Monitoring Swainson's Hawks, *Buteo swainsoni*, and other Tree-nesting Raptors on Properties within and near the Los Baños Wildlife Area Complex, 2008

Swainson's hawk pair: Photo by DFG staff

Prepared By: Christina L. Sousa
January, 2010

Los Baños Wildlife Area Publication #: 43

Status: Final Report

For additional copies, contact: Resource Assessment Program
Ca Department of Fish & Game
18110 W. Henry Miller Rd.
Los Baños, CA 93635
Phone: (209) 826-0463
Fax: (209) 826-1761

Abstract

During 2008, the California Department of Fish and Game monitored raptor nests on lands within and around the Los Baños Wildlife Area Complex in Merced County. Our goal was to study the success of breeding Swainson's hawks and to monitor other tree-nesting raptors that may compete for resources. We found that great horned owls, red-tailed hawks, and Swainson's hawks are all utilizing these lands for nesting sites. They chose riparian habitat and other trees on wildlife areas themselves, and also utilized single trees or phone poles along the perimeter of agricultural lands. Of the raptor species we monitored this year, Swainson's hawks had the lowest overall success rate for producing fledglings, but were still successful at several locations. Some of the unsuccessful nests were simply due to environmental factors such as high winds blowing nests out of the trees, but all of the species monitored abandoned some nests as well. Competition for food, nesting habitat and foraging grounds, as well as disturbance from human activity are likely some of the factors involved in nest abandonment. Continued monitoring in a way that does not cause disturbance to nesting birds is the best way for us to learn more about these species. Breeding grounds are crucial to the survival of any species and by continuing to monitor raptor nests, we can adapt our management of local wildlife areas as necessary in an effort to promote quality breeding sites and species diversity.

Keywords: *Swainson's hawk, nest success, red-tailed hawk, great horned owl, fledglings*

Introduction

The Swainson's hawk, *Buteo swainsoni*, is currently listed as a threatened species by the state of California (California Department of Fish and Game 2008), but was once an abundant breeding bird in the state. It commonly nested throughout the lowlands from northeastern California, south along the eastern edge of the Sierra Nevada to the Owens Valley, throughout the Sacramento and San Joaquin valleys, and along the southern coast from Ventura to San Diego County (Grinnell and Miller 1944). Historically, Swainson's hawks nested in the San Joaquin Valley and populations were once estimated at 17,000 breeding pairs as recently as the early 1900's (California Department of Fish and Game 2000). During the 1970's however, a survey was conducted that estimated only 110 breeding pairs of Swainson's hawks remained throughout the entire Central Valley (Bloom 1980). Agricultural lands have increased dramatically in central California over the years and likely have contributed to the hawk's decline. These hawks frequently choose mature trees along riparian corridors for their nesting sites and development of agricultural fields may result in mature trees

being removed or riparian corridor habitat being altered. In addition, the effects of increased chemicals used in agricultural practices, such as fertilizers or pesticides, may be detrimental not only to the birds themselves, but also their prey. Increasing pressure from the urban development of California in an effort to sustain an ever-growing population has also greatly reduced suitable habitat. It is estimated that of the riparian woodlands that were present in California's Central Valley 200 years ago, approximately 10% are all that remain intact today (Smith 1980, Thelander and Crabtree 1994). With limited pockets of suitable riparian habitat remaining, Swainson's hawks are often found nesting in isolated trees along roadsides or mature trees within agricultural property (Schmutz 1989). A decrease in available nesting trees means there will be more interaction with other tree-nesting raptor species that are competing for breeding territory.

Since 2001, the California Department of Fish and Game (DFG) has consistently observed Swainson's hawks, along with other tree-nesting raptors, on several properties within the Los Baños Wildlife Area Complex. DFG staff began monitoring raptor nests during 2001 on some of these properties with the goal of determining nest success for Swainson's hawks, and to monitor other raptor species which may compete for nesting locations. The primary species that also nest on these properties include red-tailed hawks (*Buteo jamaicensis*) and great horned owls (*Bubo virginianus*). In order to better understand the interaction between these birds, we have been monitoring nesting success of all tree-nesting raptor species that we locate each year. In addition, we have begun monitoring raptor nests on private lands that are viewable from public roads. We hope to gain and provide a better understanding of the local population size of breeding Swainson's hawks in Merced County by monitoring as many nests as possible.

Study Area

The Los Baños Wildlife Area Complex is managed by the California Department of Fish and Game (DFG) and is comprised of several different wildlife areas that are located in Merced and Fresno counties. Climate in our region generally consist of hot, dry summers, and cool, wet winters. The wildlife areas where we conducted our

surveys are primarily a combination of managed wetland and upland habitat. We monitored raptor nests on the Los Baños Wildlife Area (Los Baños WA), including the Mud Slough Unit, the O'Neill Forebay Wildlife Area (O'Neill Forebay WA) and on Volta Wildlife Area (Volta WA), all of which are located in Merced County (Figure 1). Nests located on private lands near these sites were also monitored if we were able to view them well from public roadsides. Private lands that surround the wildlife areas primarily consist of agricultural fields, which can have mature trees located along the perimeter of the fields. All of the raptor nests we located and monitored during 2008 were within the Grasslands Ecological Area in the San Joaquin Valley of central California.

The Los Baños WA (2,266 ha / 5,600 acres) is the largest property we surveyed this year and contains the most nesting habitat for tree-nesting raptors of any of the sites we monitored. This area is owned and managed by DFG and is made up of seasonal wetlands, California annual grasslands, mixed willow riparian habitat, shrub lands, and mature Fremont cottonwood trees (*Populus fremontii*) also exist on the property. Salt Slough, Mud Slough, and a few other waterways, along with man-made and natural lakes are located on the wildlife area and provide permanent water year-round. Though there is no direct connectivity, the Mud Slough Unit (243 ha / 600 acres) is located a few miles southeast, and is a subset of the Los Baños WA. Managed habitat on the Mud Slough Unit is similar to that of the Los Baños WA (e.g. seasonal wetlands, shrub lands, etc.). This property is transected by a waterway known as Mud Slough, which does provide permanent water, but lacks riparian habitat such as that found at the Los Baños WA. Nesting habitat on the Mud Slough Unit is limited to a small stand of trees within the property, which include blue gum (*Eucalyptus globulus*) and black willow (*Salix nigra*).

