

CHARACTERISTICS OF LEWIS' WOODPECKER HABITAT ON THE MODOC PLATEAU, CALIFORNIA

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The Lewis' Woodpecker (*Melanerpes lewis*) breeds throughout western North America in open Ponderosa Pine (*Pinus ponderosa*) forests, logged or burned coniferous forests, open riparian woodlands, and oak (*Quercus spp.*) woodlands (Bent 1939, Snow 1940, Bock 1970, Jackman 1974). Features of each habitat include an open tree canopy, snags, and a shrub understory (Bock 1970, Jackman 1974, Sousa 1983).

The nomadic habits of the Lewis' Woodpecker make quantitative study of its habitat difficult. A population of this species may occur at a location during one breeding season, then disappear from the same location during subsequent years. Bock (1970) attributed this irregular pattern of habitat occupancy to fluctuations in food supply. In this paper we present quantitative descriptions of Lewis' Woodpecker habitat in northeastern California.

STUDY AREA AND METHODS

Our study took place on the Modoc Plateau region of the Modoc National Forest approximately 32 km northwest of Adin, Modoc County, California. The habitat structure of the study area was heterogeneous because a 47,000-ha fire in 1976 had eliminated much of the tree canopy and shrub understory in some areas while leaving other areas undisturbed. Unburned portions of the study area consisted of an open-canopied forest of Jeffrey Pine (*Pinus jeffreyi*), Douglas-fir (*Pseudotsuga menziesii*), and Incense Cedar (*Calocedrus decurrens*) with an understory of Curl-leaf Mountain-mahogany (*Cercocarpus ledifolius*), Green-leaf Manzanita (*Arctostaphylos patula*), Big Sagebrush (*Artemisia tridentata*), Bitterbrush (*Purshia tridentata*), Choke Cherry (*Prunus virginiana*), Bitter Cherry (*P. emarginata*), and Golden Currant (*Ribes aureum*). The fire altered the habitat by replacing the tree canopy with numerous charred snags and removing most of the understory. By 1982 a shrub layer consisting of Green-leaf Manzanita, Choke Cherry, Golden Currant, and *Ceanothus* species was present in burned areas.

Our study site encompassed approximately 2100 ha and included both burned (900 ha) and unburned (1200 ha) habitat. We used a systematic-random sampling scheme (Cochran 1977) to place six 1000-m-long transects in each habitat. Transects were spaced 200 m apart and sampled the entire habitat. We conducted 25 surveys (11 in burned and 14 in unburned habitats) from June through August in both 1982 and 1983 to note the presence of Lewis' Woodpeckers. A chi-square test was used to determine whether the species used both habitats equally (Sokal and Rohlf 1969).

To describe the habitat used by Lewis' Woodpeckers, we randomly selected 25 sampling points each in the burned and unburned habitats. Sampling points

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were systematically placed along the existing survey transects. At each sampling point we used the point-center quarter method to estimate density, basal area, and average height of snags and live trees (Cottam and Curtis 1956). Total and relative cover by shrub species were estimated along a 15-m line intercept. Average shrub height was calculated as the mean height of five systematically sampled shrubs along the line intercept. We recorded the number of shrub species within a 7.5-m radius of the sampling point.

One-way analysis of variance was used to test for differences between burned and unburned habitats (Sokal and Rohlf 1969). A Spearman rank-order correlation coefficient (r_s) was calculated to compare relative frequencies of shrub species occurrences between habitats (Conover 1971).

RESULTS

Lewis' Woodpeckers used burned habitat more frequently than unburned habitat during the period 1 June through 15 July, but showed no significant preference for habitat during the period 16 July through 31 August (Table 1). Burned habitat contained significantly more but smaller snags than did unburned habitat (Table 2). The density of live trees was significantly greater on unburned than on burned habitat. Although the number of shrub species and the amount of shrub cover in the two habitats differed only slightly, the unburned habitat had taller shrubs than the burned habitat (Table 2). The relative frequencies of shrub species were independent of whether or not the area had burned ($r_s = 0.46$; $df = 20$; $P < 0.05$).

DISCUSSION

Lewis' Woodpeckers on the Modoc Plateau used burned habitat with greater frequency than unburned habitat (Table 1). Although they occupied burned habitat throughout our sampling period, they were observed in unburned areas no earlier than August of either year. Furthermore, by locating three nests and observing fledged young, we verified that woodpeckers bred in the burned habitat, but we observed no breeding activity in the unburned habitat. Therefore we conclude that Lewis' Woodpeckers used burned habitat for breeding and after nesting expanded their habitat to include unburned areas.

Table 1 Numbers of Surveys on Which Lewis' Woodpeckers Were Observed in Burned and Unburned habitats on the Modoc Plateau, 1982 and 1983

Dates	Burned habitat ¹		Unburned habitat		χ^2 ^a
	Present	Absent	Present	Absent	
1 June-15 July	4	1	0	7	5.58*
16 July-31 August	5	1	3	4	0.86
1 June-31 August	9	2	3	14	4.68*

^aChi-squared test for goodness of fit: $df = 1$; *, significant ($P < 0.05$) χ^2 value.

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Table 2 Comparisons of Burned and Unburned Habitats Used by Lewis' Woodpeckers on the Modoc Plateau ^a

Variable	Burned habitat		Unburned habitat	
	Mean	SE ^b	Mean	SE
Shrub cover (%)	13.4	3.2	26.5	3.7*
Average shrub height (m)	0.6	0.1	0.9	0.1**
Number of shrub species	4.5	0.3	5.6	0.4*
Snag basal area (m ² /ha)	11.8	3.0	1.9	0.9**
Tree basal area (m ² /ha)	3.8	1.9	31.7	3.6***
Snag density (snags/ha)	471.5	115.2	99.1	19.6**
Tree density (trees/ha)	203.2	38.6	912.7	104.4***
Average snag height (m)	8.3	0.7	16.1	1.2***
Average tree height (m)	12.2	0.9	10.7	1.0

^aSample size is 25 for each group. One-way analysis of variance: $df = 1, 48$. Significance levels: *, $P < 0.05$. **, $P < 0.01$. ***, $P < 0.001$.

^bSE, standard error.

Results of our habitat analysis are not in total agreement with the conclusions of previous studies. Bock (1970) suggested that Lewis' Woodpecker habitat is characterized by snags, an extensive shrub layer, and an open tree canopy. Sousa (1983) stated that optimal breeding habitat should have at least 50% shrub cover and 2.5 snags/ha. In our study area, both the burned and unburned habitats had open tree canopies and sufficient numbers of snags, but neither had an extensive shrub layer. Thus, we suggest that additional factors play major roles in attracting nesting Lewis' Woodpeckers.

SUMMARY

We studied Lewis' Woodpecker habitat in burned and unburned areas of the Modoc Plateau, California. Although both habitats appeared suitable, the species was observed more frequently in burned habitats. We verified that the woodpecker nested on burned habitat, but we observed no nesting activities on unburned habitat. We suggest that factors other than habitat structure alone predispose Lewis' Woodpeckers to use an area.

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Lewis' Woodpecker

Sketch by Narca Moore-Craig