

Use of Oak and Associated Woodlands by Mexican Spotted Owls in Arizona¹

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Abstract. – Although the spotted owl is often associated with coniferous forests, oak and associated woodlands also provide habitat for spotted owls. In Arizona, Mexican spotted owls are year-round residents in Madrean oak-pine forests, encinal woodlands, and ponderosa pine-Gambel oak forests, while some spotted owls winter in pinyon-juniper woodlands. Oak and associated woodlands present unique management challenges to resource managers charged with maintaining viable populations of Mexican spotted owls.

INTRODUCTION

The spotted owl (*Strix occidentalis*) is associated with mature coniferous forests throughout much of its range (Gould 1977, Forsman et al. 1984, Ganey and Balda 1989a, Thomas et al. 1990). Hardwoods, however, may also provide important habitat elements for spotted owls. For example, the northern spotted owl (*S. o. caurina*) occurs not only in coniferous forests but also in mixed-evergreen forests containing various hardwoods in the understory (Gould 1977, Forsman et al. 1984, Solis and Gutiérrez 1990). Hardwoods contribute to canopy closure and layering thought to be important in providing a cool microclimate for spotted owls (Barrows 1981), and hardwoods are used frequently by roosting owls during warm weather (Barrows 1981, Forsman et al. 1984).

The California spotted owl (*S. o. occidentalis*) also occupies hardwood stands and mixed-evergreen stands, often roosting in understory hardwoods during warm weather (Bent 1938, Gould 1977, Barrows 1981, Gutiérrez and Pritchard 1990). Canyon live oak (*Quercus chrysolepis*) was the dominant tree species in 91% of the areas where Gould (1977) found this owl below 1100 m in the southern coast ranges of California. Gutiérrez and Pritchard (1990) found 17 of 40 spotted owl roosts in hardwood or conifer-hardwood stands in southern California. Many spotted owls in the Sierra Nevada apparently migrate from breeding areas in coniferous forest to lower-elevation wintering areas in oak-pine (*Pinus*) woodlands (Laymon 1989, Verner et al. 1991), and

some owls reside in such woodlands throughout the year (Verner et al. 1991).

The Mexican spotted owl (*S. o. lucida*) also uses hardwoods (Bent 1938, Ganey and Balda 1989a, Dargan 1992, Duncan and Taiz, in press). Because of concerns over habitat loss and possible population declines, this subspecies was listed as threatened by the state of Arizona (Arizona Game and Fish Department 1988) and was proposed for listing as threatened by the U.S. Fish and Wildlife Service (Federal Register 56:56344-56355). Information on the habitat requirements of this owl is critical to developing sound management strategies for the maintenance of viable populations. Here, we provide preliminary information on the use of oaks and associated woodlands by Mexican spotted owls in Arizona. Our intent is to alert resource managers to the potential importance of these habitats to Mexican spotted owls.

MADREAN EVERGREEN FOREST AND WOODLAND

South of the Mogollon Rim in Arizona, spotted owls are found in montane conifer forests and in Madrean evergreen forest and woodlands (Marshall 1957, Ganey and Balda 1989a, Duncan and Taiz, in press). Madrean evergreen habitats occupied include the Encinal (oak) Series, Oak-pine Series, and Cypress Series (vegetation types throughout follow Brown 1982). Encinal is dominated by a variety of evergreen oaks, sometimes co-occurring with Mexican pinyon (*P. cembroides*) and alligatorbark juniper (*Juniperus deppeana*). Tree height is typically <15 m, with an open canopy. Oak-pine forest is dominated by trees >15 m in height with a closed, multilayered canopy. The overstory typically consists of Chihuahua (*P. leiophylla*), Apache (*P. engelmannii*), ponderosa (*P. ponderosa*), and/or southwestern white pine (*P. strobiformis*), with evergreen oaks common in the understory. Relict stands of Arizona cypress (*Cupressus arizonica*) sometimes occupy cool

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microsites within areas dominated by oak-pine forest, and deciduous riparian trees may occur in drainage bottoms within both encinal and oak-pine forest (Brown 1982).