Volta WA (1,578 ha / 3,900 acres) is relatively large but contains a limited number of trees. Most of the property is jointly owned by the Bureau of Reclamation (BOR) and Department of Water Resources (DWR), but a portion is owned by DFG. The entire property is managed by DFG as seasonal wetlands, and the Volta Wasteway, a large water-delivery canal, bisects the property and provides a source of year-round water. Relative to the other wildlife areas we monitored, open grasslands at this site are limited and uplands often contain shrubs with an alkaline substrate. Trees

where we monitored nests at this wildlife area include black willow and Fremont cottonwood.

The O'Neill Forebay WA (283 ha / 700 acres) is jointly owned by BOR and DWR and is managed as part of a mitigation agreement resulting from construction of the San Luis Reservoir Dam. DFG has attempted to restore riparian habitat that was lost during construction of the dam, and tree planting began at this site approximately 30 years ago. This wildlife area includes semi-permanent ponds with riparian habitat, annual grasslands, and is directly adjacent to the O'Neill Forebay itself. The predominant trees on the property are Fremont cottonwood and black willow, with a current mixture of both young and mature trees.

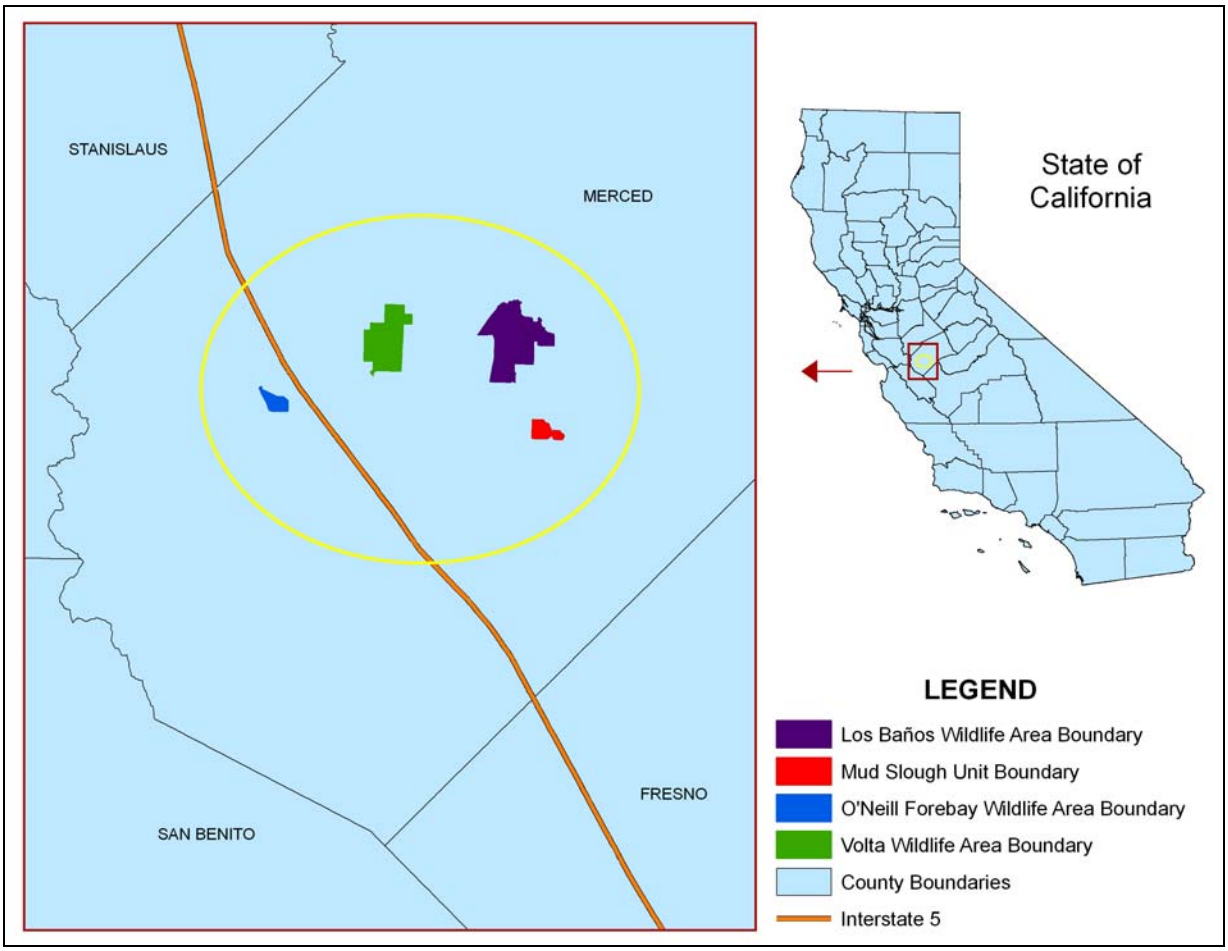

Figure 1. Areas covered during 2008 raptor nest monitoring within and around properties of the Los Baños Wildlife Area Complex.

This year we also monitored raptor nests that were not within the wildlife areas, but were located on private property and visible from public roads. These nests were situated in the midst of agricultural lands and were usually found within a lone tree or near a very low density of trees. The raptor nests we located on private lands were usually between or near one of the four wildlife areas we monitored this year. We found nests in black willow, blue gum, Fremont cottonwood, and one was situated on top of an old water tower.

