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92

Management Implications of Cowbird Parasitism on Neotropical Migrant Songbirds

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Abstract — Populations of brood parasitic Brown-headed Cowbirds (*Molothrus ater*) have increased to the point where they pose a potential threat to populations of many neotropical migrant songbirds. Because cowbirds mostly feed in short grass (e.g., pastures and lawns) or on bare ground (e.g., row crops), they benefit directly from human activities. Cowbirds commute up to 7 km between feeding areas and habitats where they search for host nests, often favoring forest edge or secondary growth. Several neotropical migrants with restricted geographical ranges are endangered, at least partly as a result of cowbird parasitism (e.g., Kirtland's warbler *Dendroica kirtlandii*, Black-capped Vireo *Vireo atricapillus*). Cowbird control using baited decoy traps has reduced the percent of nests parasitized, increased nesting success, and may be essential for the continued survival of these endangered species. It is not clear, however, whether cowbird trapping would be effective at a broader scale in reducing parasitism in extensively fragmented landscapes such as in the Midwest where many neotropical migrants are experiencing very high levels of parasitism. Cowbird trapping should be viewed as a stop-gap measure to protect specific endangered populations. We recommend instead the development of broader-scale approaches, perhaps in combination with local trapping. One approach to controlling cowbirds is landscape-level management such as consolidation of ownership to preserve large tracts, eliminating potential cowbird feeding areas within large tracts, and minimizing edge habitat. A second possible approach is large-scale cowbird eradication at winter roosts, but this approach may be too diffuse to help specific sensitive species or areas with high parasitism levels. Any management plan should be preceded by cowbird monitoring and preliminary data on levels of parasitism.

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BACKGROUND

Parasitism by the Brown-headed Cowbird (*Molothrus ater*) has become one of the major threats to populations of neotropical migrants on the breeding grounds (Mayfield 1977, Brittingham and Temple 1983). The Brown-headed Cowbird is a generalist brood parasite that lays its eggs in the nests of over 240 known host species (Friedmann and Kiff 1985), the majority of which are neotropical migrants. Historically, cowbirds were largely confined to the mid-continental prairies where they presumably followed herds of nomadic bison. Cowbirds mainly search for seeds and insects in short grass and on bare ground and may have depended upon grazing by large ungulates to create suitable feeding conditions. Since the clearing of forests for agriculture and the widespread introduction of livestock, however, cowbirds have expanded their geographical range eastward and westward as new feeding areas became available (Mayfield 1965). Similarly, cowbird populations have increased within their range as a result of increasing winter food supply (primarily waste grain in agricultural fields) and higher reproductive rates as cowbirds have come in contact with new hosts that lack defenses against parasitism (Mayfield 1965, Brittingham and Temple 1983). Cowbird populations have continued to increase in most sections of the United States (with the notable exception of the northeast: Robbins et al. 1986).

Increasing cowbird populations pose a potential threat to many hosts because of the cowbird's extraordinary fecundity and the extent to which cowbird parasitism reduces host productivity. Female cowbirds lay at least 30-40 eggs per season on average (Rothstein et al. 1986). Dan Roby (pers. comm.) found that individuals in captivity can lay up to 77 eggs in a season. Relatively small numbers of cowbirds can therefore parasitize many nests. Cowbird parasitism reduces host productivity for the following reasons: (1) female cowbirds remove host eggs (usually one) from 33% to 90% of all parasitized nests (Friedmann 1963, Weatherhead 1989, Sealy 1992); (2) cowbird eggs are unusually thick and, when laid, often break those of the host (Spaw and Rohwer 1987, Roskaft et al. 1990); (3) cowbird eggs have a short incubation period of 11 days compared with 12-14 days for most hosts (Nice 1953, Friedmann 1963), which gives nestling cowbirds a head start; (4) cowbirds usually parasitize hosts smaller than themselves, which gives cowbird nestlings a further advantage in competition with host young; and (5) cowbird nestlings grow faster, beg more loudly and have larger gapes than host nestlings (Friedmann 1929, Ortega and Cruz 1991). As a result of these factors, small hosts with long incubation periods usually fail to produce any of their own young if a single cowbird egg hatches (Rothstein 1975, May and Robinson 1985). For larger hosts and those with shorter incubation periods, cowbird parasitism is less costly (Smith 1981, Roskaft et al. 1990, Friedmann et al. 1977), except when the nests are multiply parasitized (i.e., two or more cowbird eggs are laid).