Habitat use by Mexican spotted owls in southern Arizona has not been intensively studied, and the importance of these habitats to the owl is unknown. However, of 64 sites where Ganey and Balda (1989a) located spotted owls roosting in southern Arizona, 19 (30%) were in oak-pine forest and 9 (14%) were in encinal woodland (fig. 1). Duncan and Taiz (in press) reported that oak-pine and Arizona cypress forests were prominent components of the "core area" of 13 (68%) of 19 management territories established for spotted owls on the Coronado National Forest. Core area and management territory as used in this paper refers to a management designation, however (see Federal Register 54:27416-27418 for clarification). These areas are sometimes delineated without detailed knowledge of owl movements, and that delineation may not provide much insight into which available habitats are used by owls.

PONDEROSA PINE-GAMBEL OAK FOREST

North of the Mogollon Rim in Arizona, most spotted owls occur in montane conifer forest, particularly the Mixed Conifer Series dominated by Douglas-fir (*Pseudotsuga menziesii*) and/or white fir (*Abies concolor*) (Ganey and Balda 1989a). Spotted owls also breed in ponderosa pine-Gambel oak forest (*Q. gambelii*; Pine series, Ponderosa pine-Gambel oak Association) in north-central Arizona. Gambel oak is often common in both habitat types. For example,



Figure 1. Mexican spotted owl roost in Madroan oak-pine forest, Chiricahua Mountains, Arizona (photo by Russell B. Duncan).

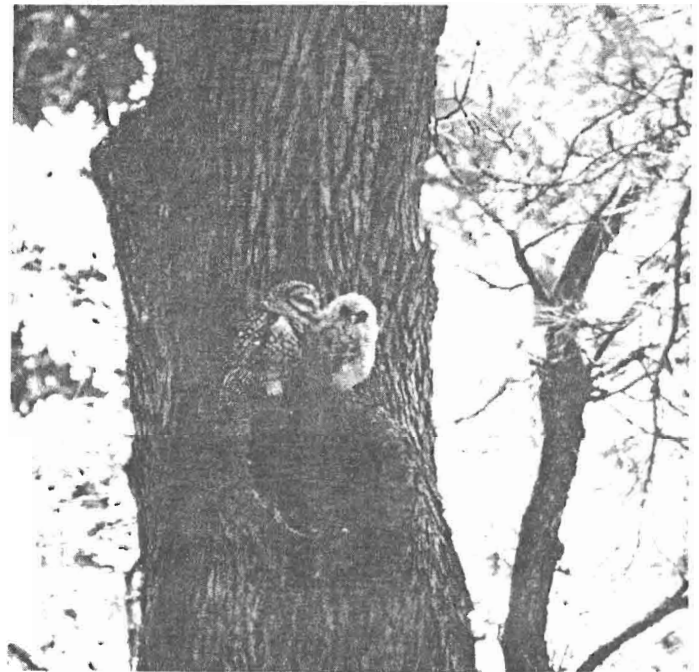


Figure 2. Adult and juvenile Mexican spotted owl perched near their nest, a cavity in a large Gambel oak tree, Coconino National Forest, north-central Arizona (photo by Joseph L. Ganey).

ponderosa pine/oak or oak was listed as the dominant or codominant habitat type within the core area at 50 of 113 management territories established for spotted owls on the Coconino National Forest, Arizona (Dargan 1992).

Spotted owls occupying ponderosa pine-Gambel oak forest are typically found in stands containing well-developed understories of Gambel oak. These understories contribute to relatively high canopy closures for ponderosa pine stands (table 1). The oak component also contributes to stand density and basal area (table 1). Oak trees provide large horizontal limbs for perching and nest sites in the form of large cavities. In an ongoing radiotelemetry study of 13 spotted owls in ponderosa pine-Gambel oak forest, 3 of 6 nests used were in cavities in large Gambel oak trees (fig. 2). In addition, 56 (16%) of 342 roosts

Table 1. - Selected habitat characteristics of 18 Mexican spotted owl roost sites in ponderosa pine-Gambel oak forest on the Coconino National Forest, Arizona (Mormon Lake and Long Valley Ranger Districts). Characteristics were measured on circular plots (0.04 ha) centered on the roost tree.