Methods

Beginning in January of 2008, we reviewed nest location data from the previous year's surveys. For each property, we then located and recorded nests that remained intact from the 2007 season and that still appeared viable for use or for re-building. Because tree-nesting raptors are the focus of our surveys, we searched for the nests of red-shouldered hawks (*Buteo lineatus*), white-tailed kites (*Elanus leucurus*), great horned owls, red-tailed hawks, and Swainson's hawks, which all occur in this area. However, the latter three species were our primary focus since they use the same habitat and do compete for nesting sites. Great horned owls usually have nests established by late winter, so we began monitoring active owl nests during January. Since red-tailed hawks begin choosing nesting sites after great horned owls are already established, and Swainson's hawks generally don't arrive until spring, we carefully observed raptor pairs in order to identify any new nesting sites, while continuing to monitor established nests that we had already located.

Each year we follow a similar driving route through the wildlife areas, which includes any roads or levees that can be safely driven at the time our surveys begin. If necessary, surveyors will exit the vehicle in order to obtain a better view of a nest, but care is taken in not approaching nest sites too closely whenever possible. Once a nest was located, we recorded the raptor species present, the species of tree (or man-made object) where the nest was located, and estimated an approximate location on a survey map. We monitored each nest every one to two weeks until the final fate had been determined (e.g. young fledged, nest abandoned, etc.). Observers monitored nests from a distance with the use of binoculars and/or a spotting scope, and recorded any

nesting behavior in addition to the presence (if any) and number of young. Surveyors also record information on nests that appear to be abandoned, destroyed, or if significant disturbance is observed nearby. During late spring and summer, we avoid surveying under extremely windy or hot conditions. Though wind is sometimes useful by revealing nests that are normally hidden behind dense foliage, using spotting scopes during excessive winds or when heat waves are present can make observing nests extremely difficult. Once all of the nests were no longer in use, we recorded their location with a global positioning system (GPS) unit and estimated the approximate height of each nest. We integrated the nest site coordinates into a geographic information system (GIS) and prepared maps of the 2008 nest locations, which will ultimately aid in the following season's nest locating efforts. We entered our data into a spreadsheet during the course of the season, and entered select information (e.g. nesting success, number of fledglings, etc.) for each nest as attributes in our GIS shapefile. We reported all Swainson's hawks and their nest fate to the California Natural Diversity Database (CNDDB).

Results

During the 2008 season, we monitored a total of 73 raptor nests at four wildlife area properties, and on nearby, privately owned lands. We observed three species of tree-nesting raptors including red-tailed hawks (30 nests), Swainson's hawks (23 nests), and great horned owls (20 nests); we found all three species at every wildlife area and on the private lands. Three species of trees were utilized for nesting by all three raptor species, which included black willow, blue gum, and Fremont cottonwood. We also observed red-tailed hawks nesting on utility poles at the Mud Slough Unit and Volta WA (locations with few mature trees present), and on an old water tower located on private property.

For all properties monitored in 2008, 43 out of 73 total raptor nests produced fledglings, yielding a 59% success rate for all species combined. Nests that we did not count as successful were those that were abandoned, destroyed or blown out of the supporting structure by wind, or had an unknown fate (i.e. no fledglings were ever observed). When looking at all properties combined, we found that red-tailed hawks

had the highest nest success rate (70%), great horned owls were slightly less successful (65%), and Swainson's hawks had the lowest number of nests that actually fledged young (39%).

At the Los Baños WA and Mud Slough Unit, we located a total of 41 nests and a combined total of 37 fledglings were produced for all three species monitored (Tables 1a and 1b). Red-tailed hawks had the highest nest success rate, followed by great horned owls and Swainson's hawks. Due to the lack of nesting habitat available, only three nests were located at the Mud Slough Unit, which included one for each species, and all were successful in fledging young this year. We found nearly an equal concentration of all three raptor species nesting at both properties. At Los Baños WA, we found nests throughout the property as well as along the perimeter, and at the Mud Slough Unit we found one nest within the primary stand of trees that exists, and the others were located along the perimeter of the property (Figures 2 and 3).

Table 1a. Productivity of tree-nesting raptors at Los Baños Wildlife Area, 2008.

Nesting Species	# of Nests Monitored	Percentage of Successful Nests	# of Fledglings[1]	# of Nests Abandoned
Great Horned Owl	13	69%	15 (1.67)	4
Red-tailed Hawk	12	70%	12 (1.43)	3
Swainson's Hawk[2]	13	33%	6 (1.50)	6

[1]Total number of fledglings followed in parentheses by average number per nest.
[2]One pair of hawks made two attempts at nesting; the first nest failed and the second was abandoned.

Table 1b. Productivity of tree-nesting raptors at the Mud Slough Unit of Los Baños Wildlife Area, 2008.

Nesting Species	# of Nests Monitored	Percentage of Successful Nests	# of Fledglings[1]	# of Nests Abandoned
Great Horned Owl	1	100%	1 (1.0)	--
Red-tailed Hawk	1	100%	2 (2.0)	--
Swainson's Hawk	1	100%	1 (1.0)	--

[1]Total number of fledglings followed in parentheses by average number per nest.

We monitored a total of 11 nests at O'Neill Forebay WA that produced a combined total of nine fledglings, but Swainson's hawks were not successful in fledging any young this year (Table 2). We observed twice as many red-tailed hawk nests at O'Neill Forebay WA as that of great horned owls, and most nests were located near the

perimeter of the property (Figure 4). Red-tailed hawks also had twice as many successful nests as that of great horned owls, but on average produced fewer young. Though we did not locate any during the 2008 monitoring effort, red-shouldered hawks have also been observed nesting at this wildlife area during past years.

Table 2. Productivity of tree-nesting raptors at O'Neill Forebay Wildlife Area, 2008.

Nesting Species	# of Nests Monitored	Percentage of Successful Nests	# of Fledglings[1]	# of Nests Abandoned
Great Horned Owl	3	33%	3 (3.0)	1
Red-tailed Hawk	6	67%	6 (1.5)	3
Swainson's Hawk	2	0%	0	1

[1]Total number of fledglings followed in parentheses by average number per nest.

At Volta WA, we located a total of seven nests that produced a combined total of six fledglings, but again, Swainson's hawks did not produce any young at this property (Table 3). Great horned owls on average produced the highest number of fledglings, and as with our results for O'Neill WA, we found twice as many red-tailed hawk nests as that of great horned owls, which were also twice as successful at producing fledglings. The two Swainson's nests on the property failed because both nests had fallen from the trees. Raptor nests at Volta WA were located both within the property and along its border (Figure 5).

