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 km^2 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).

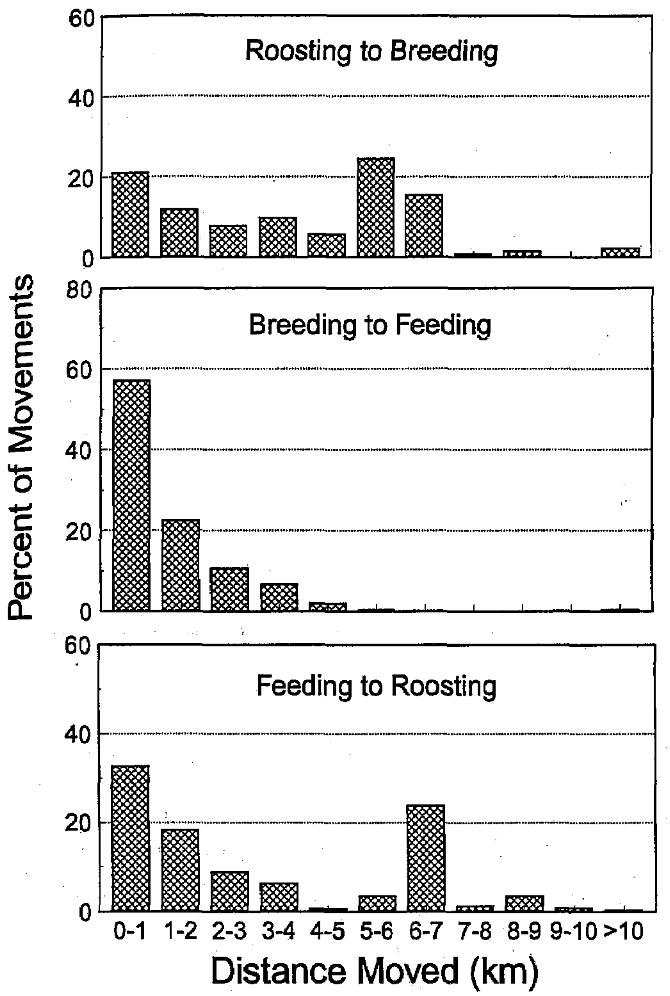

Figure 1. — Movements patterns of breeding female Brown-headed Cowbirds in Illinois and Missouri. Movements are presented as the percent of total movements from roosting to breeding, breeding to feeding, and feeding to roosting locations in 1 km distance classes, and are based on 1,160 movement by 96 radio-tagged Cowbirds during 1991 and 1992 (Thompson, In Review).

CONDITIONS FAVORING COWBIRD PARASITISM

Numbers of cowbirds and rates of parasitism within the Eastern deciduous forest vary with distance from edges (Gates and Gysel 1978, Chasko and Gates 1982, Brittingham and Temple 1983). In an extensively forested area of Wisconsin, for example, Brittingham and Temple (1983) and Temple and Cary (1988) found that percent of parasitized nests declined from 65% within 99 m of an edge to less than 18% at >300 m. Brittingham and Temple (1983) argued that forest fragmentation leads to higher levels of parasitism by increasing the ratio of forest edge (>300 m from an edge) to forest interior (300 m from an edge). In a moderately (50%) forested area of the Shawnee National Forest in southern Illinois, however, Robinson et al. (in review) and Trine et al. (in review) found no appreciable decrease in parasitism levels even 800 m from the nearest edge. Apparently,

