

Are Sooty Grouse Associated With Big Trees Throughout California?

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Abstract

The Sooty Grouse (*Dendragapus fuliginosus*) is commonly thought to be associated with open or early-successional forest. Recently, Bland and Gardner (2013) showed *D. f. sierrae* is closely associated with elements of old forest. Along California's north coast, populations of *D. f. fuliginosus* are presumed to be associated with open or early-successional forest because they typically occupy "coastal mosaic" habitats, comprised of interspersed patches of broadleaf trees, conifers, and grasslands. Here, I show that coastal populations are also closely associated with large conifer trees in breeding season. Territorial males occupied sites with significantly more large trees (canopy diameter ≥ 15 m) than randomly-located unoccupied sites in similar forest cover.

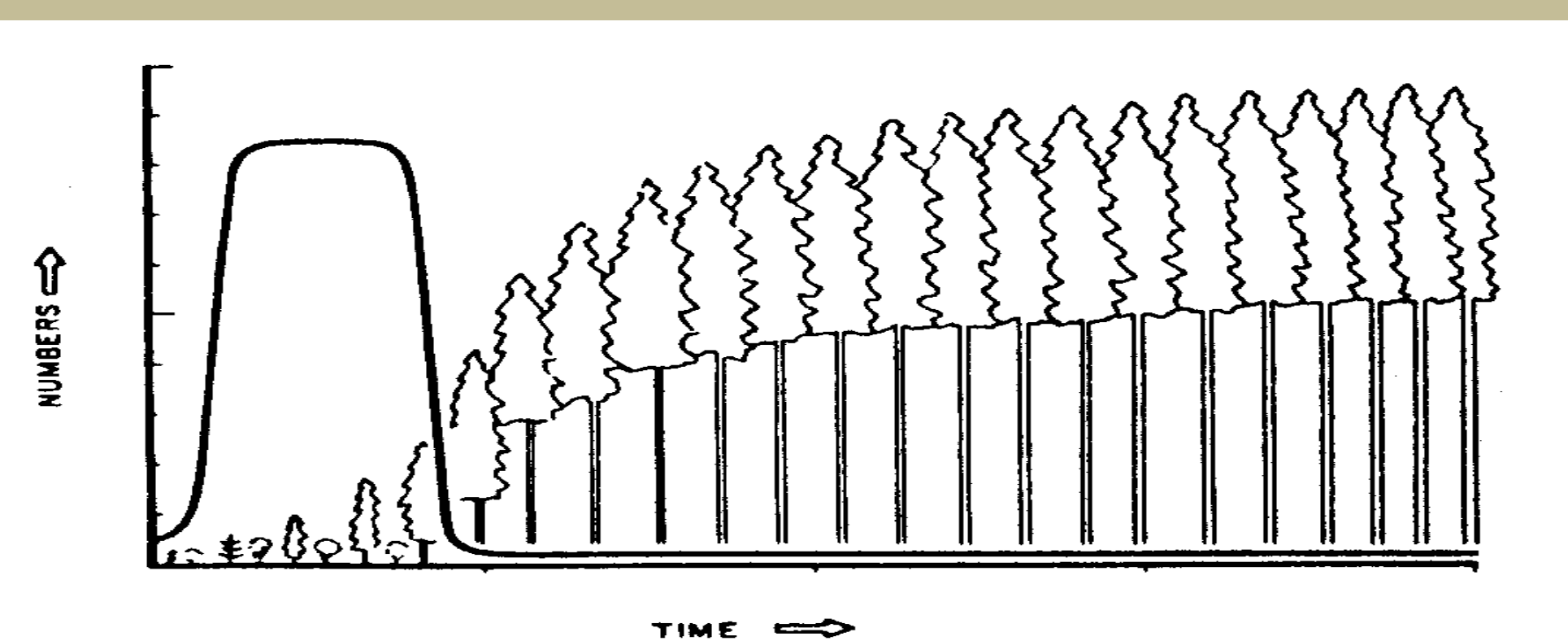


Male Sierra Sooty Grouse displaying from a large Jeffrey pine.

