



# RAPTORS & RICE

IN CALIFORNIA'S SACRAMENTO VALLEY



2011 EDITION



## ABOUT THE AUTHOR

### ZACH SMITH

Zach grew up in San Diego and spent much of his youth honing his soccer skills.

A move to Davis for college eventually introduced him to the world of science, particularly raptors. After graduation, he worked as a freelance field biologist that has led him to many wild parts of California, the Gulf Coast of Texas, the southern New Jersey shore, Chile's Atacama Desert, the humid lowlands of Veracruz and the Canary Islands, among other locales. Zach teamed with conservationist Ed Pandolfino from 2007–2010 to coauthor the Central Valley Raptor Study. Currently, Zach works at the Montezuma Hills Wind Resource Area and lives in Davis with his wife, Elizabeth.

PEREGRINE FALCON  
*Falco peregrinus*



## INTRODUCTION

The Central Valley of California is one of the most important regions in North America for wintering raptors. Also known as birds of prey, this general category includes eagles, kites, harriers, hawks, falcons and owls. These birds can be observed with relative ease throughout this large valley as they seek out enough food to survive the winter. The combination of a mild climate and thousands of square miles of open country makes the region an attractive winter destination for thousands of raptors from all over western North America. The mix of pasture, grassland, forage and row crops, in addition to stream and wetland habitats, provides enough prey to support a diverse raptor population.

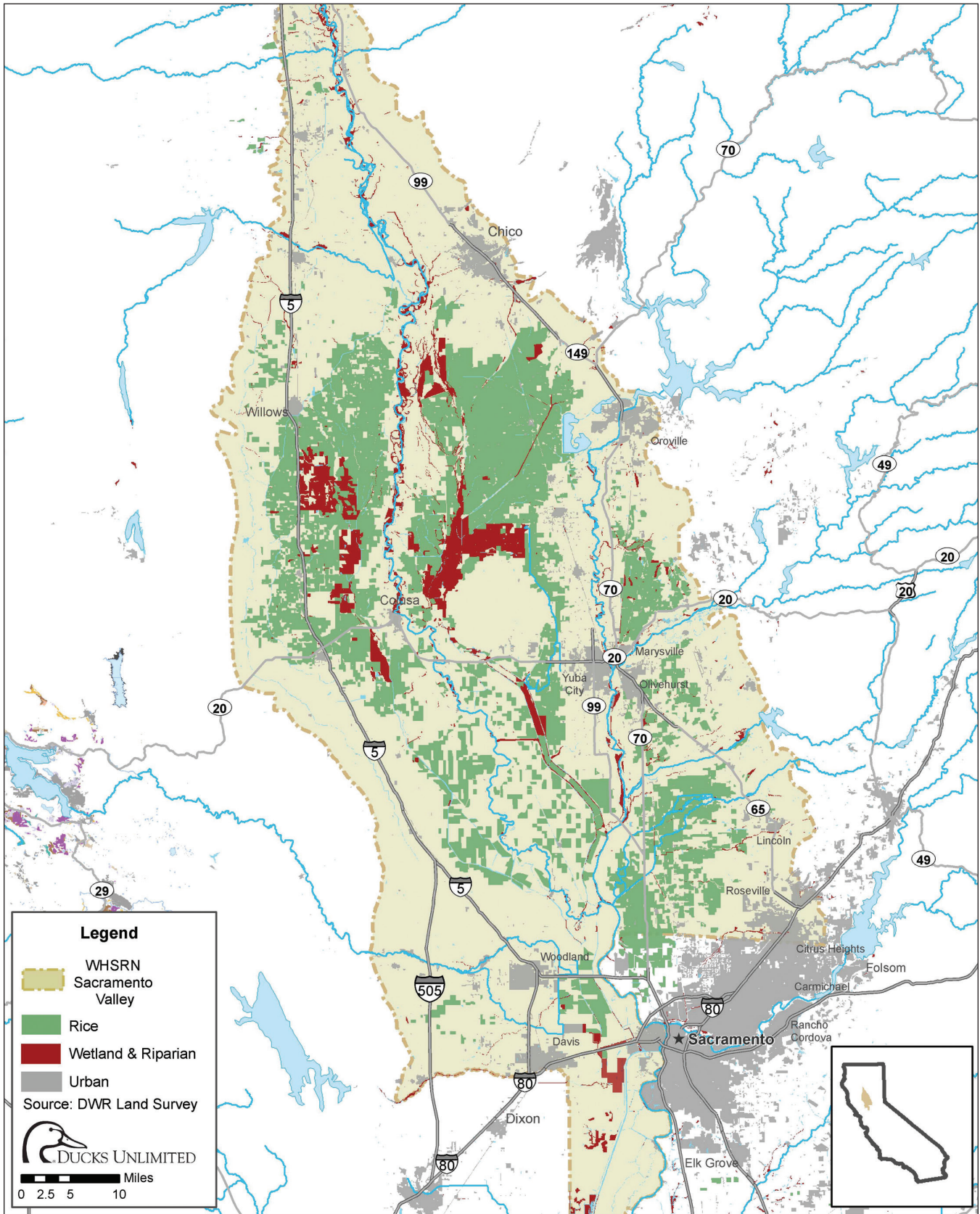
Since the early 1900s, volunteers have participated in the Christmas Bird Count, a yearly volunteer effort to count birds across the continent. Both historic Christmas

