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23. The Role of Vegetation in Cowbird Parasitism of Yellow Warblers

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Abstract

We studied the effects of fire on parasitism of Yellow Warbler nests by Brown-headed Cowbirds. Half of a 67-ha plot of riparian habitat in northern Colorado burned in the spring of 1989. The fire reduced the abundance of Yellow Warbler territories by nearly half, while numbers remained unchanged on the unburned area. Contrary to our expectation, we found that parasitism rates were lower on the burned area in 1989 and 1990 than in 1988, even though there was little cover for warbler nests there, and numbers of cowbird detections there did not decline after the burn. Nest predation increased on both areas after the burn, and Yellow Warblers reproduced poorly in both 1989 and 1990. We suggest that cowbirds switched from using Yellow Warblers to ground-nesting hosts with better-concealed nest sites after the burn. We speculate that cowbirds first chose host habitats by the condition of the local vegetation and then searched selectively for host nests there.

Introduction

Nest parasitism by the Brown-headed Cowbird may pose a major threat to western riparian birds (Goldwasser et al. 1980, Laymon 1987). Brood parasitism by cowbirds may be higher in western riparian habitats than in more extensive woodlands elsewhere, because of their narrow, linear, or patchy configuration (Bleitz 1956, Brittingham and Temple 1983, Sedgwick and Knopf 1988). Cowbird populations in these habitats may also be maintained at high levels by virtue of surrounding habitats being open and often grazed by cattle, thus providing ideal foraging areas for the cowbird (Laymon 1987, Sedgwick and Knopf 1988).

Much research has been directed toward the selection of host species by cowbirds (Friedmann and Kiff 1985) and their impacts on hosts' breeding success (e.g., McGeen 1972, Goldwasser et al. 1980, Brittingham and Temple 1983, Hobson and Sealy 1989). Although some authors have speculated that cowbirds tend to parasitize the species that raised them (Walkinshaw 1949, McGeen and McGeen 1968, McGeen 1972), it has been widely assumed that a cowbird's selection of host species and nests is opportunistic. This assumption is supported by the wide range of hosts that cowbirds are known to parasitize. More than 220 host species have been used, including such inappropriate birds as Blue-winged Teal (*Anas discors*), Ferruginous Hawk (*Buteo regalis*), Wilson's Phalarope (*Phalaropus tricolor*) and California Gull (*Larus californicus*) (Friedmann and Kiff 1985). Because Brown-headed Cowbirds may lay 40 or more eggs in a single breeding season (Scott and Ankney 1980, 1983), there has apparently been little need to be selective. Spreading eggs over a large number of nests will offset any costs to the cowbird of laying eggs in some "inferior" nests.

Zimmerman (1983) found a higher rate of parasitism of Dickcissels (*Spiza americana*) in prairie habitats compared with old field habitats. Few other studies to our knowledge have addressed the processes involved in selection of habitats or of host nests by individual cowbirds (but see Hahn and Hatfield Chapter 13 and other chapters in Part IV). In this chapter we address the roles of habitat quality and predation pressure on the parasitism of Yellow Warbler (*Dendroica petechia*) nests by cowbirds.

In the second year of our study of a population of Yellow Warblers in Colorado, a fire burned nearly half of the study area, transforming the habitat from lush, thick vegetation to burned skeletons of woody shrubs. In the year after the fire, the majority of live vegetation was new sprouts from the roots. With data from one year prior to the fire and two years postfire, we were able to compare choices of burned versus unburned habitats by laying cowbirds, and to make inferences on the process that cowbirds use to select nests to parasitize. We also monitored breeding success of the warblers and noted how both nest parasitism and nest predation in the burned and unburned habitats influenced it.