Introduction

Much of the literature on Sooty Grouse indicates the species is associated with open or early-successional forest (Fig. 1). In central California, two subspecies occur in distinctly different forest types, *D. f. sierrae* in xeric coniferous forest with open but more or less contiguous canopy, and *D. f. fuliginosus* in "coastal mosaic" vegetation comprised of interspersed patches of broadleaf trees, conifers, and grasslands. Studies I conducted in 2007-2013 demonstrated *D. f. sierrae* is closely associated with old forest throughout the year, and that territorial males choose songpost trees that average 1 m diameter at breast height (Bland and Gardner 2013). In coastal mosaic habitats, where open grasslands are a dominant landscape feature, *D. f. fuliginosus* has been presumed to have less affinity for mature forest, as is true in the coastal Pacific Northwest (Zwicker and Bendell 2005). The objective of this study was to determine whether *D. f. fuliginosus* is associated with big trees in coastal mosaic habitats of California.

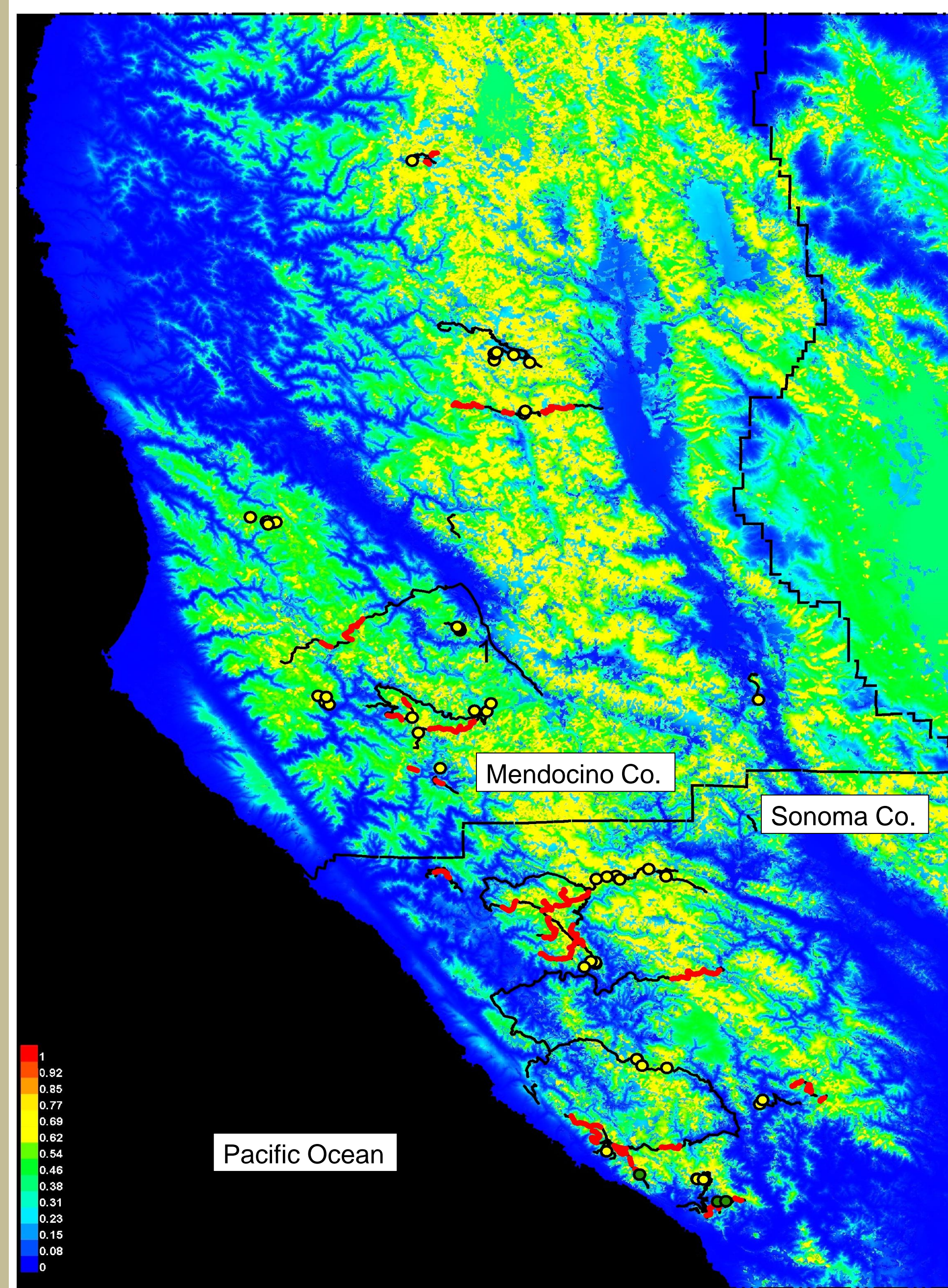
Figure 1. Popular conception of the Sooty Grouse's association with secondary forest succession (Zwicker and Bendell 1985).



