
Chapter 5: Spotted Owl Module

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Introduction

Knowledge regarding the effects of fuels and vegetation management on California spotted owls (*Strix occidentalis occidentalis*; CSOs) and their habitat is a primary information need for addressing conservation and management objectives in Sierra Nevada forests. The specific research objectives of the California spotted owl module as identified and described in the Plumas-Lassen Study (PLS) Plan are:

- 1) What are the associations among landscape fuels treatments and CSO density, distribution, population trends and habitat suitability at the landscape-scale?
- 2) What are the associations among landscape fuels treatments and CSO reproduction, survival, and habitat fitness potential at the core area/home range scales?
- 3) What are the associations among landscape fuels treatments and CSO habitat use and home range configuration at the core area/home range scale?
- 4) What is the population trend of CSO in the northern Sierra Nevada and which factors account for variation in population trend?

5) Are barred owls increasing in the northern Sierra Nevada, what factors are associated with their distribution and abundance, and are they associated with reduced CSO territory occupancy?

6) Does West Nile Virus affect the survival, distribution and abundance of California spotted owls in the study area?

Current information on the distribution and density of CSOs across the HFQLG study area is required to provide the data necessary to build predictive habitat models and provide baseline population information against which we will assess post-treatment changes in CSO populations and habitat. Continued monitoring on the Lassen Demographic Study Area is critical for estimating CSO population trends and status. Our focus in 2006 was to conduct landscape inventories of CSO distribution and abundance, and continue banding to provide the required data and baseline information to meet the objectives of Research Questions 1-4 identified above. Complete landscape inventory surveys were conducted across 9 of 11 survey areas in 2006 (Figure 1). Surveys were not conducted in 2 survey areas in 2006 (SA-5, SA-7, Figure 2). Surveys were not conducted in these 2 study areas in 2006 because sufficient data for determining the number and distribution of CSO sites for initial habitat modeling efforts was collected in 2004-2005. Details on survey methods are described in the study plan. Efforts were made to monitor the pair and reproductive status of each owl, and to capture, uniquely color-mark, and collect blood samples from each individual owl across the study area. Capture and color-marking is necessary to estimate survival and population trend, and to assess exposure to West Nile Virus (WNV)(Research Question #5). We also recorded all barred and hybrid barred-spotted owls encountered in the study area and synthesized all existing barred owl records for the northern Sierra Nevada to address Research Question #6.

Results

CSO Numbers, Reproductive Success, Density and Population Trends:

A total of 66 territorial CSO sites were documented in 2006 across the study area (Figure 2). This total consisted of 56 confirmed pairs, 2 unconfirmed pairs (i.e., one member of pair confirmed as territorial single plus single detection of opposite sex bird), and 8 territorial single CSOs (single owl detected multiple times with no pair-mate detected). Eight pairs successfully reproduced in 2006 (14% of confirmed/unconfirmed pairs). A total of 12 fledged young were documented in 2006 (1.50 young per successful nest). CSO reproduction in 2006 was similar to 2005, with reproduction in both years lower than 2004 (Table 1). CSO reproduction is known to vary with Spring weather and other factors. The Spring of 2004 was relatively dry while those of 2005 and 2006 had higher levels of precipitation from March-May (Figure 3).

Table 1. California spotted owl reproduction on the Plumas and Lassen National Forests 2004-2006.

Year	Percent of confirmed/unconfirmed pairs	Young fledged per
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	with successful nests	successful nest
2004	49.4%	1.61
2005	18.3%	1.53
2006	13.8%	1.50

The Lassen Demographic Study Area (SA 1A, SA-11, SA12, SA-13, SA-14, SA-15) and Plumas NF Survey Areas (SA-2, SA-3, SA-4, SA-5, SA-7) were fully integrated in 2005 to define the overall Plumas-Lassen Study project area and provide consistent CSO survey effort across the project area. (Figure 2). We estimated the crude density of CSOs based on the number of territorial owls detected across 9 survey areas during 2006 surveys at the Survey Area spatial scales (Table 2). The estimated crude density across the overall study area in 2006 was 0.061 territorial owls/km². Overall study area crude densities are not directly comparable across years because different total areas were surveyed in each year. However, crude density estimates within individual study areas indicate similar densities between 2004 and 2005 with lower CSO densities in 2006 (Table 2). The crude density estimates for 2005 provided in this report differ slightly from those reported in the 2005 Annual Report for the same year because of updates and corrections to the GIS base survey maps and CSO survey results databases that were conducted in winter 2005-2006 to correct the original survey area boundaries and survey results to make them congruent with the actual watershed boundaries of each survey area. The lower crude density observed in 2006 may suggest a decline in CSO numbers or could reflect lower detection rates for individual CSOs during a second consecutive year of low reproduction and high Spring precipitation. In general, overall survey detection rates are lower and individual owl identification is more difficult in low reproduction years because individual owls are not strongly defending active nests and wander more widely within the landscape.