Table 3. Productivity of tree-nesting raptors at Volta Wildlife Area, 2008.

Nesting Species	# of Nests Monitored	Percentage of Successful Nests	# of Fledglings[1]	# of Nests Abandoned
Great Horned Owl	2	50%	2 (2.0)	1
Red-tailed Hawk	3	100%	4 (1.33)	0
Swainson's Hawk	2	0%	0	0

[1]Total number of fledglings followed in parentheses by average number per nest.

With the exception of Mud Slough, which had 100% nest success because each of the three nests we monitored produced fledglings, raptor nests located on private lands had the highest success rate of any other property. We monitored a total of 15 nests, which produced a combined total of 14 fledglings for all three raptor species (Table 4). Swainson's hawks had a higher success rate and on average, also produced

a greater number of fledglings than on any other property monitored. We had a similar concentration of nesting red-tailed hawks and Swainson's hawks on private lands, but only monitored one great horned owl nest. All of the nests we monitored were located along or near public roadways and were surrounded primarily by agricultural land (Figures 6).

Table 4. Productivity of tree-nesting raptors on private lands located adjacent to or near properties of the Los Baños Wildlife Area Complex, 2008.

Nesting Species	# of Nests Monitored	Percentage of Successful Nests	# of Fledglings[1]	# of Nests Abandoned
Great Horned Owl	1	100%	1 (1.0)	0
Red-tailed Hawk	8	86%	7 (1.17)	1
Swainson's Hawk	6	67%	7 (1.75)	2

[1]Total number of fledglings followed in parentheses by average number per nest.

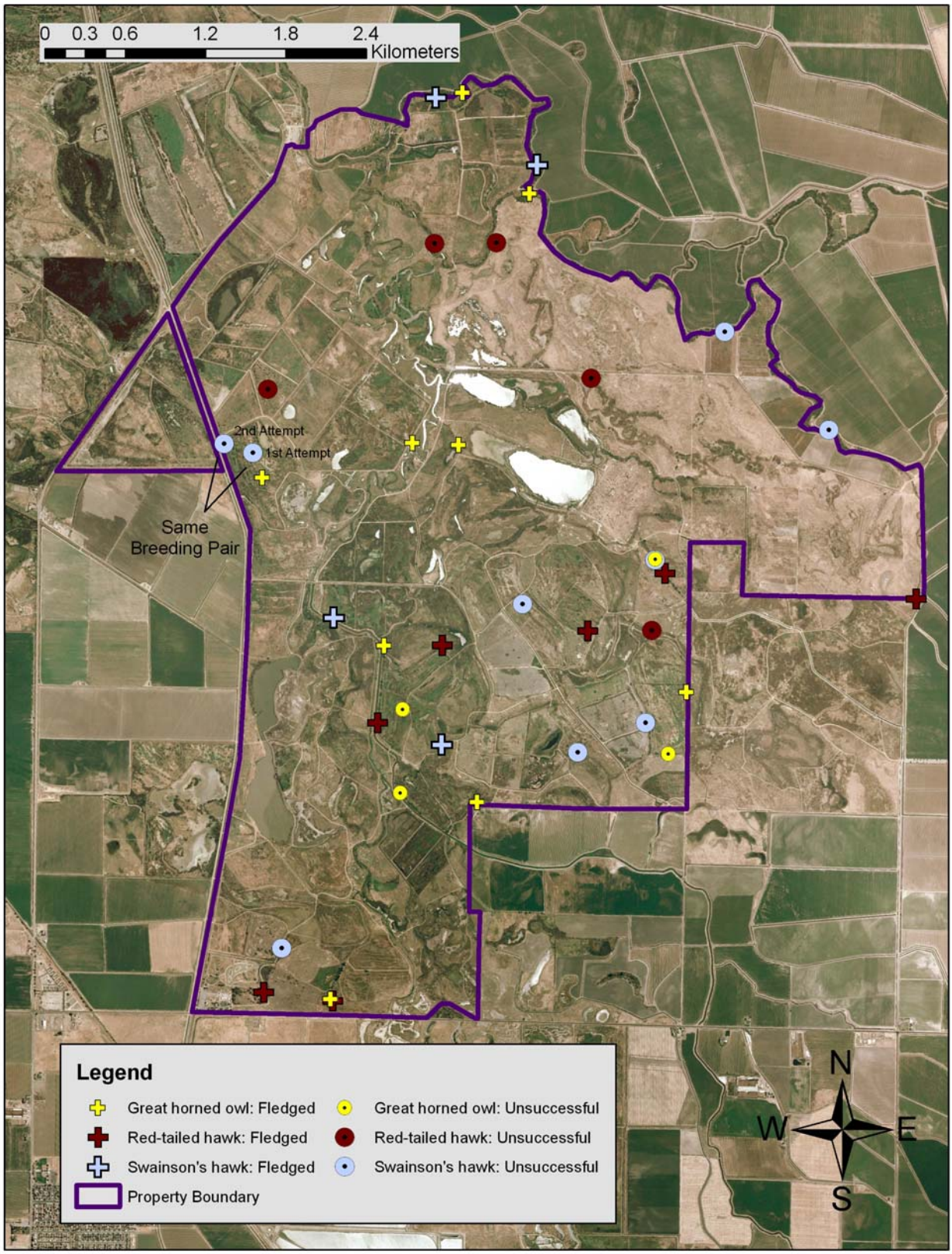

Figure 2. Raptor nest success at the Los Baños Wildlife Area, 2008.