*Fourteen different raptor species were observed in rice over the course of the Raptor Survey.*

Bird Count results and data from the recently completed Central Valley Winter Raptor Survey (“Raptor Survey,” Pandolfino et al. 2011) strongly suggest that no other area in North America supports such a high density and diversity of wintering raptors.

Rice cultivation in California is most prominent in the Sacramento Valley, the northern part of the Central Valley containing the Sacramento River. More than 500,000 acres are utilized for rice production, which is the vast majority of the state’s rice acreage (California Rice Commission 2010). The importance of rice to wildlife has

FIGURE 1: *Special Shorebird Habitat Area*



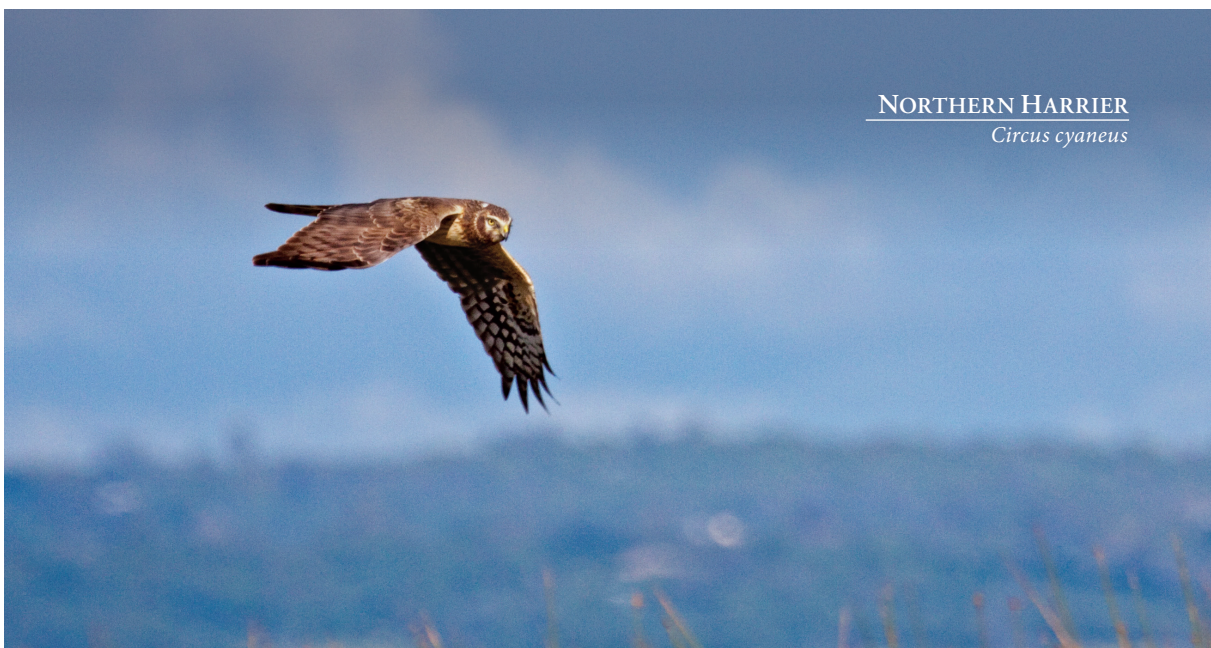
been highlighted by past research (Elphick 2000, Elphick 2004, Elphick and Oring, 2003, Shuford et al. 1998). In addition to rice acreage, there are approximately 75,000 acres of managed wetlands sprinkled throughout the rice areas (Figure 1). The presence and proximity of these wetlands to the rice fields are believed to enhance the habitat quality of the adjacent ricelands. In fact, the Western Hemisphere Shorebird Reserve Network (WHSRN) has designated the Sacramento Valley as Shorebird Habitat of International Significance. This 620,000 acre area is one of the largest specially-designated sites of its kind in North America.