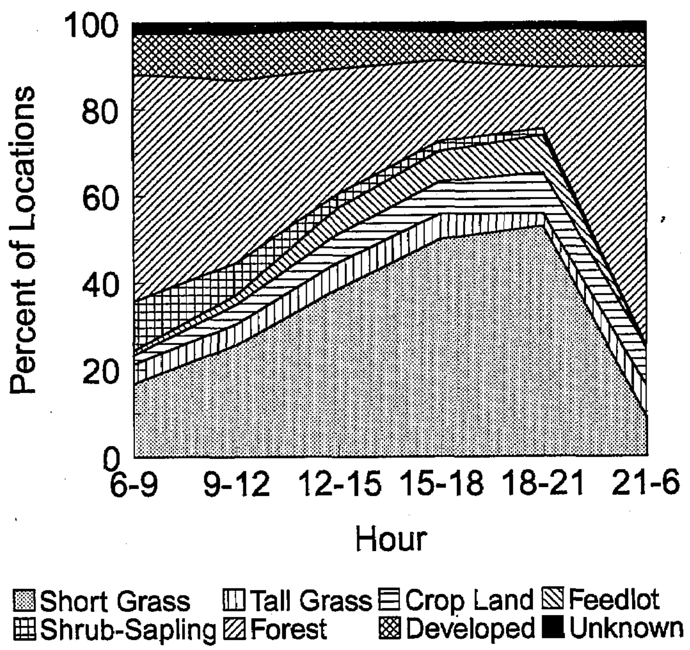

Figure 2. — Diurnal patterns in habitat use by breeding female Brown-headed Cowbirds in Missouri and Illinois. Habitat use was determined from 3,584 locations of 96 radio-tagged female Cowbirds in 1991 and 1992 (Thompson, In Review).

cowbird populations have saturated the available forest in this area. In contrast, the percent of nests parasitized is low (<10%) throughout extensively (>80%) forested sections of the Mark Twain and Hoosier National Forests (John Faaborg and Don Whitehead, pers. comm.). Similarly, Hoover (1992) found no evidence of an edge effect in central Pennsylvania where cowbird populations are generally low. The magnitude of the "cowbird edge effect" therefore varies within and among regions, apparently in response to landscape-level variation in fragmentation and cowbird abundance.

There is little information on differences between "internal" edges, such as those around clearcuts or "wildlife" openings, and "external" edges such as agricultural fields. Overcash and Roseberry (1987) found cowbird abundance to be 4-5 times higher around small (<4 ha) wildlife openings in the Shawnee National Forest of southern Illinois, but have no data on nest parasitism. Don Whitehead (pers. comm.) found higher parasitism levels along clearcuts than in forest interior in the Hoosier National Forest even though there is no feeding habitat for cowbirds in clearcuts. Brittingham and Temple (1983) found that levels of parasitism were just as high near openings of 0.2 ha as they were near agricultural openings. Robinson is currently studying the effects of small (≤0.2 ha) openings created by selective logging on cowbird parasitism.

Corridors such as powerlines within forest habitats also create internal edges. Gates and his colleagues looked at whether numbers of cowbirds and levels of parasitism are higher near these openings and compared these results with natural corridors created by streams (Chasko and Gates 1982, Gates and Giffen 1991). They found numbers of cowbirds and levels of parasitism were higher near both types of corridors, but also found higher host densities near corridors. Gates is continuing his research on cowbird use of these edges. Johnson and Temple (1990) also found that cowbird parasitism was higher near woody corridors and edges in tallgrass prairie habitat.

Livestock

Not surprisingly, availability of local feeding areas such as livestock corrals is associated with high levels of brood parasitism. Verner and Ritter (1983) and Rothstein et al. (1980) found that areas near pack stations, livestock corrals, and free-ranging livestock in the Sierra Nevada had higher numbers of cowbirds and parasitized nests. Cowbirds were rare in areas far from pack stations or other human disturbances. In the Shawnee National Forest, telemetry studies showed that cowbirds visit pastures and feedlots even in the morning (fig. 2).

Structure of the Vegetation

Within a site, the percent of nests parasitized can vary with the structure of the vegetation. Cowbirds are frequently observed perched or displaying at the top of dead snags. Anderson and Storer (1976), working within relatively open jack pine (*Pinus banksiana*) habitat, found parasitism of Kirtland's Warbler nests to be more likely when a dead snag was near the nest. Brittingham and Temple (unpubl. data) found no such relationship with snag proximity in a deciduous woods. Freeman et al. (1990) also found that cowbirds were more efficient at finding active nests in marshes with a high density of trees around the perimeter. Apparently, female cowbirds used trees as perches to locate nests and observe host behavior. Because of interspecific differences in host nest placement, however, it is unlikely that changes in vegetation structure will affect incidence of parasitism for all species in a community in the same way. Thus, we are not yet in a position to recommend general ways of managing vegetation structure to reduce cowbird parasitism.

Geographic Variation

Levels of cowbird parasitism are not homogeneous over large geographical areas. Wood Thrushes (*Hylocichla mustelina*), for example, experience much greater parasitism in midwestern than in eastern North America (Hoover and Brittingham, in press) where cowbirds are less abundant (fig. 3). The same is true of Red-winged Blackbirds (*Agelaius phoeniceus*; Freeman et al. 1990). The effects of cowbird parasitism on neotropical migrants may therefore be most severe in the Midwest, and approaches to reducing parasitism should perhaps be the focal issue in the conservation of forest-dwelling neotropical migrants in that region.

