Cavity-nesting Bird Use of Nest Boxes in Vineyards of Central-Coast California[1]

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Abstract

Oak woodland habitat is being degraded or replaced by vineyards in many areas of central-coastal California. Oak woodlands are home to many insectivorous, cavity-nesting birds that would be beneficial in and around vineyards. During March to June 2001, we used bluebird nest boxes to study nest box use and productivity of cavity-nesting birds in vineyards versus adjacent oak woodlands. In February 2001, we placed 18 nest boxes 50 m apart in vineyards and in adjacent oak woodland at four woodland/vineyard paired sites in Santa Barbara and San Luis Obispo counties. During April to June, we visited the sites 10 times for a total of 720 nest box checks. Boxes were used by two species of cavity-nesting birds in vineyards and six species in woodlands. Nest box occupancy, clutch size, and number of nestlings were nearly equal within and outside the vineyards. This study provides preliminary evidence that nest boxes may help mitigate oak woodland habitat loss by vineyard development in central-coastal California.

Introduction

More landowners than ever are planting vineyards in central-coastal California. For example, in San Luis Obispo County the number of acres in vineyards has increased from 9,900 acres in 1996 to 26,800 acres in 2000; an average annual increase of 67 percent for each of the past four years (U.S. Department of Agriculture/ Weights and Measures 2001). In some places, this new vineyard acreage is being planted in upland areas that support oak woodlands, home to many secondary cavity-nesting birds. Many of these insectivorous bird species would be beneficial in and around vineyards. The extent to which nest boxes will attract cavity-nesting birds to vineyard sites, the species composition of the birds that use nest boxes in vineyards, and the productivity of the birds using the nest boxes compared to nearby woodland populations have not been studied.

Several studies that compared the breeding success of birds using nest boxes and cavities have demonstrated larger clutch sizes (Purcell and others 1997, Robertson and Rendell 1990), lower predation rates (Nilsson 1984, Purcell and others 1997, Robertson and Rendell 1990), and more young fledged (East and Perrins 1988, Purcell and others 1997) for some species using nest boxes. Because of such results, authors have recommended the use of nest boxes as a conservation tool to help

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augment populations of cavity-nesting birds (Koenig and others 1992, Lynes 2000, Purcell and others 1997).

In this paper, we present preliminary data on nest box use and productivity of secondary cavity-nesting birds in nest boxes in vineyards and adjacent oak woodlands. Our objectives were to begin to look at the use of nest boxes in vineyards as a conservation tool to determine whether nest boxes would be compatible with vineyard management practices.

Study Area and Methods

Our study was conducted in spring 2001 in central-coastal California. Three woodland/vineyard paired study sites, each with oak woodlands adjacent to vineyards, were located in Santa Barbara County just north of Santa Ynez. The sites were approximately 10 km apart. A fourth paired site was located in San Luis Obispo County near Templeton.

The four vineyards ranged in size from 50 to 100 ha and were between 2 and 27 years old. Three of the vineyards had a fungicide or sulfur spray regimen of 7-10 day intervals that took place for 1-2 months during early summer. A dirt road separated each of the four vineyards from the adjacent oak woodlands. All four vineyards had a wire trellising system that created continuous rows of vines.

Overstory trees on the study sites were mostly coast live oak (*Quercus agrifolia)* and blue oak (*Q. douglasii)* with average density of 85 trees/ha and average diameter at breast height (DBH) of 41.4 cm. Solitary valley oaks (*Q. lobata*) were sometimes interspersed. The understory was mostly open. Woodland floors consisted primarily of annuals such as wild oats (*Avena* spp.), bromes (*Bromus* spp.) and fescues (*Festuca* spp.).