The presence of raptors in ricelands is well known, but quantitative information on species diversity and densities is scarce. The Raptor Survey was initiated in 2007 to quantify wintering habitats used by raptors, their densities and species richness in the Central Valley. Surveys were conducted each winter through 2010 along 19 driving routes throughout the Central Valley. More than half of these surveys were located in the Sacramento Valley, which provided an opportunity to create a sizable dataset on raptors observed in rice.



KILLDEER  
*Charadrius vociferus*

*A variety of shorebirds are found in the Central Valley, including Killdeer which nest extensively in rice growing areas.*



NORTHERN HARRIER  
*Circus cyaneus*



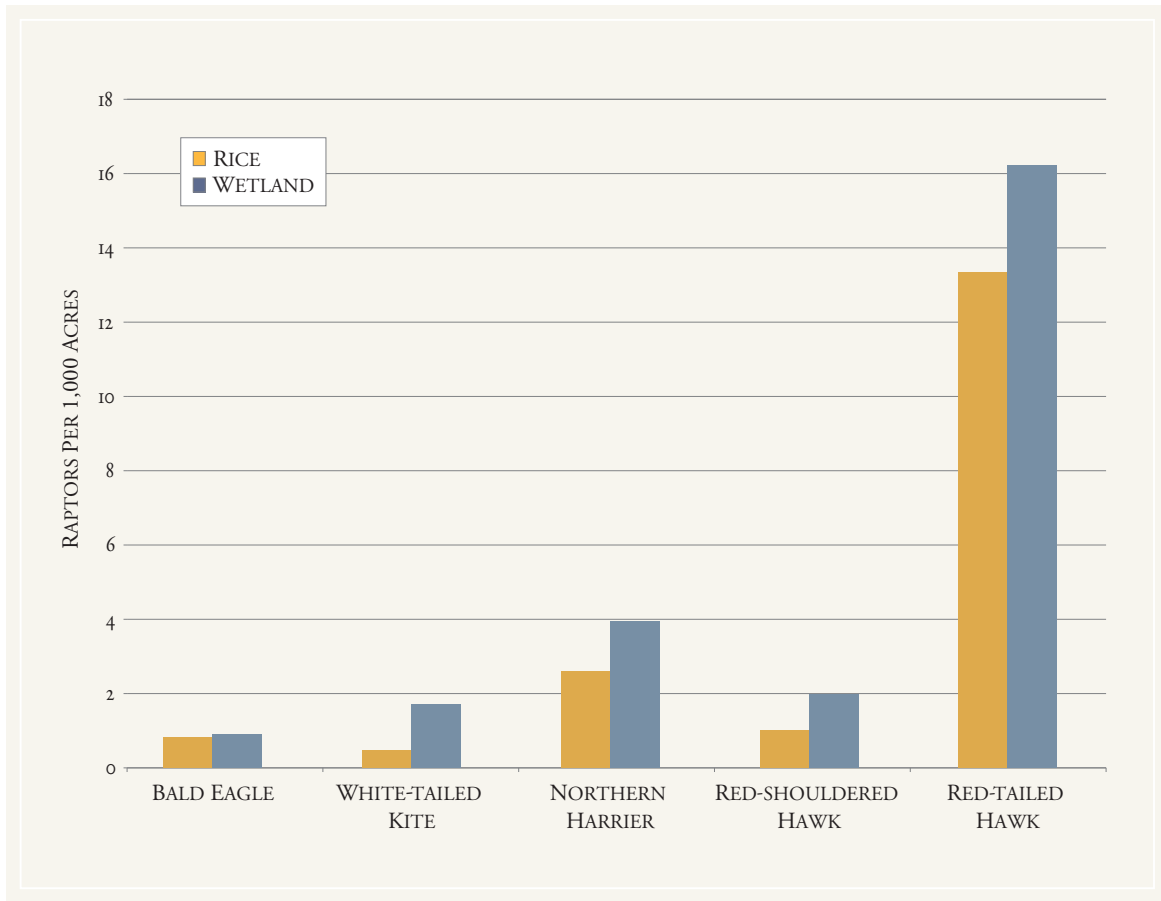
TABLE 1:

*14 Raptor Species associated with ricelands in the Sacramento Valley*

- |   |  |
|---|--|
| 1. BALD EAGLE – <i>Haliaeetus leucocephalus</i>   | 8. ROUGH-LEGGED HAWK – <i>Buteo lagopus</i>    |
| 2. WHITE-TAILED KITE – <i>Elanus leucurus</i>     | 9. GOLDEN EAGLE – <i>Aquila chrysaetos</i>     |
| 3. NORTHERN HARRIER – <i>Circus cyaneus</i>       | 10. AMERICAN KESTREL – <i>Falco sparverius</i> |
| 4. SHARP-SHINNED HAWK – <i>Accipiter striatus</i> | 11. MERLIN – <i>Falco columbarius</i>          |
| 5. COOPER’S HAWK – <i>Accipiter cooperii</i>      | 12. PEREGRINE FALCON – <i>Falco peregrinus</i> |
| 6. RED-SHOULDERED HAWK – <i>Buteo lineatus</i>    | 13. PRAIRIE FALCON – <i>Falco mexicanus</i>    |
| 7. RED-TAILED HAWK – <i>Buteo jamaicensis</i>     | 14. GREAT HORNED OWL – <i>Bubo virginianus</i> |

**FIGURE 2:**

*Species density in rice and wetland in the Sacramento Valley*



The Raptor Survey documented 14 raptor species associated with ricelands in the Sacramento Valley (Table 1). Species commonly observed in rice included Bald Eagle, Northern Harrier, Red-shouldered Hawk, and Red-tailed Hawk. All of these showed a significant affinity for rice. Rice fields are often termed “surrogate wetlands” for their role in supporting wildlife known to use natural wetlands (Elphick and Oring 1998).

Depending on the species in question, rice cultivation benefits wintering raptors in the Sacramento Valley by providing a reliable supply of prey. This is especially helpful because it can be a stressful time of the year, as younger birds are challenged with potentially inconsistent food

*Rice cultivation benefits wintering raptors in the region by providing a reliable supply of prey.*

supplies during their first time away from the nest. Of all 12 habitats sampled during the Raptor Survey, rice supported the third-highest species richness with 14 different species observed in rice over the course of the survey. Species richness was higher only in wetlands, irrigated pasture and grasslands. Raptor density in rice was the fourth highest, trailing only wetlands, pasture, and alfalfa.

BALD EAGLE  
*Haliaeetus leucocephalus*



## PRIMARY RAPTOR SPECIES USING RICELANDS

*Among the 14 raptor species documented during the Raptor Survey in Sacramento Valley rice fields, four in particular showed a significant affinity for this habitat type – Bald Eagle, Northern Harrier, Red-shouldered Hawk, and Red-tailed Hawk. See Table 2 for information on habitat associations of the following species with different habitats in the Sacramento Valley.*

RED-SHOULDERED HAWK  
*Buteo lineatus*



RED-TAILED HAWK  
*Buteo jamaicensis*



NORTHERN HARRIER  
*Circus cyaneus*



## BALD EAGLE

This species was never considered common anywhere during the Raptor Survey. However, rice fields consistently supported a large percentage of Bald Eagles observed each winter. This species is known to concentrate at locations where its preferred prey is abundant, such as salmon runs or where waterfowl form large flocks (Griffin et al. 1982, McWilliams et al. 1994). Large concentrations of waterfowl in the Sacramento Valley attract Bald Eagles to the region during winter. The species is primarily a fish-eater, but broadens its diet during winter when fish can be scarce and waterfowl are plentiful in rice fields and wildlife refuges throughout the region. The Raptor Survey results indicate that Bald Eagles are found in rice and adjacent wetlands more than would be expected based on relative availability of the habitat type.