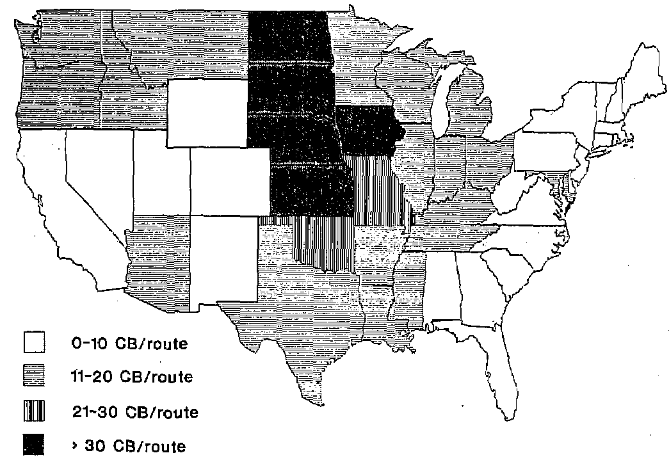

Figure 3. — Distribution and abundance of brown-headed cowbirds according to the Breeding Bird Survey.

MANAGEMENT OF COWBIRDS

Baseline Data

In the cases of a few species (e.g., Kirtland's Warbler, Black-capped Vireo, Golden-cheeked Warbler [*Dendroica chrysoparia*]) with small populations that are already threatened or endangered and are known to be severely affected by cowbird parasitism, immediate and intense management of cowbird populations may be necessary (see Cowbird Trapping below). However, because parasitism levels vary geographically for most other host species, local data on cowbird abundance, distribution, and levels of nest parasitism should be gathered to determine the extent to which cowbird management efforts are necessary. When monitoring bird populations, cowbirds should be given special attention. During point-counts, cowbirds heard giving their distinctive "rattle" call should be recorded separately from those giving other calls. The rattle call is usually given by females (Rothstein et al. 1988), whereas the other two calls are primarily or exclusively given by males. Because cowbirds have a strongly male-biased sex ratio (Rothstein et al. 1986, Yokel 1989), many males present in nest-searching areas are likely to be unmated and may be searching for mates rather than nests. Females, on the other hand, are more likely to be searching for nests. The distribution and abundance of female cowbirds is therefore potentially a better indicator of local variation in the intensity and spatial distribution of nest parasitism.

It is possible that the ratio of female cowbirds to hosts detected in fixed-radius point counts can be used as a crude index of parasitism intensity at the community level. In Illinois, ratios of 0.05-0.10 cowbird females:host males detected within fixed-radius point counts corresponded with very high levels (60-80% of all nests) of brood parasitism for most neotropical migrants (Robinson and Wilcove, in review, Robinson, unpubl. data). Because species vary enormously in susceptibility to parasitism (May and Robinson 1985), however, census data cannot be used to estimate parasitism frequencies for any one species. Rather, census data are best used to locate areas where parasitism is most likely to be a problem and in need of further study (see below). For this reason, census efforts should include points near edges (including openings created by logging, wildlife management, and agriculture) as well as in the interior of habitats (e.g., Brittingham and Temple 1983).

Data on distribution of local cowbird feeding areas is essential for designing and predicting effectiveness of cowbird control efforts (Rothstein et al. 1987). Radio-telemetry of cowbirds provides the best data on use of both feeding and breeding areas (Rothstein et al. 1980, 1984, F. Thompson, unpubl. data), but is expensive (ca. $140/transmitter) and labor intensive. F. Thompson estimated that tracking 35-40 female cowbirds fitted with transmitters with a crew of three for a two-month period costs $25,000-35,000/site/year. If telemetry is too expensive, cowbirds can be censused by visiting potential feeding sites, especially at mid-day and in the afternoon. If cowbird feeding areas are restricted, cowbird trapping is much more likely to be effective (Rothstein et al. 1987). There are also some indications that female cowbirds may roost together even during the breeding season in some areas (F. Thompson, unpubl. data), which might provide further opportunities for local control.