Neotropical migrants are especially vulnerable to cowbird parasitism. Most neotropical migrants build open-cup nests, which are the most frequent target of cowbirds (Friedmann 1929). The cowbird egg-laying period generally extends from mid-April until mid-July (Friedmann 1929, Scott 1963, Robinson, unpubl. data), which also coincides with the major period of egg-laying in most neotropical migrants (Whitcomb et al. 1981). Resident and short-distance migrants generally have longer breeding seasons that only partially overlap that of the cowbird.

Cowbird hosts with restricted geographical ranges can be particularly vulnerable to parasitism. Cowbird parasitism is considered one major cause (along with habitat loss) of population declines and the endangered status of the Kirtland's Warbler (*Dendroica kirtlandii*) (Walkinshaw 1983), Least Bell's Vireo (*Vireo belli pusillus*) (Franzreb 1989), Southwestern Willow Flycatcher (*Empidonax traillii extimus*) (Unitt 1987, Brown 1988), and Black-capped Vireo (*Vireo atricapillus*) (Grzybowski et al. 1986). Cowbird hosts with larger ranges may be less vulnerable because heavily parasitized populations can be "rescued" by immigrants produced from populations in areas where parasitism levels are lower. Local extinctions of wide-ranging species, however, have occurred in Oklahoma (Orchard Oriole, *Icterus spurius*) (J. Grzybowski, pers. obs.) and in the lower Rio Grande Valley (J. Arvin, pers. comm.) and may be linked to heavy parasitism.

The parasitic life history of cowbirds enables them to occupy a wider range of habitats than any other North American passerine. Because cowbirds do not tend their own offspring, their two main activities during the breeding season, feeding and searching for hosts, can be uncoupled and carried out in different locations. Cowbirds can therefore occupy habitats that fulfill only one of these needs (Rothstein et al. 1984) and regularly commute up to 7 km between feeding and nest-searching sites (fig. 1, see also Rothstein et al. 1984). In southern Illinois and central Missouri, for example, cowbirds that searched for nests in forests fed 0.1-4.0 km away in pastures, feedlots for livestock (pigs, horses, and cattle), mowed roadsides, lawns, recently plowed and planted row crop fields, campgrounds, gravel roadsides, bird feeders, and logging roads (fig. 1). In the Sierra Nevada of California, recently arrived cowbirds commuted on average once a day between horse corrals and feeding areas. Rothstein et al. (1984) estimated that this single corral made it possible for cowbirds to parasitize hosts over an area of 154 km² that contained no other suitable feeding sites.

In southern Illinois, where there are many potential feeding sites, cowbirds fed throughout the day (fig. 2). Perhaps because of the proximity of feeding and nest-searching areas, cowbirds tend to be most abundant in heterogeneous "fragmented" landscapes in which grassy areas are intermixed with shrubby old fields and/or forests. Cowbird control may be much more difficult in landscapes where human activities have created many potential feeding areas (Rothstein et al. 1987; see below).

away from these animals (Grzybowski 1990a). However, if livestock are dispersed, effectiveness is compromised (Rothstein et al. 1987, Tazik and Cornelius unpubl. data).

A modification of this approach has been used with rotational grazing systems, a system where cattle are moved from pasture to pasture on a rotational basis. At the Kerr WMA in Texas, cattle were placed immediately adjacent to Black-capped Vireo nesting areas (containing traps) at the beginning of the nesting season. Capture rates of females improved dramatically for the trap closest to the cattle, observed parasitism was the lowest recorded, and vireo reproductive success the highest (Grzybowski 1990b).

