A Mobile Aviary to Enhance Translocation Success of Red-cockaded Woodpeckers

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ABSTRACT

The red-cockaded woodpecker is a federally endangered species endemic to the pine forests of the southeastern United States. The Federal Red-cockaded Woodpecker Recovery Plan emphasized restoration ofpopulations within physiographic provinces throughout their range to provide for region-wide, long-term survival. Restoration efforts included habitat enhancement and translocations. A review of red-cockaded woodpecker translocation throughout their rangefound translocations offemales to resident males to be the most successful (66%); translocations of males to suitable habitat were less successful (42%). Improved translocation techniques will allow small populations to be increased more quickly, and thereby reduce the likelihood of local extirpations. We describe a experimental mobile aviary to enhance translocation success of red-cockaded woodpeckers. If successful, this technology will be significant to the regional recovery of the red-cockaded woodpecker:

INTRODUCTION

The red-cockaded woodpecker *(Picoides borealis)* [RCW] is a federally endangered species endemic to the pine forests of the southeastern United States (Jackson 1971). RCWs are cooperative breeders (Ligon 1970, Lennartz et al. 1987, Walters et al. 1988) that live in groups of two to nine birds, each group having a single breeding pair (Hooper et al. 1980, Haig et al. 1994). In addition to the breeding pair, the group may include young-of-the-year and adults, usually males, called helpers. Helpers are typically the sons of the breeding male (Hooper et al. 1980).

Each group inhabits a home range consisting of a cluster of cavity trees and foraging habitat (Ligon 1970). Clusters contain 1 to 30 cavity trees (Jackson 1977) including trees with completed, active cavities (i.e., occupied by RCWs), trees with cavities being excavated, and trees with inactive and abandoned cavities. Active cluster sites are characterized as mature, moderately stocked pine (*Pinus* spp.) stands with sparse midstories (Lennartz et al. 1983, Conner and Rudolph 1989, Loeb et al. 1992). Habitat quality and quantity are assumed to be the primary factors that determine whether or not a cluster is occupied (U.S. Fish and Wildlife Service 1985, Conner and Rudolph 1989).

Group members roost in separate cavities year-round and the breeding male's cavity is typically the site of the group's nest. Cavities are excavated only in mature, living pine trees. Cavity trees generally average 80-120 years in age (Jackson 1977, U.S. Fish and Wildlife Service 1985) and must have sufficient diameter to assure that enough heartwood is present to contain the cavity chamber (Clark 1992, 1993). Suitable trees for cavity construction are often limited (Hooper 1988, Costa and Escano 1989, Copeyon et al. 1991), and excavation of new cavities entails large investments of time and energy (Conner and Rudolph 1995).

Formation of new RCW groups is accomplished by the division of an existing home range, termed budding, or by the establishment of a new home range in a previously unclaimed habitat, termed pioneering or colonization (Hooper 1983, Walters 1990). Male RCWs practice one of two life-history strategies: (1) remain on their natal area as a helper until a breeding vacancy becomes available at that cluster or nearby, or (2) disperse in search of a breeding vacancy or unoccupied territory (Walters 1990). By remaining as a helper, a male may inherit a territory upon the death of the breeding male. Female RCWs almost exclusively disperse from their natal area (Walters 1990). RCWs use of living pines for cavities and the associated lengthy period of time required to excavate a cavity are hypothesized to be the ecological constraints that inhibit most male RCWs from dispersing and attempting to breed independently their first year (Lennartz et al. 1987). Moreover, potential cavity trees and suitable unoccupied habitat are often limited. Consequently, it is more common for individuals to compete for territories with completed cavities and replace or displace resident breeders than to set up new territories and excavate new cavities in unoccupied areas (Walters et al. 1988, 1992).