Table 2. Crude density of territorial California spotted owls across survey areas on the Plumas and Lassen National Forests in 2005 and 2006. Locations of survey areas are identified in Figure 1.

Survey Area	Size (km ²)	Crude Density of Territorial Owls (#/km ²)		
		2004*	2005*	2006*
SA-2	182.5	0.126	0.126	0.115
SA-3	218.5	0.093	0.093	0.093
SA-4	238.3	0.067	0.067	0.046
SA-5	260.3	0.077	0.077	not surveyed****
SA-7	210.4	0.071	0.071	not surveyed
SA-1A	190.5	not included***	0.047	0.042
SA-1B**	130.4	not included	0.023	not surveyed
SA-11	180.0	not included	0.056	0.033
SA-12	192.4	not included	0.088	0.068
SA-13	193.4	not included	0.067	0.067
SA-14	331.2	not included	0.054	0.042
SA-15	317.4	not included	0.041	0.022
Total Study	2,645.3	0.084	0.075	0.061

Area				
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*Total Area surveyed each year: 2004 = 1,106 km²; 2005 = 2,645 km²; in 2006 = 2,039 km².

**Project level area surveyed only in 2005. Included for comparative purposes.

***Lassen Demographic Study Area – incorporated into the overall study in 2005.

****Survey areas not surveyed in 2006.

In January 2006, a meta-analysis was conducted to estimate CSO population trends and to assess population status in response to a petition submitted to the United States Fish and Wildlife Service to list the CSO under the Endangered Species Act (Blakesley et al. 2006). Data collected between 1990-2005 from four CSO demographic studies across the Sierra Nevada and southern Cascades, including the Lassen Demographic Study Area, were analyzed as part of the meta-analysis workshop. The Lassen Demographic Study Area is contained within the overall PLS study area and consists of survey areas SA-1A, SA-11, SA-12, SA-13, SA-14 and SA-15 in Figure 2. Full details on meta-analysis methods and results are provided in Blakesley et al. (2006). In synopsis, across the four study areas results indicated that the Lassen Study CSO population exhibited the strongest evidence for a population decline between 1990-2005. Mean lambda for the Lassen Demographic Study was 0.973, with 95% confidence limits ranging from 0.946-1.001 (Table 3).

Table 3. Mean estimated population lambda (population change) for California spotted owls on four study areas in the southern cascades and Sierra Nevada, 1990-2005 (Blakesley et al. 2006)

Study Area	Lambda	Standard Error	95% Confidence Interval
Lassen National Forest	0.973	0.014	0.946-1.001
Sierra National Forest	0.992	0.013	0.966-1.018
Sequoia-King Canyon National Park	1.006	0.031	0.947-1.068
Eldorado National Forest	1.007	0.029	0.952-1.066

Vegetation Sampling – Nest Plots

Vegetation plot sampling was conducted at a total of 102 CSO territories across 2005 and 2006. Vegetation plots were centered on CSO nest trees were measured using the national Forest and Inventory Assessment (FIA) protocol. The FIA protocol is used nationally by the USDA Forest Service for inventorying and monitoring vegetation. Use of the FIA sampling protocol will facilitate monitoring of vegetation and development of CSO habitat models that can be used as adaptive management planning tools. Habitat models are currently being evaluated that can be used to assess projected changes in CSO nesting habitat suitability under varying fuels and vegetation treatment scenarios.

Banding, Blood Sampling, West Nile Virus Monitoring

Thirty-one owls were captured and banded in 2006. Blood samples were collected from 16 individuals and screened at the University of California, Davis for West Nile Virus antibodies. None of the 76 individuals tested positive for WNV antibodies in 2005. The 2006 samples have not been analyzed to date.