Study Area and Methods

The study was conducted in a 67-ha portion of a high-elevation (2,470 m) floodplain along the Illinois River at Arapaho National Wildlife Refuge, Jackson County, Colorado. The refuge is located in an intermountain basin in the rain shadow of the surrounding Rocky Mountains. Woody vegetation along the river consists almost entirely of up to eight species of shrubby willows (*Salix* spp.) growing in narrow stringers and dense clumps (Cannon and Knopf 1984). The willows represented the only woody vegetation suitable for placement of Yellow Warbler nests and covered 18.2% of the study area. A minor component of the woody community was scattered stands of Wood's rose (*Rosa woodsii*). Vegetation covering the remaining 81% of the floodplain consisted of grasses, sedges (*Carex* spp.), and various forbs, whereas the surrounding uplands were dominated by sagebrush (*Artemisia* spp.) shrublands.

To describe the avian community in the study area we censused all species of riparian birds in the summers of 1988 to 1990 using point-count surveys following the method of Reynolds et al. (1980). Fifty census points 100 m apart were censused twice each year in June. Twenty-seven census points became the burn in 1989; 23 points were located in the unburned area.

Searches for Yellow Warbler nests commenced in late May each year, soon after the warblers arrived at the site and about the time when nest construction was initiated (W. Howe, J. Sedgwick, and F. Knopf unpubl. data). Each year, nearly all of the warblers nesting on the site were mist netted and color banded to allow individual identification of pair members. Nests were visited at intervals of 2–3 days from the day of discovery to termination of that nesting event. We recorded the incidence of brood parasitism by cowbirds and nesting success as affected by parasitism or predation.

Nest searches in 1988 were conducted as part of a greater community-wide study (Knopf et al. 1988) of high-elevation riparian birds. Yellow Warblers were not the main focus of our research at the time, and nest searches were less thorough than in 1989 or 1990. The area searched in 1988 was entirely contained within the burn of spring 1989. Coverage of the 67-ha site increased each year through 1990, but in no year were nests found on all warbler territories in the study area.

To quantify willow recovery following the fire, we measured the height and width of live and dead vegetation on five willows at each census point in 1989 and 1990. The willow nearest to each census stake was measured, as was the nearest willow in each quadrant defined by the four cardinal directions from that central willow. Willows were measured similarly on the unburned site in 1989 only.

Results

Effects of the Fire on Willows

The fire burned 32 ha of the study site in April 1989, one month prior to the arrival of Yellow Warblers for the breeding season. The aboveground portions of 66% of the willows were reduced to dead skeletons. With the exception of a few small willow stands that were killed entirely, underground portions of most of the burned willows remained alive. Willows that were still alive below ground produced root sprouts that attained an average height of 1.2 m by the end of the 1989 growing season. By the end of the 1990 growing season the root sprouts attained an average height of 1.7 m. Only 0.5 m of new growth was added on average in 1990 due to heavy browsing by moose (*Alces alces*). Mean height of live vegetation in the willows unaffected by the burn was 2.9 m.

Territories and Nests

In 1988 we counted 37 Yellow Warbler territories in the area that later became the burn. Following the fire this number decreased to 20 territories in 1989 and then increased slightly to 22 territories in 1990. Several warbler territories in 1989 were abandoned after only one or two nesting attempts, a pattern not observed in either 1988 or 1990, when three or more renesting attempts were typical. On the unburned site the number of warbler territories from 1988 to 1990 remained stable at 43–44 per year.

Including renesting attempts, we located 34 warbler nests on the burn in 1988, 25 in 1989, and 34 in 1990. The unburned area was not searched for nests in 1988. Roughly half of it was searched in 1989, and nearly all of it in 1990. Including renesting attempts, we located 29 nests in 1989 and 44 nests in 1990.

All of the nests in the unburned area were cryptic and difficult to locate. Many nests in the burn were placed in willows that had not burned, and as usual were well concealed. In 1989, however, 7 of 25 nests located in the burn were placed among burned, dead willow stems with little to no concealing vegetation and were easy to find. Two nests in particular were visible from distances up to 20 m.