Capture rates at traps are often high at the beginning of the trapping effort, and drop substantially after an initial capture period of two to four weeks. Most of the cowbirds are normally removed in this initial period, although traps operated near cowbird feeding sites continue catching cowbirds for most of the season.

Cowbird Shooting

Female cowbirds can be attracted to taped calls and removed by shooting. Shooting has been used in conjunction with trapping on Fort Hood (Hayden and Tazik unpubl. data), but the specific effects of shooting were not isolated from those of trapping. About 247 female cowbirds were removed, some of which may have been later trapped if not shot. Nonetheless, the technique can be used to remove a substantial number of cowbirds, and may be useful and more cost-effective in some areas with small or scattered groupings of sensitive species. Cowbirds, however, are sensitive to activity near the traps, including extended human visitation. Thus, shooting should not be conducted at the trap locations themselves.

Control at Roosts

Because cowbirds gather in large roosts during the nonbreeding season, they are potentially vulnerable to large-scale control efforts (e.g., Johnson et al. 1980). Such control efforts, however, should be considered carefully before they are implemented. Previous eradication programs have had little apparent effect on national populations of cowbirds, possibly because birds from many regions gather in the same roosts. The effects of control at winter roosts are therefore likely to be diffuse and may not protect any specific endangered population. Control efforts may also work only for a few years if they select for cowbirds that avoid large roosts. Nevertheless, control at winter roosts may offer the most practical way to reduce cowbird populations in fragmented landscapes where local trapping is too expensive. Even if many of the cowbirds killed would be from areas where they pose little threat, the enhanced productivity of host species throughout their range might increase the pool of immigrants available to recolonize

areas with heavier rates of parasitism. Martin (1992), however, has argued that in most areas the effects of nest predation on host population dynamics far outweigh the consequences of brood parasitism. Landscape management that reduces both cowbird and nest predator populations (Temple and Cary 1988) may therefore still be the best long-term solution to preserving populations of neotropical migrants (see below). The ethical implications of large-scale eradication of a native songbird also need to be considered before such a program is considered. Even among the authors of this paper, opinions are divided about the value of control at winter roosts.

Landscape and Habitat Management

Perhaps the best and most permanent way to reduce the impact of cowbirds on neotropical migrants is through landscape-level management, which can be effective at a much larger scale than trapping. Because cowbirds are frequently associated with agriculture, human settlements, and internal and external edges, the best management strategy is to maintain large areas of contiguous habitat. Unfortunately, we cannot provide one specific guideline for minimum area requirements for reducing cowbird impacts because edge effects vary among landscapes and cowbirds can commute long distances when searching for nests (fig. 1). *As a general rule, however, bigger tracts are preferable to small ones, wider riparian strips are better than narrow ones, and compact shapes are preferable to complex shapes with high ratios of edge to interior.*

Managers must also keep in mind the landscape surrounding the area being managed. Landscapes with few feeding opportunities for cowbirds may not have problems with cowbird parasitism even along edges and small openings. Landscapes with abundant cowbird feeding habitat may have cowbird populations that saturate breeding habitat regardless of proximity to edge. Ultimate solutions to the increasing threat of cowbird parasitism to neotropical migrants must involve changing land-use practices and configurations that reduce cowbird feeding areas. Below we provide more specific guidelines.

Forest Habitat

1. Where possible, managers should seek to maintain and establish large areas of contiguous forest cover that include core areas of forest interior. Estimates of areas necessary to sustain populations of neotropical migrants vary regionally. Robbins et al. (1989), for example, suggest maintaining at least 3000 ha of contiguous forest as the minimum required to retain local populations of forest songbirds in the mid-Atlantic states. Data from moderately fragmented areas of the Midwest suggest that areas of 20,000-50,000 ha may be necessary because the landscape supports very high cowbird populations and parasitism rates remain high even two km from feeding areas (Robinson, unpubl. data). The Biological Advisory Team (1990)