Barred and Sparred (spotted/barred hybrid) Distributional Records:

We detected the presence of 5 barred owl and 3 sparred owls during 2006 surveys within the study area. Our synthesis and update of barred-sparred owl records through 2006 based on Forest Service and California Department of Fish and Game databases indicates that there are a minimum of 36 individual site records across the northern Sierra Nevada (Figure 4). This includes 17 records that have been documented within our intensively surveyed study area. The first barred owl in the region was reported in 1989. Twenty-one of the 36 site-records were recorded and known occupied between 2002-2006. The pattern of records suggests that barred/sparred owls have been increasing in the northern Sierra Nevada between 1989-2006.

California Spotted Owl Diet:

A single survey plot was established at a CSO nest or roost location at each CSO territory on the Plumas National Forest in 2003-2005. Systematic searches for pellets and prey remains were conducted in each plot during each year. A total of 2256 pellets have been collected over the three years (2003 = 606; 2004 = 812; 2005 = 838). To date 1418 pellets have been sorted and all prey items identified to species or taxonomic group when species identification could not be ascertained. Mammals comprised the dominant taxonomic group identified in the diet. The three most frequently detected species were the dusky-footed woodrat (detected in 43% of pellets), northern flying squirrel (detected in 39% of pellets), and *Peromyscus* species (detected in 27% of pellets)(Table 4). The 838 pellets collected in 2005 have been sorted and identification of all prey species is near completion.

Summary 2004-2006

Our efforts to date have focused on collecting the initial data to address our primary research objectives and provide the baseline data for monitoring HFQLG implementation. In conjunction with the now fully integrated Lassen Demographic Study we have collected landscape-scale information on the distribution and abundance of CSOs across approximately 650,000 acres of land. Determining the accurate number and distribution of CSO sites requires multiple years of survey and marking of individual CSOs to delineate separate territories and identify individual birds that move among multiple sites within and across years. These baseline data are fundamental for developing empirically based habitat models for understanding CSO habitat associations and developing adaptive management tools and models. Dedicated monitoring of CSOs

on the Lassen Demographic study continues to provide critically valuable demographic and population trend information for determining the status of CSOs. The declining population trend estimated through the meta-analysis of the Lassen Demographic Study data and the overall lower densities observed in 2006 warrant close continued monitoring of the status of CSOs within the study area and continued management focus on providing high-quality CSO habitat. Our focused diet analyses have broadened and deepened our understanding of CSO diets and sources of variation in CSO diets among pairs and across environmental gradients. Monitoring of WNV exposure coupled with demographic monitoring has provided an opportunity for assess if WNV may ultimately be a factor influencing CSO viability. Finally, through our research into historical and current occurrence records, in conjunction with our field surveys, we have been able to document the colonization of the northern Sierra Nevada by barred owls, which may become a potential serious threat to CSO viability.

Current Research: 2007

In 2007 we will continue monitoring owl distribution, abundance, demography, and population trend across the Study Area. Beginning in March 2007 we will initiate a radio-telemetry component to the overall study to address how owls are using habitat within their home ranges. We will attempt to radio-tag 6 pairs of CSOs in 2007. In addition to continuing field surveys in 2007 designed to address our six research questions, we have broadened our emphasis on the development of predictive habitat relationship models as described in the module study plan. We have been working closely with biologists on the Plumas and Lassen National Forests, and the R5 Regional Office, to identify and define the types of analyses and tools that would best address management needs. Baseline information collected through 2006 forms the foundation for this phase of the research. These models should be completed in 2007. The combination of broad-scale landscape CSO distribution data, in conjunction with detailed demographic information available from the Lassen Demographic Study, will facilitate exploration and development of predictive habitat models for use in an adaptive management framework and to directly monitor implementation of the HFQLG project.

Literature Cited

Blakesley, J.A., M.E. Seamans, M.M. Connor, A.B. Franklin, G.C. White, R.J. Gutierrez, J.E. Hines, J.D. Nichols, T.E. Munton, D.W.H. Shaw, J.J. Keane, G.N. Steger, B.R. Noon, T.L. McDonald, S. Britting. 2006. Demography of the California Spotted Owl in the Sierra Nevada: Report to the US Fish and Wildlife Service on the January 2006 Meta-Analysis. February 2006.