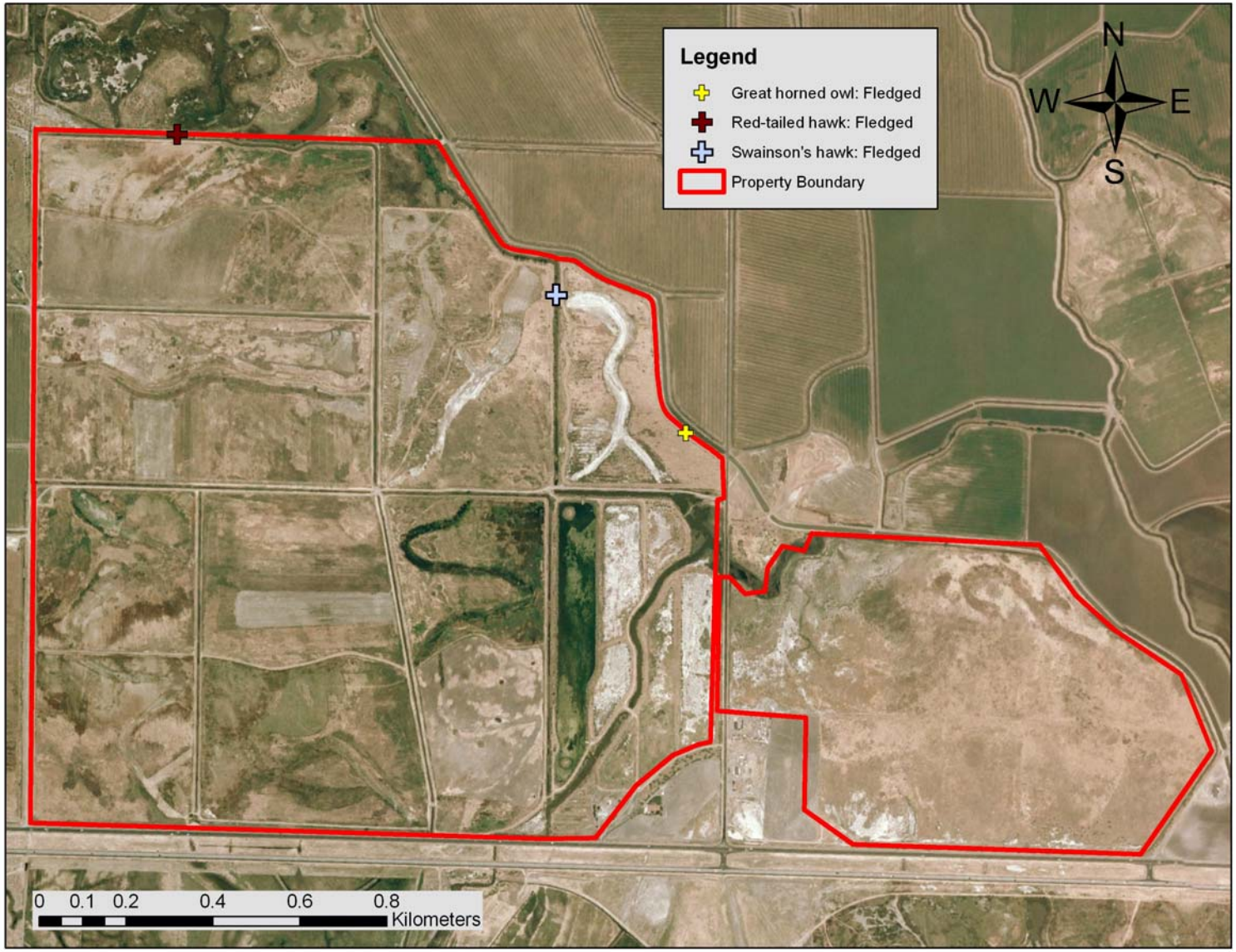

Figure 3. Raptor nest success at the Mud Slough Unit of the Los Baños Wildlife Area, 2008.