A major obstacle to the recovery of small RCW populations has been the rarity with which new groups form (Ligon et al. 1986), often not exceeding the rate of group loss (Walters et al. 1988, Walters 1991). The provisioning of suitable forested stands with artificial cavities (Copeyon 1990, Allen 1991) relaxes the constraint posed by limited cavities and is an effective management tool to induce formation of new RCW groups (Copeyon et al. 199 1, Heppell et al. 1994). Therefore, artificial cavities are extremely important to the recovery of the species.

The RCW Recovery Plan (U.S. Fish and Wildlife Service 1985) emphasized restoration of populations within physiographic provinces throughout the range of the RCW to provide for region-wide, long-term survival. Restoration efforts included reestablishment of RCWs in areas from which they have been extirpated and augmentation of existing small populations. Although installation of artificial cavities may be sufficient to increase the number of groups in relatively large populations (Copeyon et al. 1991), for the numerous small, remnant, or extirpated populations, translocating RCWs after habitat enhancement and cavity provisioning may be the only option to reduce demographic and genetic effects of small population size (Allen et al. 1993).

A review of 143 RCW translocations throughout their range between 1989-l 994 found that the most successful approach involved translocating hatching year (HY) and after hatching year (AHY) females to resident males, with success rates of 66% ($n = 44$) and 58% ($n = 33$), respectively (Costa and Kennedy 1994). Translocations of HY and AHY males to recruitment stands provisioned with cavities were less successful (42%, $n = 12$; Costa and Kennedy 1994). These levels of success were based on studies that used various criteria to measure success: number of young fledged, number of young produced, successful nests, eggs laid, nestlings present, pair bonded, apparently paired, pair present, and pair interacted. Use of more conservative measures of success, such as remained at the release cluster and reproduced, would result in even lower levels of success (Costa and Edwards, unpublished data). Because translocations of male RCWs have been less successful, and because successful translocations of females are dependent on the availability of established males, a technique to increase the success of male translocations would be significant to augmentation efforts. Moreover, the number of translocations that can be conducted each year is limited by logistical costs and the availability of RCWs from donor populations.

Pursuant to the goal of increasing translocation success, researchers from the U. S. Forest Service, Southern Research Station hypothesized that by maintaining RCWs in an aviary prior to release the birds would develop an affinity and possibly imprint (Scott and Carpenter 1987) on their surroundings, and that this would increase their likelihood of remaining in the cluster upon their release (M. Lennartz, pers. comm.; Laves 1992). Similar approaches have been successfully used in reintroductions of the Peregrine Falcon (*Falco peregrinus*) via hacking sites in the eastern United States (Barclay and Cade 1983) and the use of call-back boxes for Masked Bobwhite quail (*Colinus virginianus*) in Arizona (Ellis et al. 1987). In both cases birds were provisioned, sheltered, and given time to acclimate to their surroundings.

In 1994, researchers from the Southern Research Station in cooperation with the Savannah River Forest Station constructed a prototype metal-framed aviary (described by Franzreb 1997). Red-bellied woodpeckers (*Melanerpes carolinus*) were used as surrogates and placed in the aviary to develop and refine captivity protocol (e.g., feeding, monitoring, handling; Edwards 1995). This prototype, although invaluable for establishing captivity protocol, was too complex for easy reassembly, too costly to reproduce, and non-mobile. Therefore, before further testing of the hypothesis of whether captivity would enhance translocation success could occur, it was necessary to redesign the aviary. Consequently, our objective was to design an aviary that was easy to assemble and mobile, and affordable to construct.