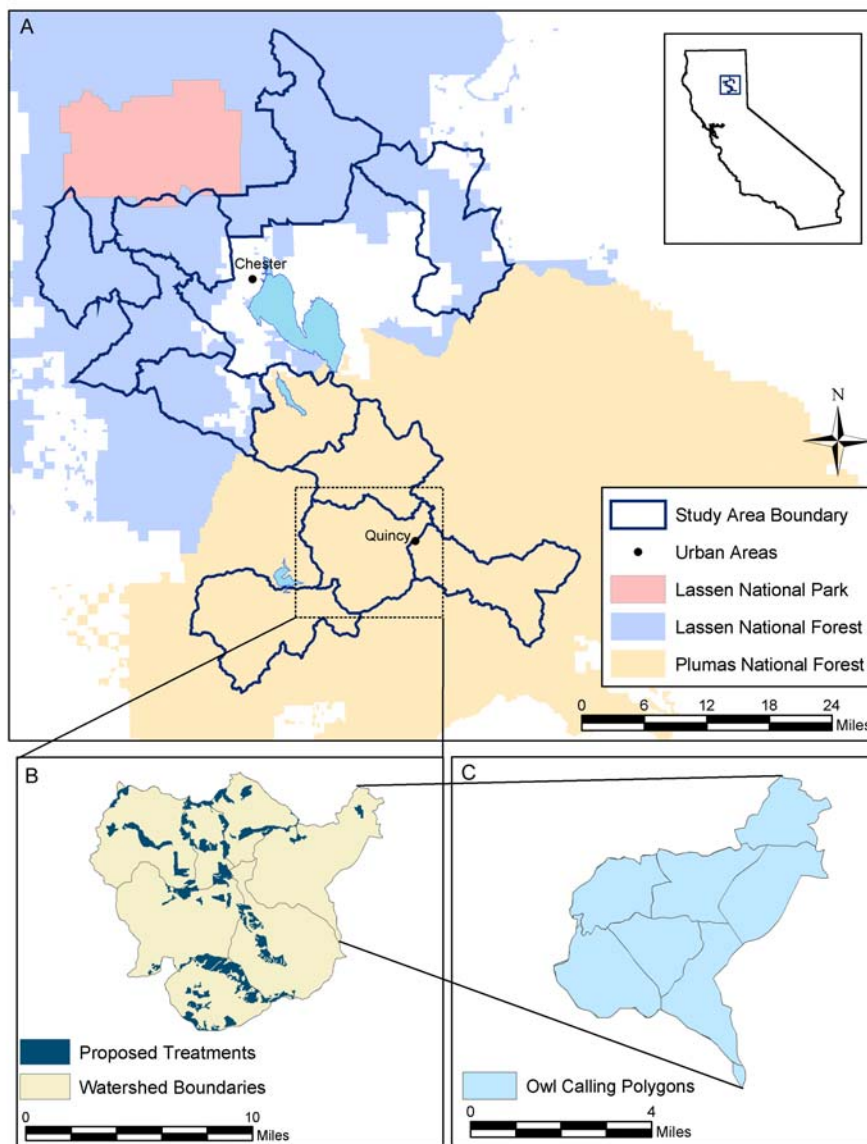


Figure 1. (A) Location of CSO Survey Areas surveyed in 2004-2006. (B) Example of original survey plot consisting of multiple Cal-Planning watersheds. (C) Example of Primary Sampling Units for surveying for CSOs. See text and study plan for further details .