## NORTHERN HARRIER

Throughout its range Northern Harriers are known to use wetland habitats, which tend to be rich in prey. Flying low over cattails and the edges of ponds and fields, Harriers look and listen for birds and rodents hiding in vegetation. Many rice fields, both flooded and dry, are bordered by waste rice stubble that harbors small rodents and birds. Harriers can be seen diligently working these edges in their slow, buoyant flight hoping to startle prey into the open for a quick chase. Harrier density was higher only in wetlands and forage crops during the Raptor Survey, pointing to the importance of rice for this species in winter. Harriers were also common in alfalfa, another crop that is important to bird life in the region (Shuford et al. 2009).

## RED-SHOULDERED HAWK

Well known for their affinity for wooded areas, Red-shouldered Hawks often utilize edge habitat (forest or streamside margins) during winter and can be seen

*Rice fields consistently supported a large percentage of Bald Eagles observed each winter.*

hunting from utility wires along roadside ditches, orchards and rice fields. As expected, they are quite common where streamside vegetation is prominent. These hawks are known as generalists, hunting a variety of prey including rodents, birds, reptiles and amphibians (Crocoll 1994). During the Raptor Survey, more observations of Red-shouldered Hawks were recorded in rice than any other habitat sampled. The combination of foraging, perching, and roosting opportunities provided by rice field margins in proximity to streamside habitat (both natural and planted) likely draw this raptor to utilize ricelands in the Sacramento Valley.

## RED-TAILED HAWK

Accounting for over 40 percent of all birds recorded on the Raptor Survey, Red-tailed Hawks are abundant throughout the Sacramento Valley. This species' ability to exploit a variety of habitats is well-documented (Preston and Beane 1993). These birds occur in high densities during the winter where rice farming is a prominent land-use. Rice supported the second-highest density of Red-tailed Hawks of any habitat type sampled during the Raptor Survey (second only to wetlands), attesting to the potential high quality of ricelands as raptor habitat. Red-tailed Hawks are year-round residents in the Sacramento Valley and most likely utilize ricelands throughout that time.

## SECONDARY RAPTOR SPECIES USING RICELANDS

Two other raptor species, White-tailed Kite and Peregrine Falcon, showed a lesser affinity for ricelands but still at levels meriting special recognition in this report.

PEREGRINE FALCON  
*Falco peregrinus*



Data from the Raptor Survey suggest that rice may be important locally for kites.

### WHITE-TAILED KITE

White-tailed Kites tend to prefer other habitat types such as alfalfa, grassland, forage crops, fallow fields and wetlands in the Central Valley (Dunk 1993, Erichsen 1995), but they were observed frequently in rice fields. This species can exploit prey that is otherwise inaccessible due to its unmatched skill at hover-hunting (staying in one spot in the air like a helicopter) over open areas where perch-hunting species are limited. Data from the Raptor Survey suggest that rice may be important locally for kites.

### PEREGRINE FALCON

While not present in high densities anywhere in the Central Valley, Peregrine Falcons are drawn to the large concentrations of shorebirds (sandpipers, plovers) and waterfowl found in both ricelands and wetlands during winter. Thus, the highest Peregrine densities were in these two habitats during the Raptor Survey. These groups of birds provide Peregrines with an abundant source of food during the winter.

WHITE-TAILED KITE  
*Elanus leucurus*





**GREAT EGRET**  
*Ardea alba*

*In Addition to raptor species, Great Egrets frequent California ricelands and adjacent wetlands.*

## ADJACENT WETLANDS

Habitat variety plays a role in the distribution, abundance, and diversity of raptors found in a given area. Different species have varying needs when it comes to foraging and roosting habitat and when an area can provide a diversity of options, the raptor diversity will likely increase.

Many of the rice fields in the Sacramento Valley, while expansive in places, are often interspersed with wetlands and other agricultural land uses (see Figure 1). Adjacent managed wetlands often contain streamside habitat, either planted or native, which provides roosting cover and foraging opportunities. These areas have low levels of human activity (i.e. car traffic) which not only disturbs birds, but can be a direct source of mortality (Moore and Mangel 1996, Jacobson 2005). Of the approximately 75,000 acres of wetlands in the Sacramento Valley, about 40,000 of these acres rely upon rice tailwater for their flood-up. Of the water used in rice cultivation, only about two-thirds is actually consumed by the rice plants, leaving about one-third to released (tailwater) be reused for flooding of wetlands, other agriculture uses or simply be returned to the Sacramento River.

