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RESTRICTORS FOR RED-COCKADED WOODPECKER CAVITIES

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The red-cockaded woodpecker (*Picoides borealis*) is an endangered species endemic to pine forests of the southeastern United States (U.S. Fish and Wildl. Serv. 1985). These birds excavate cavities in living pine trees for roosting and nesting. A family group of red-cockaded woodpeckers occupies a cluster of cavity trees, and each bird has its own roost cavity. Their cavities take from several months to years to excavate and are an important, and sometimes scarce, resource (Walters 1989). Birds without cavities are forced to roost in the open, presumably making them more vulnerable to mortality from predation and adverse weather conditions. A group cannot nest without at least 1 suitable cavity. Thus, loss of cavities to other species can adversely affect red-cockaded woodpeckers.

Usurping of red-cockaded woodpecker cavities by other cavity-using species has been noted by many observers (Baker 1971, Dennis 1971, Ligon 1971, Jackson 1978, Everhart 1986). The primary usurpers of active cavities are southern flying squirrels (*Glaucomys volans*), red-bellied woodpeckers (*Melanerpes carolinus*), red-headed woodpeckers (*M. erythrocephalus*), northern flickers (*Colaptes auratus*), and European starlings (*Sturnus vulgaris*). Usurpers may physically occupy the cavity, preventing access by red-cockaded woodpeckers for a period. In addition, other woodpecker species may enlarge the cavity entrance or the cavity itself, so that red-cockaded woodpeckers will not use the cavity even after the other species abandons it. Although pileated woodpeckers (*Dryocopus pileatus*) rarely usurp cavities, they frequently enlarge them.

The effects on red-cockaded woodpeckers of usurpation and enlargement of their cavities by other species is not yet clear. Such loss of cavities could lower reproductive output if it prevents nesting or causes nest failure, increases mortality due to loss of roost cavities, or causes territories to be abandoned. These effects could result in changes in population levels, in which case managers should be greatly concerned with usurpation and enlargement of cavities. Population level effects have yet to be conclusively demonstrated, however. Loss of cavities may only inconvenience individual birds without affecting population levels. Still, some managers will be concerned with cavity usurpation and enlargement because of the importance of particular woodpecker groups to their programs.

Because red-cockaded woodpeckers appear to have little ability to prevent other species from usurping or enlarging their cavities, active management is required to reduce use of their cavities by other species. One alternative is to place restrictors on cavity entrances to

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ities by other species. We describe such a restrictor and present preliminary evidence that it reduces use of red-cockaded woodpecker cavities by other species.

METHODS

Description of Restrictors

We used 3 types of restrictors. All were rectangular or square metal plates with holes drilled at each corner for attachment. They were painted with brown exterior latex paint and attached to the cavity tree with #8 sheet metal screws. The types we designated A and B proved inadequate, leading to the design of Type C (Fig. 1). We describe all 3 types so that investigators who wish to modify our Type C design can avoid the undesirable features of Types A and B. Type A restrictors were made of 22 gauge-aluminized metal with a central opening of 38 mm (1.5 inches). Type B restrictors were made of aluminum about one-half the thickness of the metal used in Type A restrictors, and had a downward-facing U-shaped opening 42 mm in diameter. Type C was similar to the Type A, but with a downward-facing U-shaped opening (see also Everhart 1986).

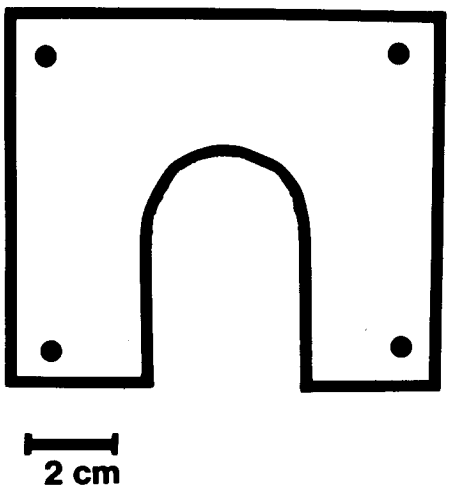

Fig. 1. Restrictor used to exclude other species and deter enlargement of red-cockaded woodpecker cavities in North Carolina.

Placement and Adjustment of Restrictors

We attached restrictors to the plate (exposed cambium) around a cavity. When no plate was present, bark was chipped away to provide a relatively flat and secure surface for attachment. In placing the Type B and C restrictors, the floor of the cavity entrance was used as the lower lip of the opening (Fig. 1).

We monitored cavities after placement of restrictors to determine that red-cockaded woodpeckers could still gain access and that other species could not. In most cases we had to adjust restrictors to reduce the size of the opening because other species were still entering the cavity. This was accomplished by sliding the restrictor downward slightly, facilitated by the use of screws rather than nails for attachment. Restrictors placed on cavities not currently being used by other species did not require adjustment. Some enlarged cavities required larger restrictors than others, but the same principles of attachment applied. Most of our restrictors were 76 × 76 mm (3 × 3 inches). If the floor of an entrance tunnel of an enlarged cavity had been destroyed, the restrictor was ineffective.

Field Testing

In spring 1985 and 1986, we placed restrictors on 7 active red-cockaded woodpecker cavities belonging to 5 family groups in a residential development built around a golf course in the Sandhills of south-central North Carolina, an area in which we have conducted studies of the behavior and ecology of red-cockaded woodpeckers since 1979 (Carter et al. 1983, Walters et al. 1988). Habitat in areas where restrictors were placed consists of second-growth longleaf pine (*Pinus palustris*) forest with scattered old-growth trees and few understory hardwoods. Population densities of species that use red-cockaded woodpecker cavities appeared high, especially for the red-headed woodpecker.