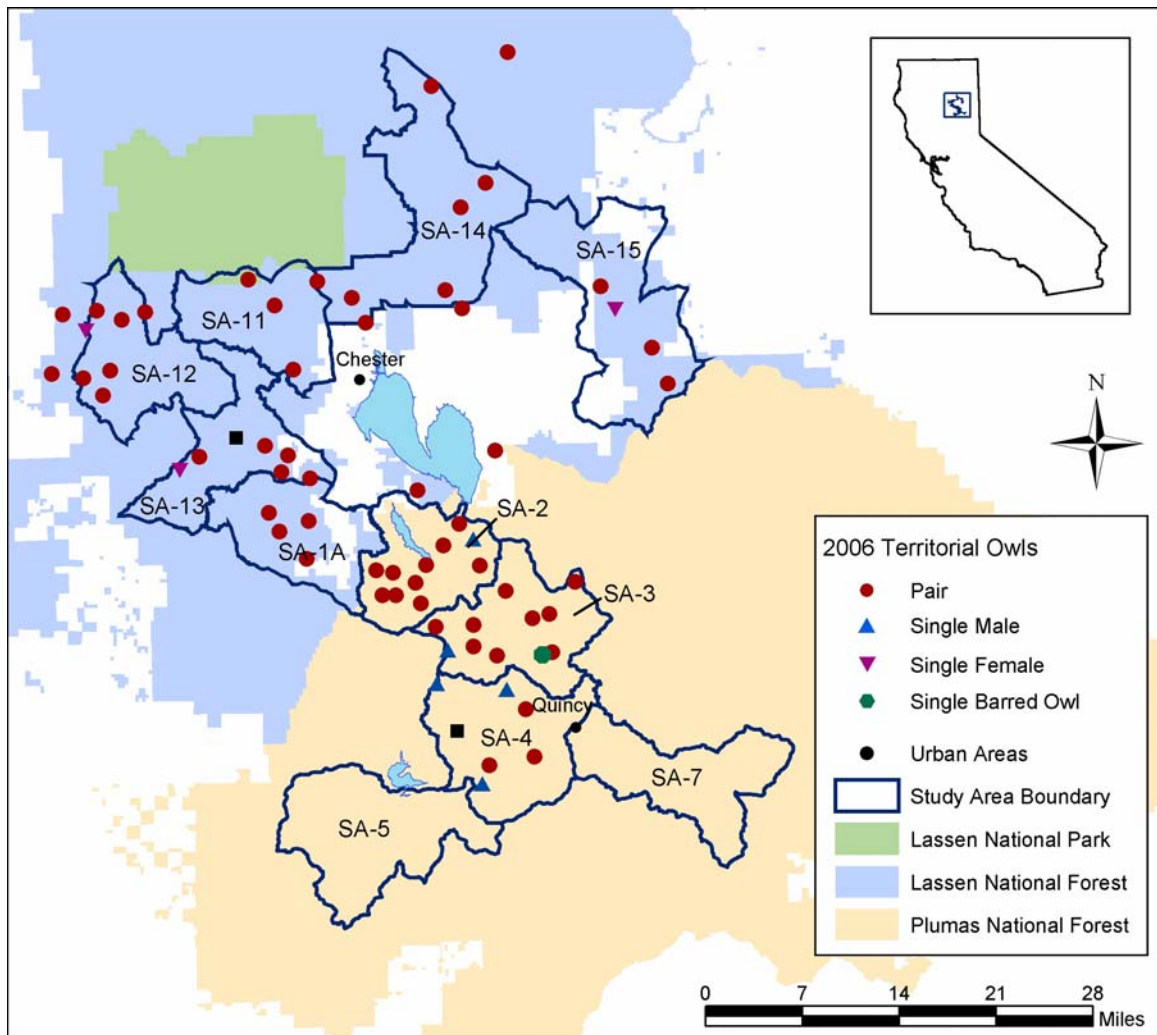


Figure 2. Distribution of California spotted owl territories within CSO survey plots across the Plumas and Lassen National Forests, 2006.

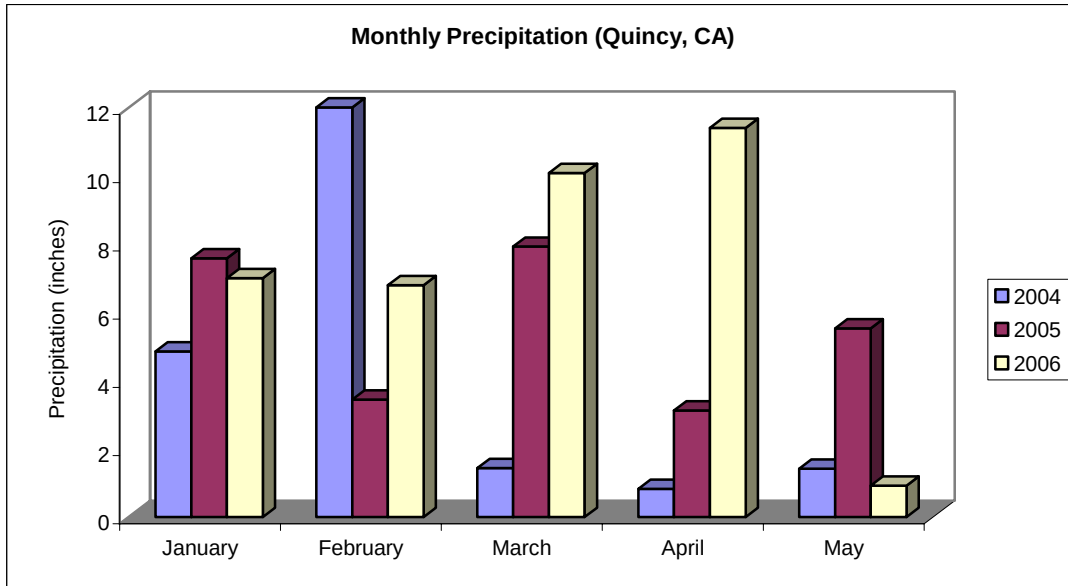


Figure 3. Monthly precipitation totals for Quincy, California, during January-May, 2004-2006 (data from Western regional Climate Center).