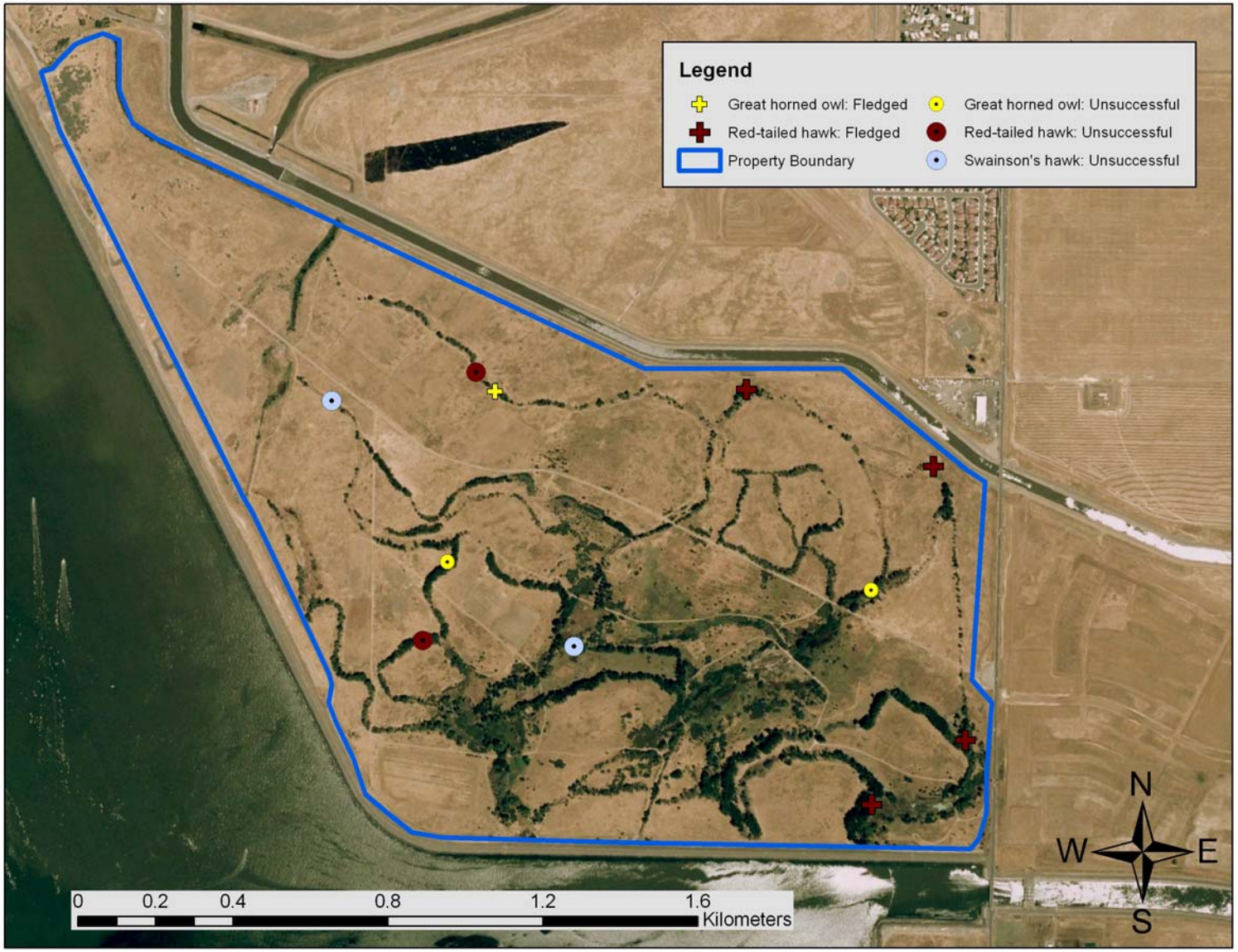

Figure 4. Raptor nest success at O'Neill Forebay Wildlife Area, 2008.

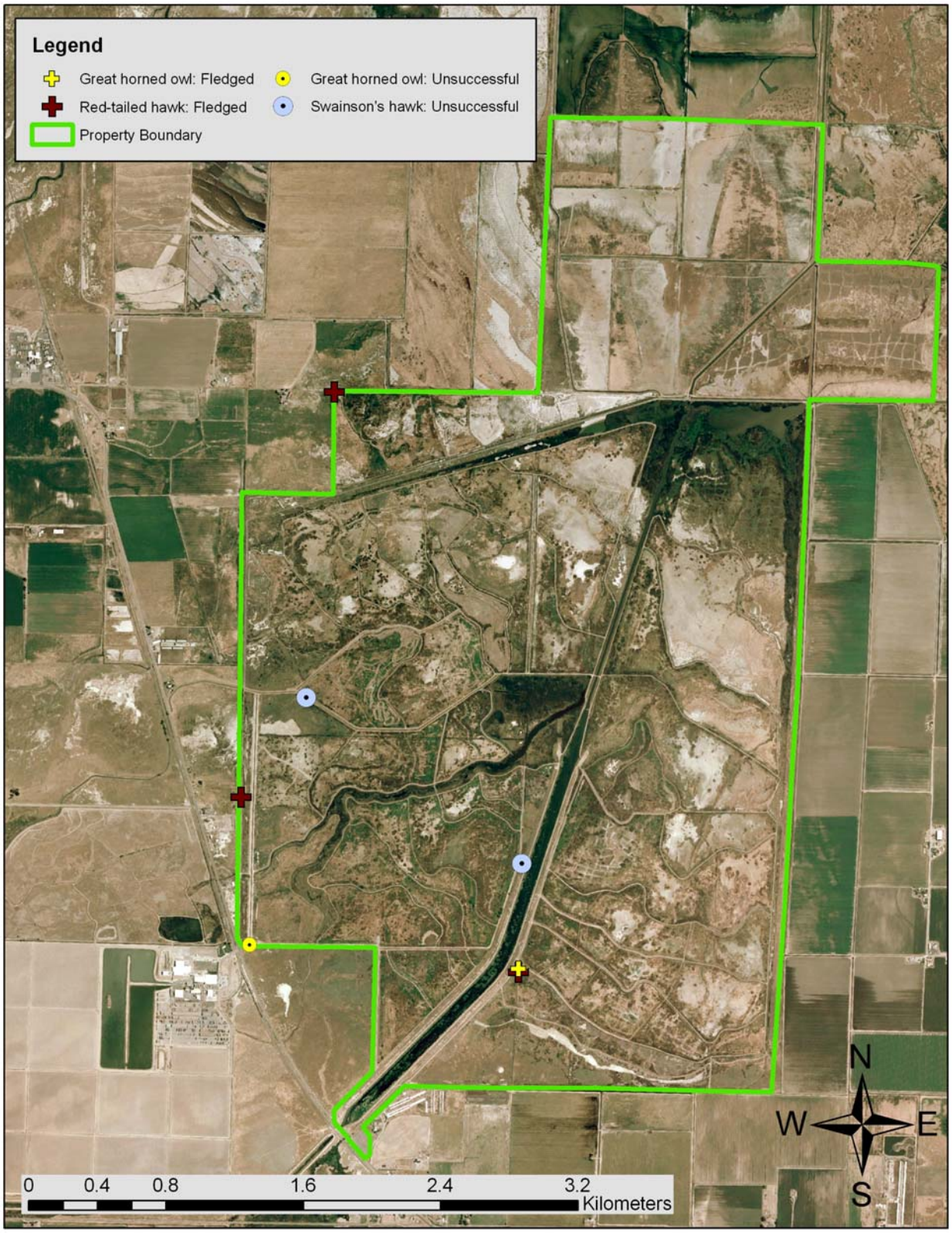

Figure 5. Raptor nest success at Volta Wildlife Area, 2008.