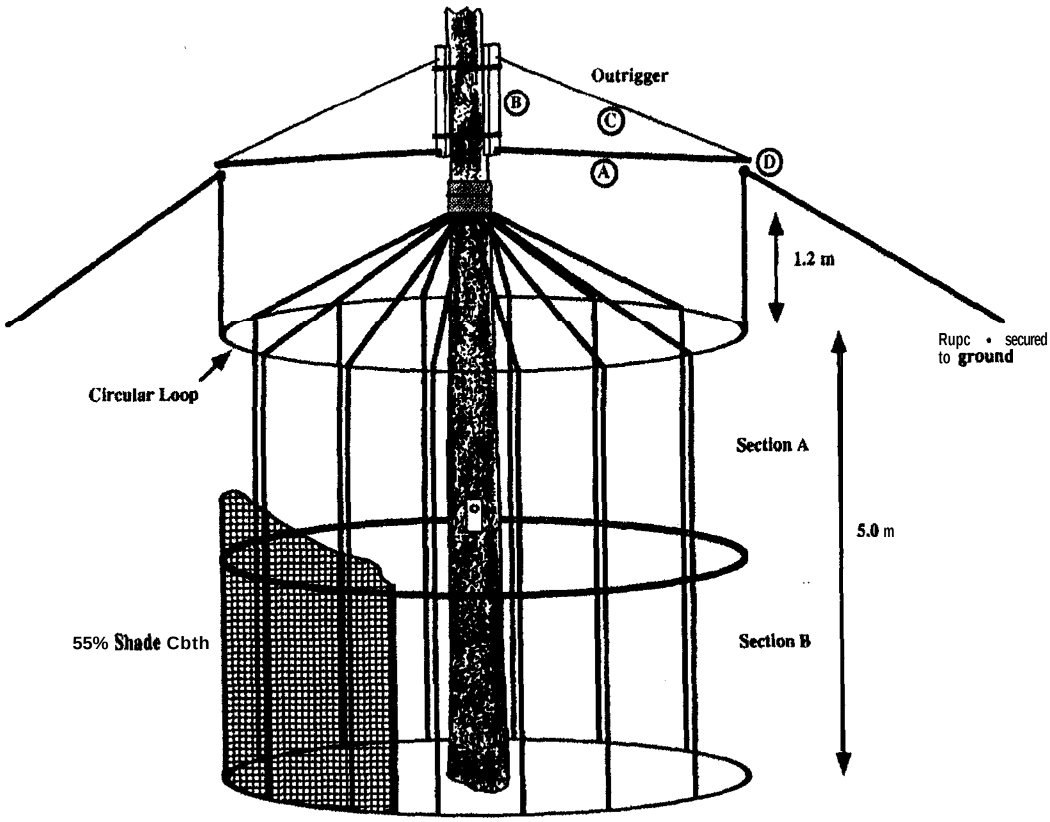


Figure 1.

Schematic of mobile aviary *showing PVC structural components of sections A and B, outriggers used to hoist section A, and the 55% shade-cloth cover: A = steel pipe; B = 2x4 lumber; C = steel cable; D = pulley. An artificial RCW cavity is also shown at approximately 1/3 the height of the bole.*

MATERIALS AND METHODS

Aviary Design

The following description of our mobile-aviary design is intended to allow the reader to visualize structural components, but is not intended to provide the reader exact specifications and details for assembly.

Our mobile aviary consists of a PVC-plastic-pipe frame that is covered with 55% shade cloth and designed to enclose a portion of the bole of a living pine tree in which an artificial cavity has been excavated (Fig. 1). Our aviary is constructed of two main sections (A and B), each 2.5 m in height and 6.1 m in diameter (Fig. 1). Each section consists of two 18.3 m circular loops; each loop contains 12- 1.5 m pieces of plastic pipe (1.9 cm diameter) connected with T-couplings. The top and bottom loops are held in place by 12 vertical supports (2.6 cm diameter), Once erected, a section is self supporting.