Nest boxes were constructed of 2 cm exterior plywood, had a 16 x 14 cm floor, were 27 and 39 cm tall in the front and back, respectively, and had a 3.8-cm diameter entrance hole. In February 2001, we placed 21 of the boxes (84 boxes total) in each of the four woodland/vineyard paired study sites. Boxes were placed in a 7 x 3 grid with 50-m spacing. Nine boxes were placed in a vineyard, nine boxes in adjacent oak woodland, and three boxes on the vineyard edge (*fig. 1*). Results from edge boxes are not included here. In oak woodland sites, we mounted nest boxes 2 m above ground level on live oak trees >10 cm dbh. We mounted nest boxes on t-posts (n=10), if a suitable tree was not within 5 m of a grid coordinate. Nest boxes within vineyards were bolted to 3.8-cm diameter PVC pipe and sheathed over vineyard trellis t-posts 2 m above the ground.

We determined rates of nest box occupancy and productivity by checking nest boxes each 6-10 days (10 times) from mid-April to late June of 2001. We considered the presence of an egg as evidence of nest box occupancy. Because we did not monitor nest boxes at ≤ 4-day intervals, as called for to determine nest outcome (Geupel and Hardesty 1993, Martin and others 1997), we report only the clutch size and number of nestlings that we observed in the boxes.

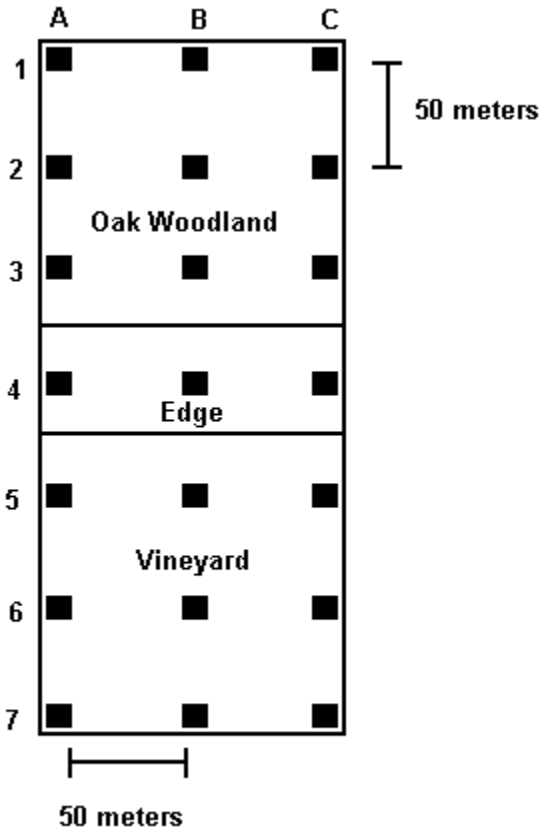

Figure 1— Nest box layout on 1 of 4 woodland/vineyard paired study plots monitored during April to June 2001 in central-coast California.

Results

Overall, nest box occupancy was 21 percent (15 of 72 boxes) (*table 1*). Occupancy was nearly equal in oak woodlands and in vineyards (19 and 22 percent, respectively). Western bluebirds (*Sialia mexicana*) and ash-throated flycatchers (*Myiarchus cinerascens*) were the most common nest box occupants, nesting in six and four boxes, respectively.

Two species nested in boxes in vineyards. Western bluebirds nested in four boxes and ash-throated flycatchers in three boxes. Average clutch size for bluebirds was 5.5 with 95 percent hatching success and 5.3 young produced per attempt. Average clutch size for ash-throated flycatchers was 4 with 92 percent hatching success and 3.7 young produced per attempt.

Six species nested in oak woodlands: western bluebirds and Bewick's wrens (*Thryomanes bewickii*) used two boxes each and ash-throated flycatchers, oak titmice (*Parus inornatus*), tree swallows (*Tachycineta bicolor*) and violet-green swallows (*Tachycineta thalassina*) each used one box. Clutch size for both bluebirds and ash-throated flycatchers was 5 with 100 percent hatching success.