Yellow Warbler Fledging Success

Yellow Warbler nesting success in the unburned portion of the study area was high in 1989; 22 of the 28 territories (78.6%) for which we had complete data successfully fledged at least one young. This percentage decreased to 19 of 35 territories (54.3%) in 1990, primarily because of higher predation that year (see below).

Before the fire, data for the burn site were incomplete for all but a few territories, and we did not get a good estimate of fledging success in 1988. After the fire in 1989, young fledged from only 2 of the 20 territories successfully. Seven of 22 territories (31.8%) produced fledging young in 1990,

reflecting the improved condition of the vegetation in the second year following the fire.

Cowbird Numbers and Nest Parasitism

The number of cowbirds detected on censuses was too small to estimate density on the burned and unburned sites. Raw numbers of cowbirds detected are therefore reported. On the burn, a mean of 13.0 cowbirds was detected per census in 1988, 13.5 in 1989, and 28.0 in 1990 (Figure 23.1). The mean number detected per census on the unburned site was similar to the burn mean in 1988 (13.5) but was only 4.5 in 1989 and 10.0 in 1990. The higher numbers detected on the burn in 1989 and 1990 were most likely due to the greater detectability of birds following the fire, as there was little vegetation present to interfere with visual or auditory detections.

Although the number of cowbirds detected on the burn site after the fire first remained stable (1989) and then increased (1990), the proportion of Yellow Warbler nests parasitized by cowbirds declined (Figure 23.1). Nine of 34 nests (28.6%) were parasitized before the fire in 1988, but only 3 of 19 nests (15.8%) in 1989 and 7 of 34 nests (20.6%) in 1990 were parasitized. In contrast, 5 of 24 nests (20.8%) were parasitized on the unburned site in 1989, and 17 of 40 nests (42.5%) were parasitized in 1990. No cowbirds were known to have fledged from the burn in either 1989 or 1990. At least four cowbirds fledged from the unburned site in 1989 and one in 1990.

Nest Predation

Several nest predators were present in the study area in all years. Primary avian predators included Black-billed Magpies (*Pica pica*) and Common Grackles (*Quiscalus quiscula*), both of which were observed depredating nests of the Yellow Warbler. Each year a family of magpies was observed systematically searching the study area, apparently for nests, from late May into June at a time when egg laying was at its peak. Mammalian predators probably included striped skunk (*Mephitis mephitis*), long-tailed weasel (*Mustela frenata*), and perhaps Richardson's ground squirrel (*Spermophilus richardsonii*). No mammals were seen depredating nests, but a number of nests each year were found torn out of the supporting branches, with eggshell fragments or bands and body parts from banded nestlings present on the ground below the nests. We attribute these failures to mammals.

Nest predation accounted for the greatest loss of nests in both 1989 and 1990 (Figure 23.1). In marked contrast to nest parasitism by cowbirds, nest predation on the burn site skyrocketed in the years after the fire, almost certainly due to the greater visibility of nests to predators. In 1989, 14 of 25 nests were depredated on the burn (56.0%), but only 8 of 29 nests (27.6%) were depredated on the unburned site. Nest predation was higher in 1990 than in 1989, but the pattern remained similar: 23 of 34 nests on the burn (67.6%) and 25 of 44 nests (56.8%) on the unburned site.

