Tricolored Blackbirds nesting in triticale and other forage crops.

Triticale is an excellent crop for nesting Tricolored Blackbirds but it also is an excellent forage crop for dairy cows when harvested as green forage. Most farmers in the San Joaquin Valley harvest triticale and other small grain forage crops in the spring (mid-April to May). This creates a dilemma because most Tricolored Blackbird young do not leave the nest until after the crop is set to be harvested (mid- to late May). In the past, several large colonies have been destroyed from harvesting of fields before the young have fledged. In some instances 20,000 young were destroyed in a single field. Large scale failure of colonies may cause a further decline in a population that has already seen an 80% decline over the last 80 years.

Farmers and forage crops will play a crucial role in the persistence of the Tricolored Blackbird. Farmers, federal and state agencies, and conservation groups like Audubon are working together to develop solutions that help protect the Tricolored Blackbird as well as maintain a healthy farming economy. Several strategies previously implemented asked farmers to compromise their harvesting schedule, and hopefully farmers and conservation groups can develop programs where nesting birds are incorporated into planting schedules yet still allow farmers to cultivate needed crops. One solution used in the past is for the farmer to harvest the triticale around the Tricolored Blackbird nesting colony, returning to the nesting patch after the young have fledged. However, it may be difficult for farmers to avoid harvesting a nesting patch because of the need to feed cows or sell their crop at a specific time or price. Planting varieties of grains and triticale that mature later in May or early June may be one way to accommodate regular nesting colonies. By delaying the maturity or heading out process of the grain, less nutritional value is lost if harvest commences after the colony completes nesting in May or June. Where possible, synchronizing the harvest schedule of the triticale to the breeding schedule of the Tricolored Blackbird, will avoid conflicts between the birds and farmers. A longer-term solution may be to have farmers set aside low yielding portions of their farm and convert it to a natural landscape that is attractive to Tricolored Blackbirds and other wildlife. This solution could move the Tricolor colonies out of Triticale and into a more secure habitat, reducing the risk to the farmer of having to delay harvest of forage crops. In the last 5 years, farmers have played a crucial part in the protection of over 400,000 Tricolor nestlings that would have otherwise by killed by harvesting and we hope the number of protected young will continue to grow with the help of the farming community.

Tricolored Blackbirds face many pressures that are reducing its population to dangerously low levels. From the loss of natural wetland habitat to conflicts with farmers in triticale fields, and lack of water due to cutbacks in the Central Valley, the Tricolored Blackbird is in desperate need of support. Farmers in the Central Valley have begun stepping forward to cooperate with conservation efforts, and we hope this cooperation will continue to grow. The Tricolored Blackbird is a great example of how farmers can help cultivate wildlife that is dependent on farms for their survival. With communication and cooperation between farming and

conservation groups, the Tricolored Blackbird can be a positive example of how farming is supporting wildlife.

MAINTAINING AND ENHANCING THE HABITAT VALUE OF ALFALFA AND FORAGE CROPS TO BIRDS

California's population has been projected to reach more than 50 million in the next 20 years. In the Central Valley alone, the population is expected to increase from 5.4 million to 15.6 million (CVJV 2006). Increased urban demand for water will accompany this population increase, putting additional strain on an already limited water supply. As water supply costs for wetland habitat management become more expensive, or even unavailable, the consequences to the millions of birds that occupy the Central Valley will be significant. Farm land, some of which is already important wildlife habitat, will become even more valuable. Yet, California farmland, particularly in the Central Valley, also is threatened by population growth and increased urban water demand. In fact, the Central Valley is one of the most threatened farming regions in the United States and it has been projected that California's population growth will lead to a loss of almost one million acres of irrigated farmland (American Farmland Trust 1997). Such a result is likely to be devastating to the millions of birds, as well as other wildlife that have become dependent on the food and habitat provided by these irrigated crops.

Given the dependence of many California birds on irrigated farmland, successful bird conservation in California is strongly linked with farm conservation. Working to ensure that farmers, particularly in the Central Valley, are able to continue farming and thereby provide wildlife habitat should be a shared goal of wildlife and agricultural interests alike. Developing and adopting wildlife friendly farming practices that reduce negative aspects of farming and enhance the overall habitat value of working farms is an important component of this goal. Audubon California is dedicated to working with farmers to identify farm management practices that benefit birds and other wildlife while maintaining the economic viability of agricultural operations.