Methods

Field surveys were conducted 18 March-30 May, 2016, in northern Sonoma and southern Mendocino Counties (Fig. 2), near the species' southern limit on the Pacific coast. Survey routes were established near historic observation sites, primarily on public lands (e.g., state parks, national forests) and lands owned by conservation NGOs (e.g., The Conservation Fund, The Wildlands Conservancy). Recorded female "cackle" calls were broadcast every 300-500 m at prominent spurs or vantage points to stimulate silent males to sing (Bland 2013). Locations of singing males (occupied songposts) were recorded with a hand-held GPS (Garmin 60C, Garmin Ltd., Olathe, OK).

Figure 2. Study area with habitat suitability model overlay. Black lines are survey routes; yellow dots, locations of detected grouse; red lines, portions of survey routes where comparison sites were randomly selected.



A satellite image of each occupied site was acquired from Google Earth (google.earth.com) and brought into ArcGIS (ESRI Corp., Redlands, CA). A 2-ha circular plot was superimposed over the songpost, and all conifer canopies ≥ 15 m diameter were measured (Fig. 3). Conifers were distinguished from broadleaf species by shape, texture and color, using supervised image classification (Fig. 3). The predominant conifer in the survey area is Douglas fir (*Pseudotsuga menziesii*), although coast redwood (*Sequoia sempervirens*) and white fir (*Abies concolor*) also occur at some sites. Comparable unoccupied sites were identified by first creating a Maxent habitat suitability model (Phillips et al. 2006) based on the elevation and forest cover type (California Wildlife Habitat Relations cover types) of occupied sites (Fig. 2). The sites were then randomly-selected from portions of survey routes that transected suitable cover (Maxent suitability >0.50) but where no singing males were detected. This ensured comparisons would not include entirely unsuitable habitat (e.g., chaparral or redwood forest). Mann-Whitney *U* tests were used to compare the number of large conifers in five canopy-diameter categories: ≥ 15 m, ≥ 16 m, ≥ 18 m, ≥ 20 m, ≥ 22 m.

Figure 3. Identification and measurement of large conifers. Left, true color Google Earth image shows characteristic shape and texture of large conifers. Right, same image, color-classified. Pinks are conifers; greens, broadleaves; tan, grass; black, shadows. Yellow ring is a 2-ha sample plot; white rings, conifer canopies ≥ 15 m diameter.



Results

Forty-seven singing males were detected over ~400 km surveyed. The forest cover types that contributed most to the provisional habitat suitability model were Douglas fir (10.9 %), montane hardwood (8.8 %), and annual grassland (6.2 %). Large conifers were more abundant at occupied sites across all canopy-diameter categories, with canopies ≥ 20 m diameter differing most significantly (Table 1).

Table 1. Number of large conifers at sites occupied versus unoccupied by grouse (plot size = 2 ha).

Diameter Class	Occupied Mean	Unoccupied Mean	Adjusted Z (M-W U)	P-value
≥ 22 m	0.57	0.13	3.39	0.000691
≥ 20 m	1.15	0.26	4.57	0.000005
≥ 18 m	2.53	0.89	4.29	0.000018
≥ 16 m	5.47	2.55	4.13	0.000036
≥ 15 m	7.45	4.19	3.54	0.000395

Conclusions

As in the Sierra Nevada Mountains, and contrary to the common conception of Sooty Grouse habitat associations, male Sooty Grouse in the North Coast Ranges of California are closely associated with large fir trees, which they use as territorial songposts. Thus, the Sooty Grouse is associated with mature forest canopy throughout California, even where the forest canopy occurs in small patches. This finding is significant for conservation and management of Sooty Grouse because the species is thought to have declined in northern Sonoma and southern Mendocino Counties as a result of commercial-scale logging over the past century. Further research is needed to determine the year-round habitat associations and seasonal movements of both male and female Sooty Grouse in coastal California.

Literature Cited

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Acknowledgments

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