RESULTS

We placed Type A restrictors on 4 cavities, 1 in each of 4 groups, in late April and early May 1985 (Everhart 1986). In each case the restrictor was placed on an active cavity that had already been usurped by starlings or red-headed woodpeckers. It was immediately apparent that red-cockaded woodpeckers would not enter cavities protected by Type A restrictors, presumably because the lower portion of the restrictor prevented clear access to the floor of the entrance tunnel. Red-cockaded woodpeckers crawl into the tunnels and apparently would not pass over the lower lip of the restrictor. In mid-May we removed the Type A restrictors and replaced them with Type B. The birds accepted Type B restrictors, but starlings and red-headed woodpeckers were able to force their way into the cavities by bending

the thin metal. One starling became stuck in a Type B restrictor and perished. We then replaced the Type B restrictors with Type C. The 22-gauge metal was too thick for other species to bend, and the U-shaped opening was readily accepted by red-cockaded woodpeckers.

Subsequently, we used only Type C restrictors. We added 3 additional restrictors in May 1986, 2 to cavities of a fifth group, and 1 to an additional cavity of 1 of the 4 groups involved in the 1985 manipulation. All restrictors were placed on active cavities that were being used by other species.

In at least 1 case, a red-cockaded woodpecker roosted in a cavity protected by a Type C restrictor the same day the restrictor was installed. All restricted cavities remained active in the months following installation, and all were used for roosting by red-cockaded woodpeckers. In summer 1987, 5 of 7 were still being used for roosting. None of the restricted cavities has been enlarged since restrictors were attached, although 4 of 7 were being enlarged before use of restrictors.

None of the restricted cavities were used for nesting in 1985, but restrictors were not added until the nesting season was well underway. None of the cavities to which restrictors were added in 1986 were used for nesting that year either. However, 2 of 4 cavities restricted in 1985 were used for nesting in 1986, 1 of which fledged young. Of the 2 other groups with cavities restricted in 1985, 1 nested in a nonrestricted cavity in 1986, and the other failed to nest. In the latter case, the restricted cavity was usurped by starlings and the restrictor had to be adjusted. In 1987, 4 groups nested in restricted cavities. Two nests failed, but these groups renested, again in restricted cavities, and the second nests were successful. These were the only renesting attempts by any of these groups in the 8 years they have been monitored, and 1987 was the first year that as many as 4 of the 5 groups nested successfully.

Groups with restricted cavities fledged fewer young than the average for our study population in all years preceding installation of restrictors (0–1.40 fledglings/group for groups with restricted cavities, 1.27–1.50 for rest of study population, mean difference = 0.54 fledglings/group). In the first year after all restrictors were installed, groups with restricted cavities produced 1.50 fledglings/group compared to 1.73 for the rest of the population.

DISCUSSION

Our preliminary results indicate that restrictors have potential as a management tool. They appear to be effective in reducing usurpation and enlargement of cavities, and red-cockaded woodpeckers will roost and nest in restricted cavities. If population levels are indeed affected by availability of cavities, use of restrictors may be an important means to positively affect the health of a population. This management technique may be especially useful in the following situations: (1) in developed areas where populations of cavity-using species are high and other management options are limited; (2) in clusters in which cavity enlargement, particularly by pileated woodpeckers, is a problem; (3) in clusters with few cavities or few potential cavity trees; (4) in small populations where loss of cavities and reduction of reproductive output must be minimized; and (5) in rehabilitated clusters where all existing cavities are enlarged already.

We urge caution in the use of restrictors, however. Restrictors are not a panacea for the habitat-related problems facing red-cockaded woodpeckers across their range, and we do not advocate their deployment throughout the region. Restrictors are not a substitute for good habitat management, which includes hardwood mid- and understory suppression, use of long rotations, and provision of sufficient foraging habitat (U.S. Fish and Wildl. Serv. 1985, Ligon et al. 1986, Jackson 1987). Options such as reduction of hardwoods in the mid- and understory may be more effective in reducing

loss of cavities to other species over the long-term. Use of restrictors is inappropriate where most losses of cavities are due to flying squirrels, because they can easily enter restricted cavities, or where other species seldom use red-cockaded woodpecker cavities.

The technique has several drawbacks. First, the technique is labor-intensive and requires expertise. Each restrictor must be monitored closely to ensure that it prevents the targeted users from gaining access to the cavity, but does not discourage use by red-cockaded woodpeckers. Adjustments often will be necessary before a particular restrictor functions effectively. Second, the technique is untested, and may have drawbacks that are as yet unknown. For example, tree growth may cause damage to restrictors, necessitating their replacement or limiting the period over which restricted cavities are used by the birds. It is also possible that birds will injure themselves in passing through the restrictor if it is not properly adjusted. Jackson (1983) reported that the bill of a captive red-cockaded woodpecker was dulled from pecking on its wire cage. Thus the possibility of reduced foraging efficiency because of bill damage exists if birds peck on restrictor plates.

Although our preliminary data are encouraging, we have not yet demonstrated that nesting is more frequent or more successful as a result of using restrictors, nor that mortality or site abandonment is reduced. We have shown only that birds will use cavities on which restrictors are placed, that they can exclude other species that might otherwise usurp the cavity, and that they can deter enlargement. Tests for effects of restrictors on reproduction and for long-term effects on bill wear are needed. Until the technique is properly tested, we advocate using restrictors only in specific situations where loss of cavities to other species is a severe problem.

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