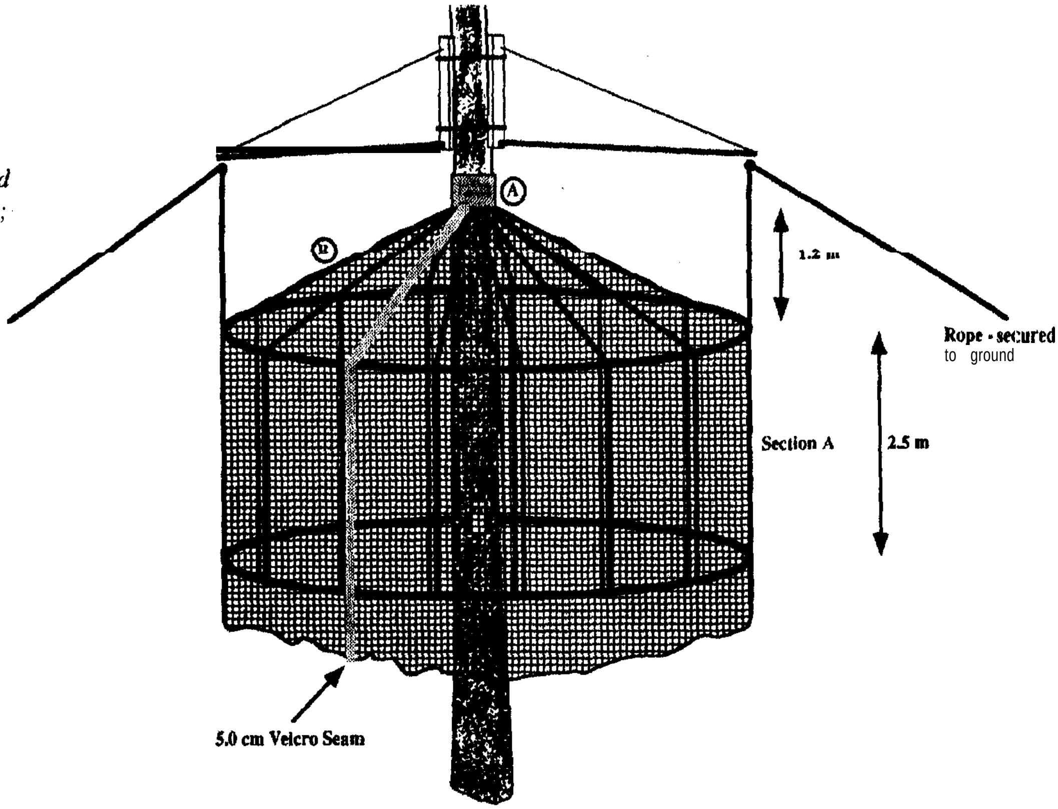
Aviary Assembly

Before the aviary can bc assembled, 3 outriggers are positioned equidistant around the bole of the cavity tree at a height of 6.7 m and secured with 2 rachet straps (Fig. I). Each outrigger consists of a 3.0 m steel pipe (3.2 cm diameter) that is attached to the base of a 1.5 m piece of dimensional (2x4 inch) lumber and supported by a 3.0 m steel cable (0.3 cm diameter). Attached to the distal end of the steel pipe is a pulley that is used to hoist the top section (A) of the aviary off the ground during assembly.

After outriggers are positioned, section A is assembled in place around the cavity tree. The one-piece shade-cloth cover is then placed over section A and closed along its 5 cm wide Velcro seam (Fig. 2). Section A and attached cover are then hoisted via ropes from the outriggers approximately 2.5 m off the ground to allow section B to be assembled beneath (Fig. 2). After section B is complete, section A is lowered to adjoin section B and their union is secured at each vertical support with duct tape. The bottom edge of the shade cloth is then placed underneath the lower loop of section B and both are secured to the ground with stakes. The apex of the shade-cloth cover is sewn to a heavy-fabric collar that is wrapped around the bole of the cavity tree and secured with a rachet strap to prevent the bird's escape (Fig. 2). The shade cloth between the upper loop of section A and the bole of the cavity tree is supported by 0.3 cm steel cables attached to each vertical support and collectively secured to the tree bole with a rachet strap

Figure 2.