Once cowbirds have been determined to be present in an area, pilot studies should be initiated to obtain parasitism estimates for the most potentially sensitive species. Percent parasitism can be estimated from a sample of nests (Pease and Grzybowski, in review) or the relative frequencies with which hosts are seen feeding their own fledglings versus cowbird fledglings. If the level of parasitism is high (>25% of nests), the species most likely does not reject cowbird eggs (Rothstein 1975) and may be threatened by cowbird parasitism.

Once a potential threat has been established, one should then ideally assess the assumption that the presence of cowbirds is reducing host reproductive success to levels below that needed to compensate for adult mortality. The critical parameters to measure are: (1) parasitism frequency, (2) nest predation frequency, (3) frequency of abandonment of parasitized and unparasitized nests, (4) the number of host young fledged from parasitized and unparasitized nests that escape predation, (5) the length of the nest cycle, (6) the length of the incubation period, and (7) the length of the breeding season (May and Robinson 1985, Pease and Grzybowski, in review). The last three parameters can often be obtained from the general ornithological literature. The first four parameters, however, can only be obtained by hiring a crew of skilled field workers. With these data, managers can estimate the average seasonal productivity per pair, given renestings. In general, host populations must produce 2.0-2.5 young/pair/season to maintain a positive population growth rate, assuming adult and juvenile survival rates of 40-60% and 20-35% respectively. As more demographic studies of color-marked populations are conducted, estimates of survival rates will improve as will our ability to estimate the productivity necessary to maintain positive population growth rates.

The levels of brood parasitism that a population can tolerate (i.e., maintain a positive growth rate) vary with the parameters described above. Species with high nest predation, low abandonment of parasitized nests, long incubation periods, and short breeding season relative to the length of the nest cycle can tolerate only low levels of parasitism. Conversely, species with low nest predation rates, high abandonment rates of parasitized nests (e.g., Prairie Warbler *Dendroica discolor*: Nolan 1978), short incubation periods and long nesting season might be able to tolerate high levels of parasitism. Managers should consult with researchers studying bird demographies when the threat posed by parasitism is unclear.

Cowbird Trapping

Trap Design

Trapping cowbirds has been successfully used to manage several neotropical migrants with small populations and local geographical ranges. Cowbird trapping, however, is unlikely to be effective over large areas such as national forests, which require landscape-level management (see below). Here we summarize methods used to trap cowbirds in situations where it is most likely to be effective. Traps used for removing cowbirds are referred to as cowbird decoy traps. They are typically outdoor cages which range in size from very portable versions with dimensions as small as 2 X 2.5 X 1.5 m to larger cages 5 X 5 X 2 m. The latter size is more often used to remove large numbers of blackbirds from areas of concentration during the winter months. They can be constructed into panels which can be quickly assembled and disassembled if there is a need to move them from location to location. They should also have a small side box with a removable side opening into the cage at a top corner wall no more than an arm's length deep into which cowbirds can be collected and thus removed. The basic design is described in a USDI leaflet (1973); other designs and recommendations for construction from inexpensive materials are provided.

Free-ranging cowbirds are attracted to the live-decoy cowbirds in the trap and a food source, and enter through some funnel or slit entrance, normally dropped from the ceiling of the cage. Once inside, cowbirds will usually attempt to leave the trap by moving upward, but toward the side walls, rather than directly up through the funnels. Thus most, if not all never find an exit.

The funnels, however, should be dropped to such an extent that cowbirds seeking an exit along the top sides of the trap have enough room to circle around the funnel, but above the funnel entrance. The funnel should have some wire mesh across it and below its top wide enough for cowbirds to pass through, but not presenting an obvious open hole when viewed from the floor of the cage.

Slit designs, modeled after Australian Crow traps, can also be used. Slits of 1-1/2" width allow a cowbird to drop through with open or closed wings, but are narrow enough to make it inconspicuous as the exit, and, because the cowbird has to fly directly upward, too narrow for the cowbird to pass through with open wings. To some extent, slit designs have been more successful in preventing escapes (D. Steed, pers. comm.).

Larger cages from 3 X 2.5 to 2 m have been uniformly successful in capturing cowbirds. The smaller sizes have also been successful but not as successful as larger ones (Hesterberg et al. 1985).