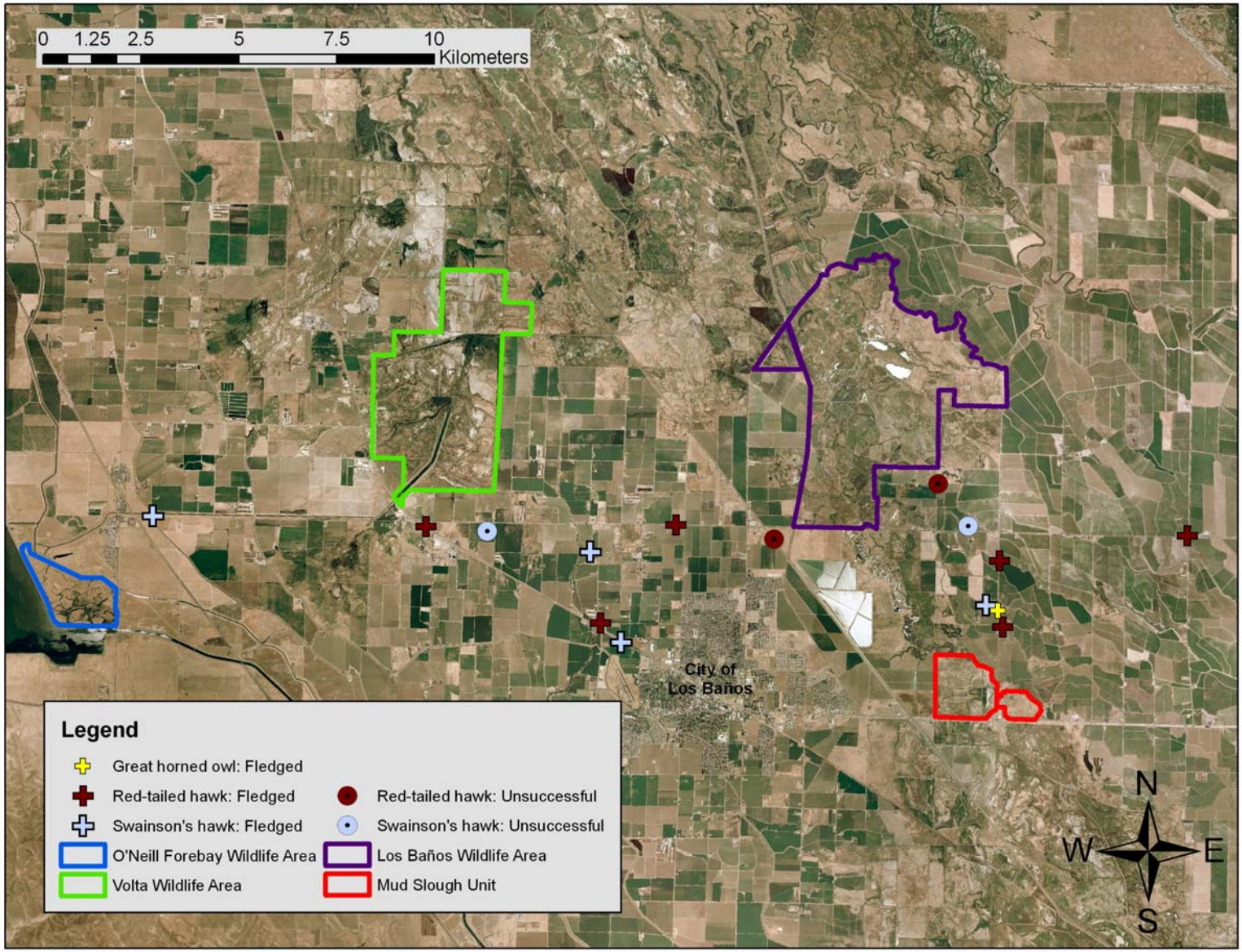

Figure 6. Raptor nest success at private properties near the Los Baños Wildlife Area Complex, 2008.

Discussion

In Merced County, Swainson's hawks and other tree-nesting raptor species have been utilizing DFG lands and local properties with nesting habitat for years. When comparing this year's data with that of the past two years, we noticed a rise in the total number of combined nests found (58 total nests monitored in 2006, 54 in 2007, and 73 in 2008). Every species monitored during 2008 had a higher number of nests than the last two years so it was not simply due to an increase in one species but reflects a rise in the overall raptor population. However, when we looked at data for Swainson's hawks in particular, we found they are consistent in having the lowest nest success rate of any of the species we have monitored here. This year, Swainson's hawks had the highest rate of abandoning their nests; red-tailed hawks had the lowest rate of abandonment and the highest concentration of nests of any species. By the time Swainson's hawks arrive, red-tailed hawks and great horned owls are usually already nesting, which means that the remaining habitat may be less suitable when there is a high concentration of birds within a given year.

Great horned owls have a wider prey base than hawks (Gilmer et al. 1983) and therefore may be able to nest and forage in a larger array of habitat. Studies have shown that Swainson's hawks will often compete and be the aggressor toward red-tailed hawks due to decreases in the availability of nesting habitat. However, they also have shown that although red-tailed hawks and Swainson's hawks do overlap in both territory and nesting habitat, the red-tailed hawks revealed a preference to, and were less likely to relinquish areas that contain a moderate number of perching sites (Bent 1937, Fitch et. al. 1946, Janes 1985). This is because these hawks usually forage from a perched position, while Swainson's hawks primarily forage during flight and can still succeed in areas with low perch density. Thus all three raptor species we monitored do have unique characteristics that allow them to overlap and successfully breed within proximity of one another, but during years where raptor populations peak, competition will increase along with territoriality, and the late-arriving Swainson's hawks will be left with fewer options for nesting sites.

Sometimes we find nests that fail due to obvious reasons such as nests being blown from trees by high winds. However, much of the time we are unable to determine

why a particular nest has failed or was abandoned. This year we found that Swainson's hawks did not fledge young at either O'Neill Forebay or Volta WA, and were most successful on private lands. One explanation for this could be that nesting sites amongst private lands were usually surrounded by agricultural fields, which can be the preferred foraging habitat for Swainson's hawks (Babcock 1995, Schmutz 1989, and Smallwood 1995). With the exception of O'Neill Forebay WA, all other DFG sites we monitored this year have a moderate amount of agricultural land adjacent to and surrounding the properties. Swainson's hawks, though less successful than on private land, did produce young at almost all of those sites. Unlike many of the other properties we monitored, Volta WA has primarily pasture or grassland adjacent to it as opposed to agricultural crops. However, the two Swainson's hawk nests we monitored at this property both failed due to broken branches in the supporting trees and we found the nests on the ground. Volta WA has a limited amount of nesting habitat so once these two nests failed, the hawks likely abandoned the property.