Schematic A being elevated by outriggers prior to the assembly of section B. The 55% shade-cloth cover is placed over section A before it is raised; A = fabric collar; B = metal conduit/steel cable supports,



(Fig. 2). These cables also act as support for the PVC frame during periods of high wind. The integrity of the upper loop of section A is further maintained by placing each steel cable inside a piece of metal conduit (1.3 cm diameter).

During captivity RCWs are provided a diet of commercially available mealworms and crickets, and water *ad lib.* A "feeder tree" (Fig. 3) is constructed to allow the bird to naturally forage. A 15-20 cm diameter pine log is cut to a length of approximately 4.6 m, placed vertically inside the aviary, with its base buried 1 m under ground for support. Two metal cones are placed opposing each other at opposite ends of the feeder tree to prevent the crickets from escaping (Fig. 3). A commercial water device is also attached to the feeder tree (Fig. 3).

RESULTS AND DISCUSSION

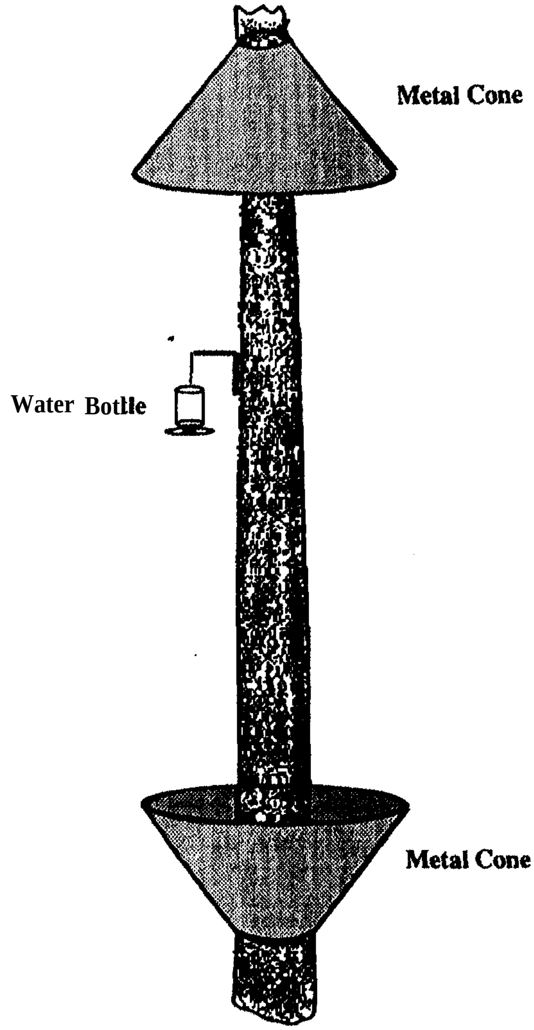
Although our mobile aviary design needs further testing to determine whether its use will improve translocation success, it did meet our objectives. It was uncomplicated and lightweight, and could be assembled by a two-person crew in less than a day. The cost for materials to complete one aviary was approximately $1500 (I 997 U.S. dollars).

The efficacy of the mobile aviary to enhance RCW translocation success is currently being tested by the U.S. Forest Service, Southern Research Station (Edwards and Franzreb 1995). Preliminary results are inconclusive; however, the study is scheduled to continue through 1999. Beginning this fall (1997), a second aviary project will also test the efficacy of the mobile aviary to enhance translocation success of male RCWs. This project will be conducted at multiple sites and should continue for 2-3 years. The findings from these projects will be very important to the regional recovery of the RCW.

Improved translocation techniques will allow small RCW populations to increase more quickly, and thereby, reduce the likelihood of local extirpations. They also will be useful in re-establishing populations in areas where the habitat has been restored to accommodate RCWs, but because of a lack of a nearby source population, natural immigration to the restored area is unlikely. In addition, improved techniques are also needed in translocations designed to enhance population genetics, remove surplus birds from geographically isolated populations, and increase opportunities for the relocation of RCWs in mitigated cases of habitat loss.

Figure 3.

Feeder tree showing opposing metal cones and water bottle.



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