Materials typically used are 1 X 1" chicken wire or 1/2" hardware cloth. One caution: Some chicken wire sold as 1 X 1" is actually 1 X 1-1/2". This slightly larger size is large enough to allow female cowbirds, particularly of the dwarf race (*M. a. obscurus*), to escape. Panels can be constructed with inexpensive 2 X 2" boards, and panels can be assembled using bolts with butterfly nuts. Designs using metal braces, PVC tubing, among other materials are possible and are more resilient to long-term deterioration, weathering and persistent predators (such as raccoons, mink, and feral cats) which may be attracted to the traps. Designs for the latter have been developed by personnel at the Kerr Wildlife Management Area in Texas (Rte. 1, Box 180, Hunt, TX 78024) and the Wichita Mountains Wildlife Refuge in Oklahoma (Rte 1, Box 448, Indiahoma, OK 73552). Mobile versions for areas with roads can also be constructed on a small trailer bed.

Operating the Traps

Food should be placed directly under the funnel entrance, but not in large piles that may look foreign to a cowbird. Water and perches should be provided to the sides, preferably at points where the opening of the funnel entrance is not directly visible from the perch or water dish. Perches can often be hung from the cage ceiling or supported by the sides. The cage floor should be weed and grass-free at all times. Cages with the ground scraped bare in grassland or field settings will often attract and capture free-ranging cowbirds without decoy cowbirds, or even bait. Bait can be a variety of grains or other seeds including wheat, millet, cracked corn, or sunflower seeds.

Decoy cowbirds should be a combination of males and females. Use of at least two female decoys with males substantially improved capture of females. Decoy sex ratios favoring females had the greatest success, with the male:female ratio of the captured population improving from 3.3:1 to 1.37:1 (Collins et al. 1989; Beezley and Rieger 1987). The improved capture of females with female decoys far outweighs the concerns of an occasional escaping female parasitizing nests of sensitive species. By clipping the wings of female decoys, escapes can be minimized or made inconsequential. However, females should not be clipped to such an extent as to appear injured, as this may affect the capture of additional birds.

Another consideration in trapping is the length of time decoy cowbirds are in the trap. Decoys held for more than two weeks may change their behavior in ways that actually deter capture of additional cowbirds. This happens when the cowbirds in the trap show anxiety for joining potential incoming birds. Thus, decoys should be marked, removed periodically, and replaced with recently captured birds.

Trap Placement and Effectiveness

The effectiveness of individual traps in breeding areas often extends less than 0.8 km from the trap (Grzybowski, unpubl. data). On Fort Hood, Texas during 1991, 52 traps were operated to protect a population containing 152 scattered Black-capped Vireo territories (Hayden and Tazik, unpubl. data). In the Wichita Mountains, nine traps are used to protect approximately 75 vireo territories (Grzybowski, unpubl. data). The ratio of traps to territories of sensitive species can be even higher for smaller and moderately dispersed groupings. Thus, unless the population of concern is small and therefore already in serious trouble, trapping must be widespread, and therefore expensive.

Trap placement can play an influential role in enhancing cowbird capture. Traps should be placed in partly open settings, near taller potential perches, but not directly under them. Collins et al. (1989) indicated that traps placed in dense riparian habitat were less effective than those located in open areas immediately adjacent to such habitats. As a general rule, traps should be placed so that a cowbird resting on the floor of the cage cannot see a potential perch through the funnel entrance.

The daily movements of cowbirds may be one of the most important considerations. A strategy of effective trap placement is to place them between the cowbird feeding sites and the areas requiring protection from parasitism. Many cowbirds in hilly terrain travel up or down draws and hollows or across saddles when moving between morning breeding areas and afternoon feeding areas. Traps placed at the entrances of these areas or in the saddles may be more effective in some settings. In the Wichita Mountains, Oklahoma, for example, traps placed in the middle of Black-capped Vireo nesting areas reduced observed parasitism from approximately 70% to 30% with only a doubling or tripling of reproductive success. When traps were placed on the perimeters of the vireo nesting areas, however, the observed parasitism declined to less than 20%, and seasonal fecundity increased six to eight fold above that in untrapped areas (Grzybowski 1990a).

Another strategy is to place traps near cowbird feeding areas, especially where livestock are concentrated. Capture rates of females near cattle or buffalo were 2.14 per trap day (for the initial trap operation period) compared with 0.14 per trap day 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) of Balcones Canyonlands Habitat Conservation Plan in Texas recommended establishing tracts of 2000-5000 ha to minimize the effects of cowbird parasitism and nest predation for the endangered Golden-cheeked Warbler. We strongly recommend that land acquisition should focus on consolidation of ownership of the largest tracts within a region and the restoration of forest habitat to eliminate cowbird feeding areas. In riparian corridors, we also advocate land acquisition and restoration to provide habitat patches that are wide enough to maintain populations of Bell's Vireos and Willow Flycatchers (Smith 1977). Consolidation of ownership in large tracts is particularly likely to be effective in moderately fragmented landscapes where larger tracts could represent potential sources of immigrants to recolonize smaller fragments.