Variable	Standard		Range
	Mean	error	
Canopy closure (%)	80.1	1.4	69.0-94.0
Oak density (trees/ha) ¹	656.3	135.1	74.1-2568.8
% of total density consisting of Gambel oak	51.0	6.2	10.0-95.4
Oak basal area (m ² /ha)	24.3	2.3	9.9-37.9
% of total basal area consisting of Gambel oak	41.7	4.0	18.9-83.2
Oaks/ha >50 cm d.b.h.	2.0	0.5	0.0-9.0

¹Trees defined as stems >10 cm diameter at breast height (d.b.h.) and >2 m in height.

observed were in oak trees. Gambel oak was used mostly during the summer months; 43 (47%) of 91 roosts located from June through September were in Gambel oak trees.

PINYON-JUNIPER WOODLANDS

Although many Mexican spotted owls remain on their breeding areas throughout the year, some migrate during the winter (Ganey and Balda 1989b). During the winters of 1990-91 and 1991-92, two radio-tagged owls (one each winter) in northern Arizona migrated from breeding areas in ponderosa pine-Gambel oak forest (elevation 2290 m) approximately 40 km to pinyon-juniper woodland (Great Basin conifer woodland, Pinyon-juniper series; elevation 1370 m). These owls left the breeding areas in late December and returned from early to late March. Other owls have been known to migrate as early as mid-November and return as late as early April (Ganey and Balda 1989b). The number of owls that migrate downslope is currently unknown and may vary among years. The factors guiding choice of a wintering area are also unknown, although all documented wintering areas are below the level of persistent snow.

RESEARCH NEEDS AND MANAGEMENT CHALLENGES

Management of oak and associated woodlands used by spotted owls presents resource managers and researchers with unique challenges. Management concerns relating to spotted owls have typically centered around timber harvest and the loss of mature or old-growth stands. Many spotted owls in the ponderosa pine-Gambel oak forest type occupy stands with many snags and down logs, pronounced canopy layering, and large oak trees (Dargan 1992). Regeneration of stands containing these habitat components will be a challenge to silviculturists.

Fire management in these stands presents another challenge. Decades of fire suppression have allowed fuels to accumulate. As a result, these stands are vulnerable to destruction by fire (Dargan 1992). One recent prescribed burn within a spotted owl territory removed virtually all logs and oak snags and most of the live oak trees (S. J. Nagiller and T. Randall-Parker, Coconino National Forest, personal communication, 1992).

Management of fuelwood harvest presents yet another important challenge. Oak, pinyon, and juniper are all popular fuelwoods, and demand exceeds supply in some areas (Dargan 1992). Fuelwood harvest could alter habitat suitability for spotted owls, particularly if large trees containing nest cavities are harvested. Illegal cutting of large oak trees in ponderosa pine-Gambel oak forest is a serious problem (Dargan 1992).

Management of winter habitat will also be challenging for resource managers. At present, little is known concerning how owls select wintering areas or use habitat within these areas. Some wintering habitat includes a mosaic of federal, state, and privately owned lands. This mosaic will complicate the planning and implementation of management activities (Laymon 1989).

Studies currently underway will provide resource managers with some of the information needed to answer these challenges. The U.S. Forest Service is conducting population surveys to document how much spotted owls use these habitats. The Rocky Mountain Forest and Range Experiment Station is studying home range size and habitat use by radio-tagged spotted owls in ponderosa pine-Gambel oak forest. This study should provide quantitative information useful in management of both fuelwood and timber harvest. In addition, monitoring of radio-tagged owls migrating to lower elevations will provide information on habitat use within wintering areas. Telemetry studies of habitat use in the mountains of southern Arizona would also be valuable.

Clearly, much remains to be learned regarding the ecology of Mexican spotted owls in oak and associated woodlands and the importance of such habitats to owl populations. Specific management recommendations must await the results of current studies. In the meantime, we urge resource managers to be aware that spotted owls occupy these habitats and to consider the potential impacts of management activities on spotted owls.

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This symposium focused on technologies that bridge the gap between research and its application in the management of woodlands. Topic areas include: ecology and silvicultural practices; growth, yield, and utilization potentials; livestock and grazing practices; wildlife habitat and values; and hydrology and watershed management. The proceedings include titles and abstracts of all papers in Spanish, a bibliography, and a summary of research needs.