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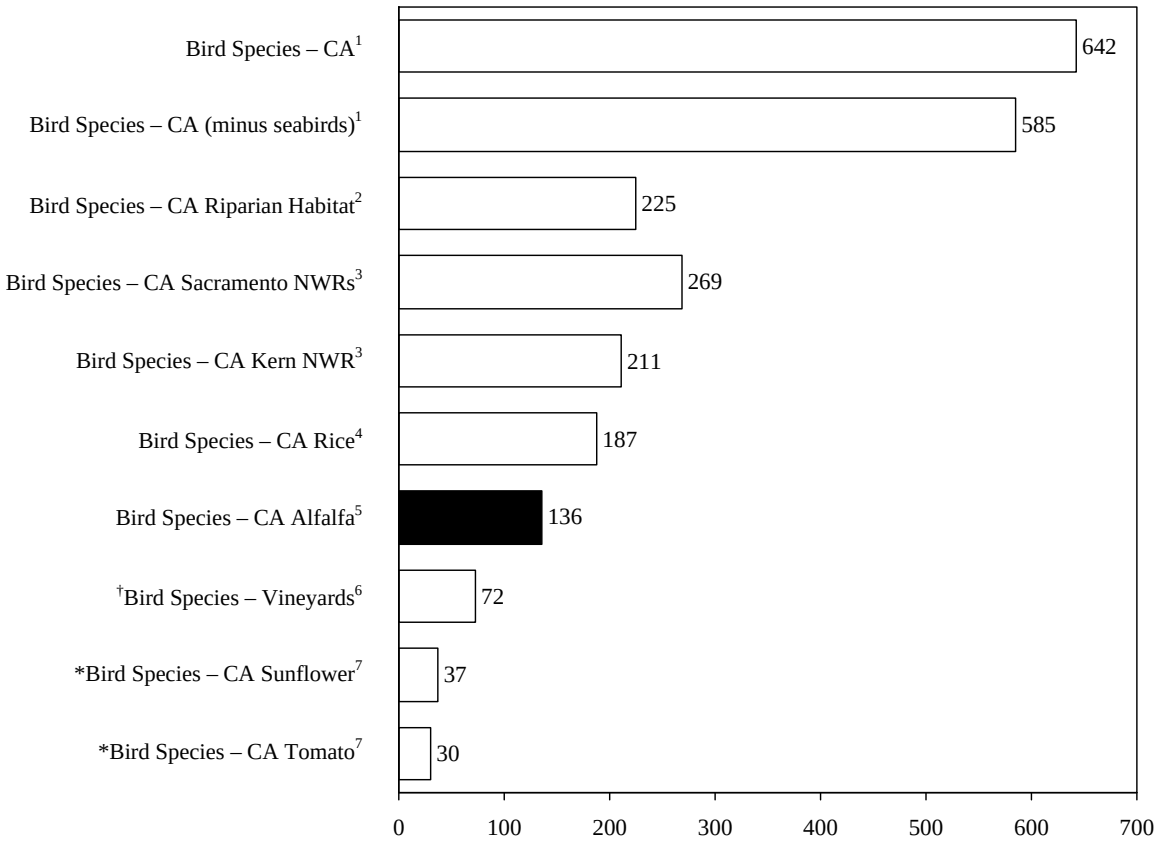

Figure 1. Bird species observed in different habitat and crop types in California. [1]CRBC 2010; [2]CVJV 2006; [3]Bird Checklists of National Wildlife Refuges of California http://www.npwrc.usgs.gov/resource/birds/chekbird/r1/6.htm; [4]Sterling and Buttner 2009; [5]Putnam et al. 2001; [6]TNC, unpublished data; [7]Audubon California, unpublished data; †Data is for Napa and Sonoma Counties only. *Data is for Yolo County only.

2008 Distribution

Region	2008
Central Coast	1.8%
North Coast	0.4%
Northeast Interior	0.3%
Sacramento Valley	9.5%
San Joaquin Valley	**86.4%**
SF Bay	0.2%
Southern California	1.6%

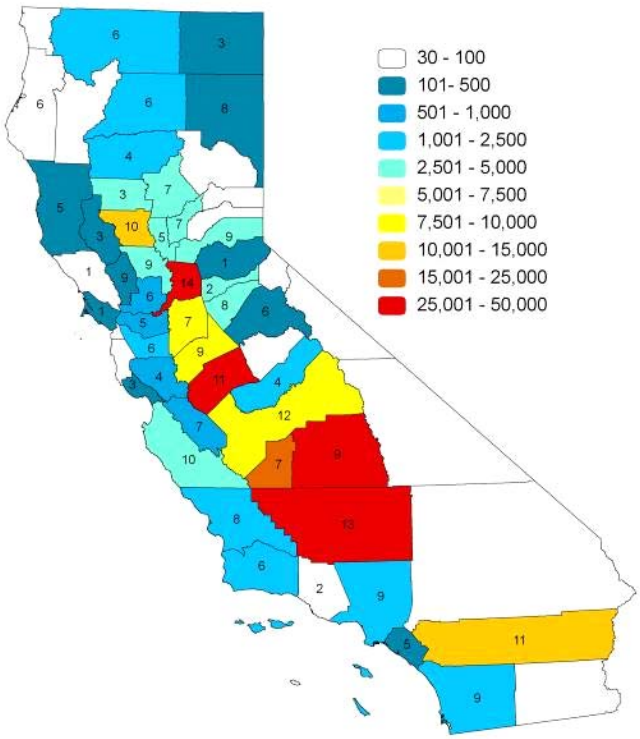

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Figure2. Distribution of breeding Tricolored Blackbirds in California counties and the percentage of the California population in each of seven regions in 2008.