Table 1—*Nest box occupancy and nesting success of secondary cavity nesting birds in vineyard (V) and oak woodland (W) study plots, central coastal California, spring 2001.*

Species	Treatment	Boxes used	Average clutch size	Average number of nestlings
Western bluebird	V	4	5.5	5.3
	W	2	5	5
Ash-throated flycatcher	V	3	4	3.7
	W	1	5	5
Bewick's wren	V	0	—	—
	W	2	6	2
Oak titmouse	V	0	—	—
	W	1	4	4
Tree swallow	V	0	—	—
	W	1	5	5
Violet-green swallow	V	0	—	—
	W	1	4	0

Discussion

Our data from one season of nest box monitoring provide preliminary evidence that at least two species of secondary cavity-nesting birds will use and produce young in vineyard nest boxes in central-coastal California. We found similar numbers of nest boxes occupied, and young produced among nest boxes placed in vineyards versus in adjacent oak woodlands. The main difference we found was in species richness with six species nesting in oak woodland boxes and two species occupying vineyard boxes. The difference in species richness may be partially due to this being the first year of this study. Purcell and others (1997) found that on their California oak-pine study site, nest box occupancy rates increased steadily from 25 percent in 1989 to 68 percent in 1994, with at least two species having low representation in the early part of the study. We expect to see increases in both the abundance and diversity of birds nesting in woodland and vineyard boxes. The diversity of birds nesting in vineyard boxes will probably never equal that of woodlands, however, because of habitat preferences not provided by vineyards.

Several factors may explain disproportionate use of nest boxes in vineyards by western bluebirds and ash-throated flycatchers. Bluebirds readily nest in boxes (Purcell and others 1997, Twedt and Henne-Kerr 2001). Bluebirds are commonly found in open habitat such as farmlands and orchards (Scott 1987). Bluebirds are also less sensitive to human disturbances than many other oak woodland species (Lynes 2000) and may have been less disturbed by management practices that occurred in the vineyards during this study. The ash-throated flycatcher, a species known to nest in a diverse range of habitats and occupy large territories is a late-arriving migrant species. This species may nest in sub-optimal locations when nest sites are limiting (Purcell and others 1997). Ash-throated flycatchers may have nested in vineyards due to a lack of available and suitable oak woodland nest sites.

Management Implications

Nest boxes could conceivably interfere with management practices such as spraying and harvesting of grapes. We found that because our vineyard nest boxes were sheathed over t-posts, the boxes did not impede normal vineyard operations during winter and spring and were easily removed after the breeding season and stored for the next nesting season so as not to interfere with the grape harvest.

Vineyard managers were also concerned with the potential of boxes attracting pest bird species that would either consume grapes or hinder vineyard operations. One common pest species, the European starling (*Sturnus vulgaris*) causes excessive economic loss on farms and usurps nest sites and possibly consumes the eggs of other bird species (Ingold 1994, Purcell and Verner 1999). We excluded starlings from our nest boxes by using an entrance hole less than 4.1 cm as advised by Giusti and Gorenzel (1993) and Lynes (2000). Another common vineyard pest is the house finch (*Carpodacus mexicanus*) which also causes economic losses to vineyard owners by consuming grapes (E. Amoral, personal communication). This bird is smaller than starlings and would have been able to use the nest boxes in this study. We did not find house finches occupying our nest boxes. Future studies should be aware, however, that vineyard nest boxes may attract this pest species which would be a negative consequence to any vineyard nest box program.

While there are some potential drawbacks to erecting bird boxes in vineyards, there are several benefits of bird boxes to vineyard managers. Though our data suggest that nest boxes in vineyards may not be used by the full suite of secondary cavity-nesting birds that occurs in oak woodlands, we found that vineyard boxes may be biologically beneficial to at least two species of secondary cavity-nesting birds, at least to the fledging stage. Bird boxes and the birds they attract are also aesthetically pleasing. Additionally, because environmental conservation is an important social topic, placing bird boxes in vineyards can serve as a valuable political tool to help enhance the conservation image of growers. Vineyard managers may therefore want to consider the inclusion of bird boxes in future vineyard management plans.

We plan to continue this study for several years and expand its scope by erecting boxes in additional vineyards in San Luis Obispo and Santa Barbara Counties.

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