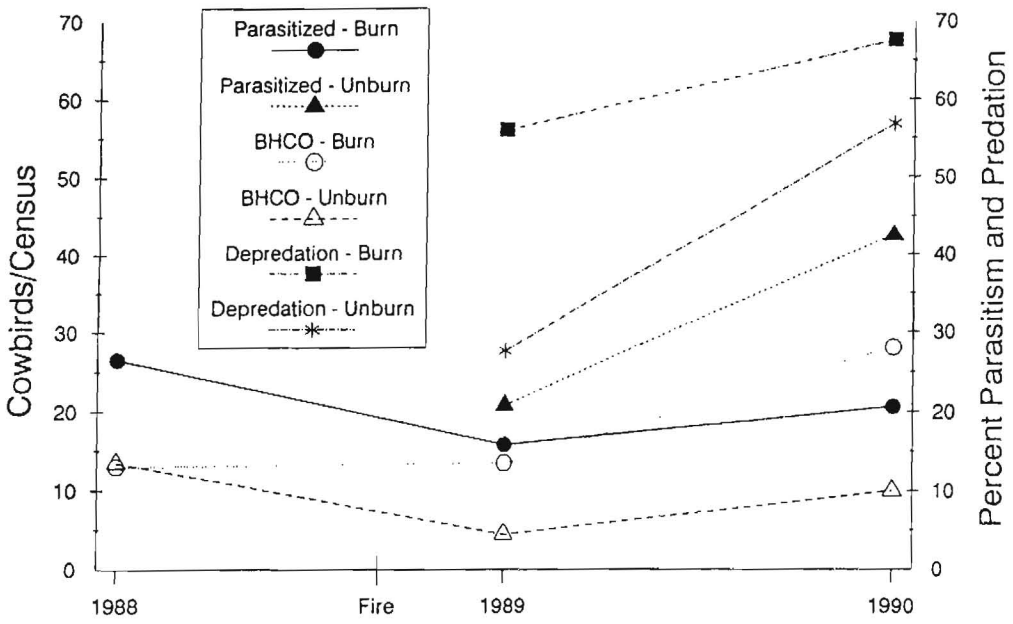

Figure 23.1. Parasitism and predation rates on Yellow Warbler nests, and number of cowbird detections on point-count censuses on burned and unburned sites from 1988 to 1990.

Discussion

Censuses confirmed the continued presence of cowbirds on the burn in years following the fire, although the increase in observations may be due to the greater visibility of cowbirds among the burned willows rather than to an actual increase in their numbers. In addition, adult warblers were fairly easy for us to observe and follow throughout their territories in most cases. We assume that female cowbirds should also have had little difficulty locating female warblers and nests on the burn because of their increased visibility. The ease with which avian and mammalian predators located nests on the burn supports this view. The decline of cowbird parasitism of Yellow Warbler nests after the fire was therefore contrary to our expectations.

The reduction of parasitism on Yellow Warbler nests may reflect a shift in host species by the cowbirds from species nesting in the willows to other bird species on the site. Our impressions were that the grasslands and meadows were less affected by the fire and recovered relatively quickly. Ground-nesting species, such as Song Sparrow (*Melospiza melodia*) and the abundant Savannah Sparrow (*Passerculus sandwichensis*), were each observed feeding fledgling cowbirds on the burn in both postfire years. The extent to which the fire affected parasitism of those and other species of open habitats, however, is not known. A community-wide look at shifts in parasitism rates among species would shed light on the ability of cowbirds to respond to microhabitat changes by adjustments in host or microhabitat selection.

The reduced parasitism of exposed Yellow Warbler nests in this study suggests that the availability of host nests is only one of several stimuli employed by searching cowbirds. We suggest that cowbirds use a hierarchical approach similar to that used by shrub-nesting passerines to select habitat (Knopf et al. 1990). In the case of the cowbird, birds seem initially to select specific features of the vegetation and landscape prior to initiating specific searches for host nests. We speculate further that the choice of landscape and vegetation for laying is influenced by the natal habitat of the individual cowbird.

Management Implications

Besides providing insights into how cowbirds may search for hosts, this opportunistic study further emphasizes that cowbird parasitism should not be viewed independently of the other principal source of reproductive loss, predation. Management of vegetation to provide good nesting cover for host species may in some situations favor increased rates of cowbird parasitism. Certain management practices, such as prescribed burns, may reduce cowbird parasitism locally but at a cost of lowered host reproductive success due to increased levels of predation. We find it interesting that predators located all parasitized nests in the burn in this study, suggesting that parasitism increased the probability that predators would detect host nests.