Results from the Raptor Survey indicate that wetlands throughout the Central Valley support a higher density and diversity of wintering raptors than any other habitat type in the region. A mixture of managed wetlands and rice fields in flooded and dry states provides vital hunting and roosting habitat for wintering raptors in the Sacramento Valley.



**BLACK-NECKED STILT**  
*Himantopus mexicanus*

*Stilts are among the nearly 230 wildlife species that use California ricelands.*



BALD EAGLE  
*Haliaeetus leucocephalus*

*Raptor densities in the Central Valley are among the highest of any region in North America.*

## CURRENT POPULATIONS

Studies on raptor densities and habitat associations have not previously been attempted on the scale of the Raptor Survey, so historical population data for wintering raptors are not readily available. The California Department of Fish and Game conducted raptor surveys in the Central Valley twice each year sporadically from the late-1960s through the early-1980s but differences in study design make comparisons unreliable (Malette 1970, Schlorff 1984). Other studies have been done over shorter time spans and limited geographic focus (Wilkinson and Debban 1980, Smallwood et al. 1996, Reeves and Smith 2004). Data from the Raptor Survey indicate that the Central Valley supports roughly 90,000 wintering raptors comprising 19 species (Pandolfino and Smith, manuscript in preparation). Density data from the Raptor Survey and from Christmas Bird Counts both suggest that raptor densities in the Valley are among the highest of any region in North America (Root 1988, Berry et al. 1998, Pandolfino 2006, Pearlstine et al. 2006).



NORTHERN HARRIER  
*Circus cyaneus*



## IMPORTANCE OF RICE FIELDS TO RAPTORS

The Raptor Survey results indicate that for a few species rice fields are important in helping to support a healthy wintering raptor population in the Sacramento Valley. One way to gauge the value of ricelands to raptor populations is to calculate the potential impact of reductions in rice acreage. Raptor density in wetland habitat (4.3 birds/km<sup>2</sup>) was higher than in any other habitat type. The corresponding density figure for rice was 2.6 birds/km<sup>2</sup>.

The difference in raptor diversity and density between rice and wetlands was consistent over the three years of the Raptor Survey. Based on this difference, we can estimate that, for every 1,000 acres of rice lost, one would need to create 600 acres of wetland to compensate for the raptor habitat lost. Therefore, the 500,000 acres of ricelands in the Sacramento Valley potentially support raptors at a level equivalent to approximately

300,000 acres of wetlands. Wetlands support large numbers of waterfowl, shorebirds, and rodents which in turn support the raptors. Creating more of this habitat to make up for lost rice would be difficult and very expensive. Since various land uses can support raptors at some level, estimating the cost for creating raptor habitat equivalent to what is currently provided by ricelands is challenging. However, a project to acquire and restore 300,000 acres of new wetlands could potentially cost \$2 billion. In addition, operation and maintenance cost for this amount of wetlands would be approximately \$35 million per year.

*The 500,000 acres of ricelands in the Sacramento Valley potentially support raptors at a level equivalent to approximately 300,000 acres of wetlands.*