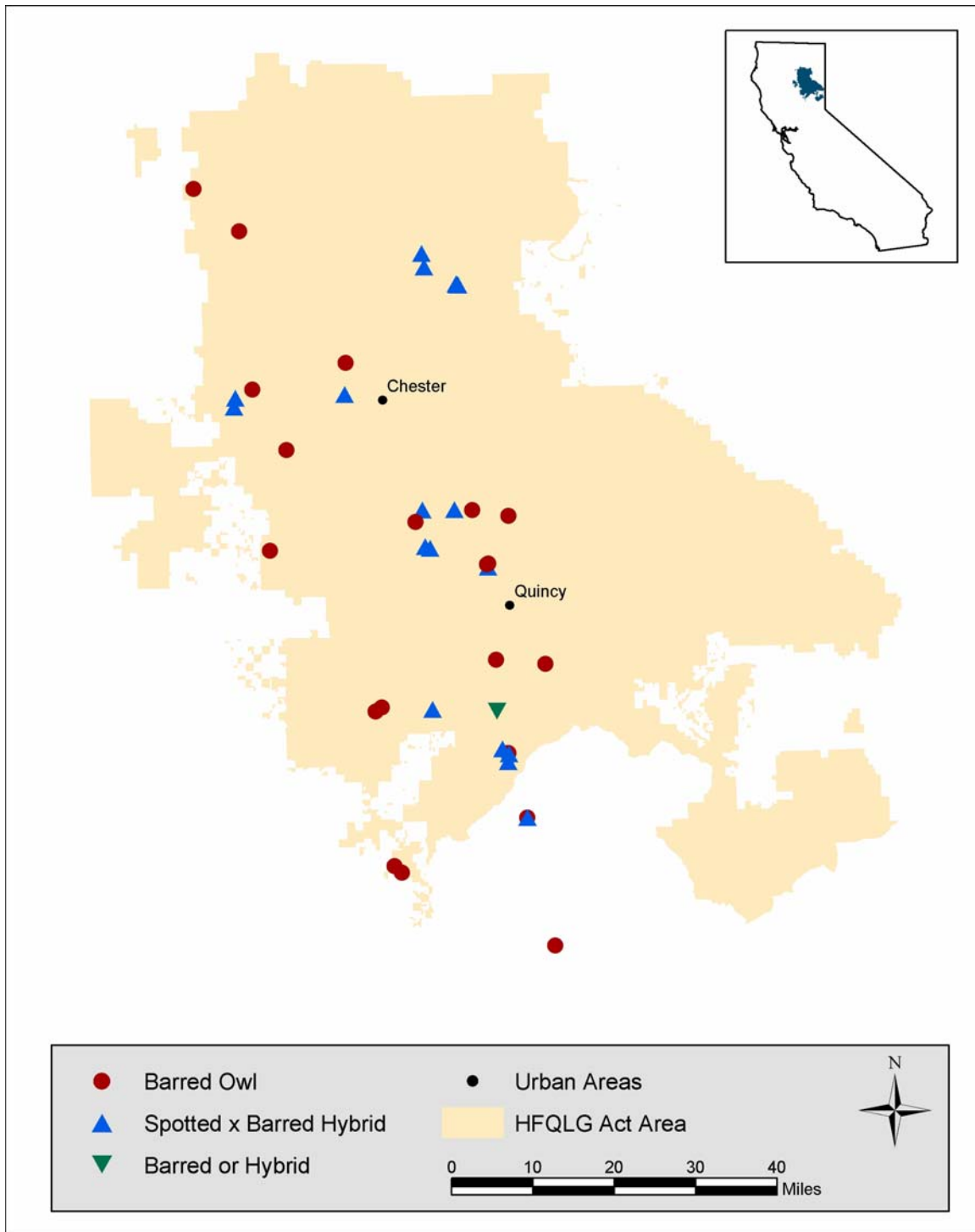


Figure 4. Distribution of Barred and Sparred (Spotted-Barred hybrids) Owls between 1989-2006 within the HFQLG Project area.