Disturbance can also play a role in a raptor's decision to abandon a nesting site. Factors such as approaching nests too closely, vehicles or loud machinery passing by while birds are actively trying to nest, or chemicals from agricultural spraying all may constitute disturbance. Though agricultural fields may provide excellent foraging sites, the timing of when these fields are treated or harvested could affect nesting birds. Babcock (1995) found that Swainson's hawks preferred to forage certain crops at the time when they were being cut or harvested, and even observed them hunting from the ground while waiting for small mammals to pass by. However, we observed at least two nests this year on the edge of DFG property that we suspect were abandoned due to nearby disturbance from agricultural harvesting. The timing of the harvest coincided with Swainson's hawks that were just beginning to nest and the disturbance was within a few meters of the nesting sites.

Management Implications

Habitat quality, prey base, climate, interspecific competition, and disturbance are all important factors to consider when monitoring these raptor species. Because of the number of birds we have nesting here each year, our surveys are somewhat limited and

we have not been able monitor interactions between species at every nesting site. However, we do feel it is important to continue monitoring the number of birds that attempt to nest here, as well as how many are successful. In addition, we believe that recording more detailed information during our surveys may be in order. For example, if we do not have the time to watch birds forage, we can still record additional information about the surrounding habitat at each nest site. Also, taking more detailed notes in relation to nesting birds and possible disturbance nearby might gives us more information on why nests are abandoned. Measuring exact nest heights if possible (currently we estimate them), and identifying any nests that are being used by more than one species from one season to another could help us compare habitat or nest height preferences between species as well.

Smallwood (1995) states “the most effective opportunities for Swainson’s hawk conservation might be in management of agricultural landscapes where nesting and foraging habitat limit population size.” Because DFG owns properties that are nestled within agricultural landscapes, and because we have raptors nesting here each year, it is our duty to try to manage these areas in a way that benefits tree-nesting raptors, as well as other wildlife. Providing suitable nesting trees is key, but a congregation of trees at different maturity levels may be important as well. Red-tailed hawks have been shown to have a greater mean nest height per tree than great horned owls or other *Buteos* (Gilmer et al. 1983). Therefore, continuing to plant younger trees that will grow in succession may benefit other raptors, especially during years such as this when the highest concentration of tree-nesting raptors were red-tailed hawks. Nests for each species at the Mud Slough Unit and a cluster on surrounding private properties were nearly all successful this year (see Figure 2). Trees are limited on the Mud Slough Unit so additional plantings might encourage more nesting there in future years. The same applies to Volta WA, which has minimal nesting habitat but potential foraging sites available. We are pleased that these raptors are using our lands for breeding, and continuing more detailed monitoring will provide us with better information on how to manage our lands in the future. As we continue to provide our findings to the CNDDB, which includes data compiled from various sources, we can help to contribute more information on the locations of breeding Swainson’s hawks statewide. This information

is then available to DFG and other organizations and could be used as a basis for a variety of conservation and recovery actions for this species.

Acknowledgements

Funding for this study was provided by the California Department of Fish and Game Resource Assessment Program. We would like to thank William Cook, manager of the Los Baños Wildlife Area Complex, for his interest and support of our monitoring efforts. Data collection by Melanie Bernal, Matt Schaap, and Lara Sparks (avian biologist).

Literature Citations

Babcock, K. W. 1995. Home Range and Habitat Use of Breeding Swainson's Hawks in the Sacramento Valley of California. J. Raptor Res. 29(3):193-197.

Bent, A. C. 1937. Life histories of North American Birds of Prey. (Part I). U. S. National Museum Bulletin 169.

Bloom, P. H. 1980. The status of the Swainson's Hawk in California, 1979. U.S. Department of Interior Bureau of Land Management, Federal Aid in Wildlife Restoration Project Final Report. W54-R-12, Job. 11-8. 42 pp.

California Department of Fish and Game. 2008. State and Federally Listed Threatened and Endangered Animals of California, February 2008. Department of Fish and Game Biogeographic Branch California Natural Diversity Database, Sacramento, CA. 12 pp.

California Department of Fish and Game. 2005. The Status of Rare, Threatened, and Endangered Plants and Animals of California 2000-2004, Swainson's Hawk. Department of Fish and Game Habitat Conservation Branch, Sacramento, CA.

Estep, J. A. 1989. Biology, movements and habitat relationships of the Swainson's hawk in the Central Valley of California, 1986-87. California Department of Fish and Game, Nongame Bird and Mammal Sec. Rep., Sacramento, CA.

Fitch, H. S., F. Swenson, and D. F. Tillotson. 1946. Behavior and food habits of the Red-tailed Hawk. Condor 48:205-237.

Gilmer, D. S., P. M. Konrad, and R. E. Stewart. 1983. Nesting Ecology of Red-tailed Hawks and Great Horned Owls in Central North Dakota and Their Interactions With Other Large Raptors. The Prairie Naturalist, Vol. 15, No. 3, pp. 133-143.

Grinnell, J., and A. H. Miller. 1944. The distribution of the birds of California. Pacific Coast Avifauna, No. 27. 608 pp.

Janes, S.W. 1985. Habitat selection in raptorial birds, pp. 159-188. *In* M.L. Cody (ed.), Habitat selection in birds. Academic Press, New York.

Schmutz, J. K. 1989. Hawk occupancy of disturbed grasslands in relation to models of habitat selection. Condor 91:362-371.

Smallwood, J. K. 1995. Scaling Swainson's hawk population density for assessing habitat use across an agricultural landscape. J. Raptor Res. 29:172-178.

Smith, F. 1980. A short review of the status of riparian forests in California. In: Sands. A. (Ed.), Riparian Forests in California: Their Ecology and Conservation. University of California Regents. Berkeley, CA, pp. 1-2.

Literature Citations *continued…*

Thelander, C. G., and M. Crabtree (Eds.). 1994. Life on the Edge. Biosystems Analysis, Inc., Santa Cruz, CA.