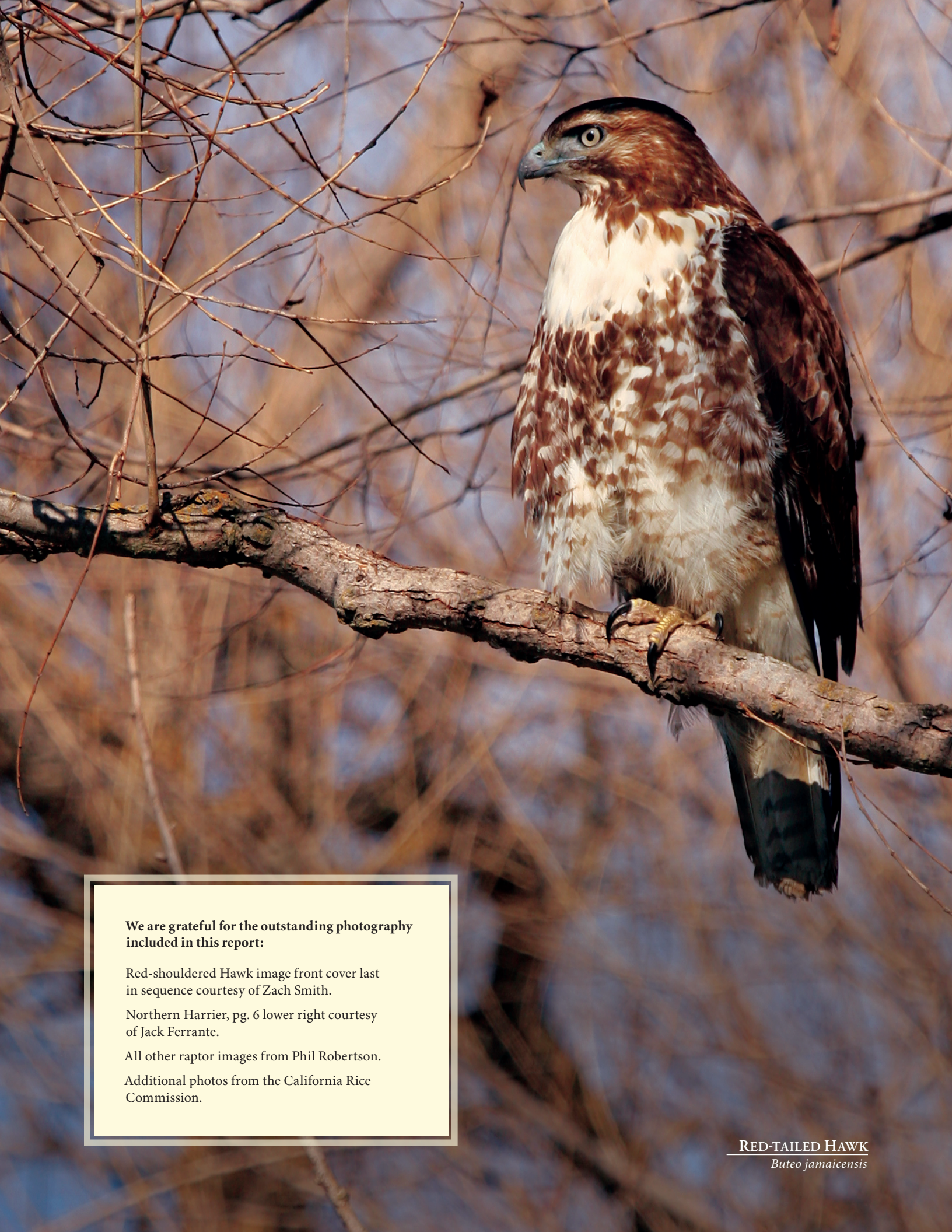
## REFERENCES

- Berry, M.E., C.E. Bock and S.L. Haire. 1998. Abundance of diurnal raptors on open space grasslands in an urbanized landscape. *The Condor* 100: 601-608.
- Brouder, S.M. and J.E. Hill. 1995. Winter flooding of ricelands provides waterfowl habitat. *California Agriculture* 49, pp. 58.
- Central Valley Joint Venture. 2006. Central Valley Joint Venture Implementation Plan – Conserving Bird Habitat. U.S. Fish and Wildlife Service, Sacramento, CA.
- Crocoll, S.T. 1994. Red-shouldered Hawk (*Buteo lineatus*). In *The Birds of North America*, No. 107 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists Union, Washington, D.C.
- Dunk, J. 1993. White-tailed Kite (*Elanus leucurus*). In *The Birds of North America*, No. 178 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists Union, Washington, D.C.
- Eadie, J.M., C.S. Elphick, K.J. Reinecke, and M.R. Miller. 2008. Wildlife values of North American ricelands: conservation in Ricelands of North America (S.W. Manley, ed.) *The Rice Foundation*: 7-90.
- Elphick, C.S. 2004. Assessing conservation trade-offs: identifying the effects of flooding rice fields for waterbirds on non-target bird species. *Biological Conservation* 117: 105-110.
- Elphick, C.S. and L.W. Oring. 2003. Effects of rice field management on winter waterbird communities: conservation and agronomic implications. *Agriculture, Ecosystems and Environment* 94: 17-29.
- Elphick, C.S. and L.W. Oring. 1998. Winter Management of Californian Rice Fields for Waterbirds. *Journal of Applied Ecology* 35:95-108.
- Erichsen, A. L. 1995. The White-tailed Kite (*Elanus leucurus*): nesting success and seasonal habitat selection in an agricultural landscape. Master's thesis, University of California, Davis.
- Griffin, C. R., T.S. Baskett, and R.D. Sparrowe. 1982. Ecology of Bald Eagles wintering near a waterfowl concentration. Special Scientific Report, Wildlife No. 247, U.S. Fish and Wildlife Service, Washington, D.C.
- MacWhirter, R.B and K.L. Bildstein. 1996. Northern Harrier (*Circus cyaneus*). In *The Birds of North America*, No. 210 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists Union, Washington, D.C.
- Mallette, R.D. 1970. Raptor survey (1968\_69). Calif. Dep. of Fish and Game, Special Wildl. Investigations rep., Proj. W\_54\_R\_1, Job II\_2. 3pp. + appends.
- McWilliams, S. R., J.P. Dunn, and D.G. Raveling. 1994. Predator-prey interactions between eagles and cackling Canada and Ross' geese during winter in California. *Wilson Bulletin* 106:272-288.
- Moore, T.G. and M. Mangel. 1996. Traffic related mortality and the effects on local populations of Barn Owls, *Tyto alba*. In: G.L. Evinck, P. Garrett, D. Ziegler, and J. Bery, editors. *Trends in addressing transportation related wildlife mortality*. Publication FL-ER-58-96. Tallahassee, Florida: Florida Department of Transportation; 263 pages.