Table 4. Prey species occurrences in California spotted owl pellets collected on the Plumas National Forest 2003-2004.

Prey Species	Number of 2003 Pellets Containing Taxon (n=606)	Percentage of 2003 Pellets Containing Taxon	Number of 2004 Pellets Containing Taxon (n=812)	Percentage of 2004 Pellets Containing Taxon	Total Number of Pellets Containing Taxon (n=1418)	Total Percentage of Pellets Containing Taxon
Mammals	581	95.87	797	98.15	1378	97.18
Dusky-footed woodrat (<i>Neotoma fuscipes</i>)	287	47.36	318	39.16	605	42.67
Northern flying squirrel (<i>Glaucomys sabrinus</i>)	254	41.91	298	36.70	552	38.93
Deer mouse (<i>Peromyscus</i> spp.)	145	23.93	237	29.19	382	26.94
Unidentified mouse (<i>Peromyscus</i> spp. or <i>Mus musculus</i>)	16	2.64	32	3.94	48	3.39
California red-backed vole (<i>Clethrionomys californicus</i>)	11	1.82	11	1.35	22	1.55
Meadow voles (<i>Microtus</i> spp.)	12	1.98	32	3.94	44	3.10
Unidentified vole	6	0.99	6	0.74	12	0.85
Pocket gopher (<i>Thomomys bottae</i>)	26	4.29	73	8.99	99	6.98
Chipmunk (<i>Tamias</i> spp.)	6	0.99	32	3.94	38	2.68
Western harvest mouse (<i>Reithrodontomys magalotis</i>)	0	0.00	1	0.12	1	0.07
Shrew (<i>Sorex</i> spp.)	22	3.63	40	4.93	62	4.37
Broad-footed mole (<i>Scapanus latimanus</i>)	23	3.80	89	10.96	112	7.90
Large bat (e.g., <i>Eptesicus</i> spp.)	8	1.32	13	1.60	21	1.48
Small bat (e.g., <i>Myotis</i> spp.)	10	1.65	8	0.99	18	1.27

Table 4. (Continued)

Prey Species	Number of 2003 Pellets Containing Taxon (n=606)	Percentage of 2003 Pellets Containing Taxon	Number of 2004 Pellets Containing Taxon (n=812)	Percentage of 2004 Pellets Containing Taxon	Total Number of Pellets Containing Taxon (n=1418)	Total Percentage of Pellets Containing Taxon
Unidentified rabbit or hare (family <i>Leporidae</i>)	1	0.17	11	1.35	12	0.85
Unidentified large rodent (comparable to a woodrat)	15	2.48	28	3.45	43	3.03
Unidentified small rodent (comparable to a mouse)	30	4.95	56	6.90	86	6.06
Unidentified mammal	3	0.50	2	0.25	5	0.35
Unidentified vertebrate (may include non-mammals)	8	1.32	15	1.85	23	1.62
Birds	59	9.74	104	12.81	163	11.50
Unidentified bird (unknown size)	4	0.66	4	0.49	8	0.56
Unidentified large bird (e.g., American robin)	23	3.80	38	4.68	61	4.30
Unidentified medium bird (e.g., western tanager)	15	2.48	31	3.82	46	3.24
Unidentified small bird (e.g., pine siskin)	12	1.98	20	2.46	32	2.26
Steller's jay (<i>Cyanocitta stelleri</i>)	2	0.33	5	0.62	7	0.49
Northern flicker (<i>Colaptes auratus</i>)	3	0.50	6	0.74	9	0.63
Insects	82	13.53	145	17.86	231	16.29
Long-horned beetle (<i>Ergates</i> spp.)	46	7.59	61	7.51	107	7.55
Giant lacewing (<i>Polystoechotes lineata</i>)	11	1.82	25	3.08	36	2.54
Jerusalem cricket (<i>Stenopelmatus</i> spp.)	25	4.13	45	5.54	70	4.94
Carpenter ant (<i>Camponotus</i> spp.)	1	0.17	11	1.35	12	0.85
Cicada	2	0.33	25	3.08	27	1.90

Unidentified insect	3	0.50	14	1.72	17	1.20
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