2. Managers should avoid agricultural or suburban developments that result in the creation of forest islands and increase cowbird populations. When agricultural and suburban development already dominate the landscape, plans should be made to retain woodlots that have compact shapes instead of ones that are long and narrow.

3. Within large tracts, managers should avoid any practice that creates cowbird feeding opportunities such as mowing roadsides and campgrounds, feeding birds, establishing corrals or pack stations, and allowing grazing. If this is not possible or practical, potential feeding sites should be concentrated as much as possible and cowbird trapping programs established. Even if cowbird parasitism rates are low in large tracts, the reduction of reproductive success near cowbird feeding areas might substantially reduce the supply of immigrant neotropical migrants available to recolonize smaller patches.

4. In severely fragmented landscapes where land acquisition and restoration are not possible and/or practical, site-specific trapping may be the only way to protect remnant populations of sensitive species. Such trapping, however, is likely to be expensive because of the availability of so many feeding areas. In these habitats, trapping might be more effective when targeted at breeding rather than feeding sites.

5. In forested areas managed for timber use, logging practices should vary depending upon the landscape. In extensively forested areas such as the Missouri Ozarks, Thompson et al. (1992) found that cowbirds preferred clearcut edges, but were no more abundant overall in areas with and without clearcuts. In these areas, the kinds of logging practices used may have little impact on cowbird parasitism levels because cowbird populations are likely to be limited by feeding habitat availability. Similarly, in severely fragmented forests with extensive feeding habitat, cowbirds might saturate the breeding habitat regardless of the method of timber harvest. Logging practices are most likely to be an important issue in moderately fragmented landscapes where opening gaps in the canopy might provide cowbirds with additional access to hosts. We recommend that low-volume, single-tree selection be used instead of group selection or small clearcuts in severely and moderately fragmented landscapes. Group selection cuts of 0.1-1 ha have the potential to increase parasitism frequency because they maximize edge habitat. Data from a fragmented forest in southern Illinois (Robinson, unpubl. data) showed higher parasitism levels for some, but not all species in tracts subjected to group selection logging within the last five years. Unfortunately, we have no data on the effect of single-tree selection on incidence of cowbird parasitism.

6. If clearcuts are used, the establishment of new edge should be minimized. Clustering cuts near existing edges, making one large cut rather than many small ones, and avoiding irregularly shaped cuts might reduce parasitism.

7. Logging roads and rights-of-way should be as narrow as possible and should be revegetated to avoid creating cowbird feeding habitat.

Tall Grass Prairie

1. Managers should maintain and restore extensive areas of contiguous prairie habitat that include core areas of prairie interior. Land acquisition should focus on acquiring inholdings to minimize fragmentation and cowbird feeding habitat.

2. Agricultural and suburban development that creates prairie islands should be avoided. When this is not possible, plan development to retain prairie fragments that have compact shapes.

3. Woody fence rows, snags, and corridors within and adjacent to prairie should be removed unless they also provide critical nesting habitat for sensitive species.

Livestock Management

Because pastures and feedlots provide the best feeding areas for cowbirds, research directed at methods of raising livestock that minimize feeding opportunities for cowbirds should be initiated. Perhaps feedlots could be designed to reduce waste grain. Similarly, pasture rotations that reduce the availability of very short grass might reduce local cowbird populations.

Winter Food Availability

Because increased availability of waste grain in winter might be increasing cowbird survival rates (Brittingham and Temple 1983), more efficient harvest methods might reduce cowbird populations. Decreasing availability of waste grain, however, might also reduce populations of geese and other game animals, which would create a potential conflict for managers.

Concluding Comments

As researchers, we feel obligated to emphasize the need for continued studies of the population dynamics of neotropical migrants. In some respects, our knowledge of the impacts of parasitism on hosts is still in its infancy. There have been few demographic studies of forest or grassland passerines of the kind necessary to determine how much parasitism neotropical migrants can tolerate. Similarly, there are no published studies on the impacts of logging on productivity of long-distance migrants. Until these gaps begin to be filled, the management guidelines provided above should be viewed as provisional.

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