- Pandolfino, E. R. 2006. Christmas Bird Counts reveal wintering bird status and trends in California's Central Valley. *Central Valley Bird Club Bulletin* 9:21-36.
- Pandolfino, E.R., M. Herzog, S. Hooper, and Z. Smith. 2011. Winter habitat associations of diurnal raptors in California's Central Valley. *Western Birds* 42(2): 62-84.
- Pearlstine, E.V., F.J. Mazzotti and M.H. Kelly. 2006. Relative distribution and abundance of wintering raptors in agricultural and wetland landscapes of south Florida. *Journal of Raptor Research* 40:81-85.
- Petrie, M. and K. Petrik. 2010. Assessing waterbird benefits from water use in California Ricelands. *Ducks Unlimited*. Sacramento, Ca.
- Preston, C.R. and R.D. Beane. 1993. Red-tailed Hawk (*Buteo jamaicensis*). In *The Birds of North America*, No. 52 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists Union, Washington, D.C.
- Reeves, K. A. and Smith, J. R. 2004. Survey of falcons, kites, hawks, and owls in the lower Mokelumne River watershed, Sacramento and San Joaquin Counties, CA. East Bay Municipal Utility District. Oakland, Ca.
- Root, T. 1988. *Atlas of Wintering North American Birds*. University of Chicago Press, Chicago, IL.
- Schlörff, R.W. 1984. Raptor population survey. Calif. Dep. of Fish and Game, Nongame Wildlife Investigations report, Proj. W-65-R-1, Job II-1. 14pp.
- Shuford, W. David, G.M. Langham, G.W. Page and C. Hickey. 2009. Distribution, abundance and habitat use of Long-billed Curlews in California's Central Valley from broad-scale surveys in 2007 and 2008. *Central Valley Bird Club Bulletin* 12(2): 29-44.
- Shuford, W. David, G.W. Page and J.E. Kjelson. 1998. Patterns and dynamics of shorebird use of the California's Central Valley. *Condor* 100: 227-244.
- Smallwood, S. K., Nakamoto, B. J., and Geng, S. 1996. Association analysis of raptors on a farming landscape. in *Raptors in Human Landscapes: Adaptations to Built and Cultivated Environments* (D. M. Bird, D. E. Varland, and J. J. Negro, eds.) pp. 177-190. Academic Press, San Diego, CA.
- Sterling, J. and P. Buttner. 2009. *Wildlife Known to Use California Ricelands*. California Rice Commission. Sacramento, CA.
- Wilkinson, G. S. and Debban, K. R. 1980. Habitat preferences of wintering diurnal raptors in the Sacramento Valley. *Western Birds* 11:25-3.

### RED-SHOULDERED HAWK

*Buteo lineatus*





**We are grateful for the outstanding photography included in this report:**

Red-shouldered Hawk image front cover last in sequence courtesy of Zach Smith.

Northern Harrier, pg. 6 lower right courtesy of Jack Ferrante.

All other raptor images from Phil Robertson.

Additional photos from the California Rice Commission.



## California Rice

California Rice Commission  
[www.calrice.org](http://www.calrice.org)  
First Edition, 2011