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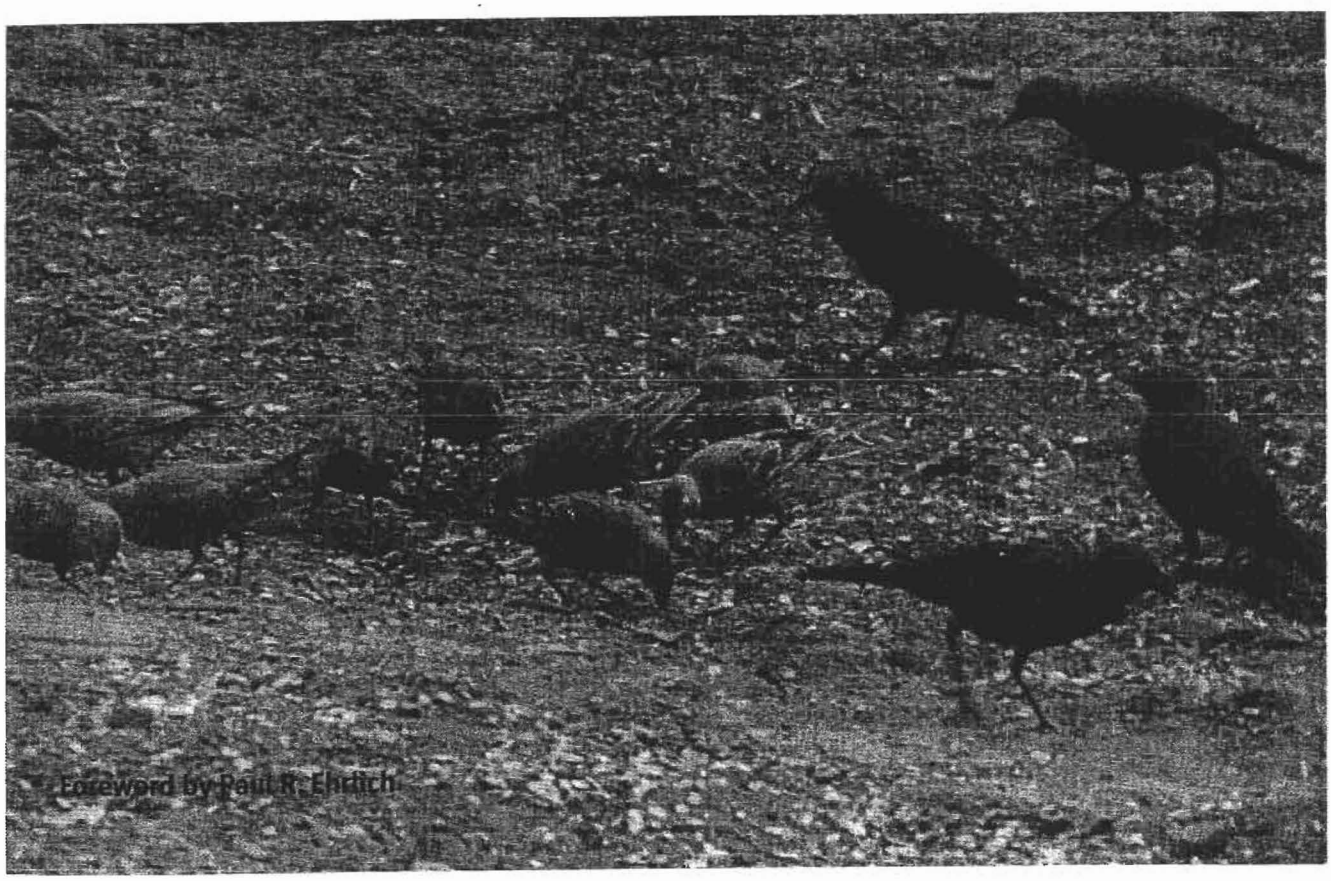

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Title page photograph of a flock of juvenile Brown-headed Cowbirds by Stephen I. Rothstein.