

Red-cockaded Woodpecker Translocation Experiments in South Carolina

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Abstract: Three female red-cockaded woodpeckers (*Picoides borealis*) were translocated and released separately into 2 colonies with resident bachelor males in April 1986. Two females paired with resident males at their release site. One pair fledged young in 1986, and both pairs fledged young in 1987. The translocation increased the local population from 1 to 3 pairs. Four nestling red-cockadeds were fostered in May 1987. All fostered young fledged. Flying squirrels (*Glaucomys volans*) in all active colonies threatened introductions and nesting attempts. To reduce competition for cavities, flying squirrels were captured and removed from cavities and nest box traps installed on cavity trees in all active colonies. Results indicated that nest boxes have intercepted the majority of squirrels since August 1986, and thus may have reduced squirrel use of cavities.

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Despite red-cockaded woodpecker abundance relative to some other endangered species, few large (>250 pairs) populations exist. Most populations are small and isolated (Lennartz et al. 1983). Fragmented habitat reserves and associated population isolation are viewed as serious threats to the species' survival (Lennartz et al. 1983, U.S. Fish and Wildl. Serv. 1985).

The Savannah River Plant (SRP), a nuclear production facility in South Carolina, supports a small, relatively isolated population of red-cockaded woodpeckers. Because SRP is surrounded by agricultural land, there is probably little gene flow between the SRP and other red-cockaded populations. Surveys have revealed 1 active red-cockaded colony within 32 km, and 8 active colonies within 48 km of SRP (J. A. Jackson and B. J. S. Jackson, unpubl. rep., Miss. State Univ., Mississippi State, 1987).

The Red-cockaded Woodpecker Recovery Plan recommends the development of translocation techniques to enhance gene flow, or to prevent loss of local populations (U.S. Fish and Wildl. Serv. 1985). Translocation efforts have met with some success, but additional tests are needed to determine if translocation is a viable management option. Odom et al. (1982) reported that 12 red-cockadedes were relocated 35 km in Georgia, and 1 pair fledged 1 young the first summer after relocation. Two birds survived 2.5 years after relocation (Odom 1983). Reinman (1984) relocated 2 red-cockaded pairs 37 km in Florida and 1 female remained and nested with a resident male, successfully fledging 2 young. This pair has remained intact since 1984, and has successfully fledged young every year through 1987 (J. P. Reinman, pers. commun.).

We describe efforts to translocate red-cockaded woodpeckers into SRP. Objectives were to: (1) increase the number of red-cockadedes on SRP to help prevent extinction from environmental catastrophes, and (2) test the effectiveness of several translocation techniques.

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Methods

The SRP, established in 1950, encompasses 76,900 ha in the southern Coastal Plain of Aiken, Barnwell, and Allendale counties, South Carolina. When SRP was formed, 32,376 ha (42%) of the property were in old fields (Beavers 1972). Since 1950, 50,587 ha (66%) of the SRP site has been planted to loblolly (*Pinus taeda*) (25,666 ha), longleaf (*P. palustris*) (12,734 ha), and slash (*P. elliottii*) (12,187 ha) pines (J. Dent, pers. commun.). Currently, 71,230 ha (93%) of SRP is forested. Most SRP red-cockaded woodpecker colonies are located in remnant mature longleaf pine, loblolly pine, or mixed longleaf and loblolly pine stands.

Historic numbers of red-cockadedes at SRP are unknown, but records established a decline over the past decade (Mackey 1984). In 1974, MacFarlane estimated that 24 red-cockadedes inhabited SRP (M. R. Lennartz, unpubl. rep., 1984).

In January 1986 there were only 5 known birds at SRP: 1 male and 1 female at 1 colony site, solitary males at 2 others, and a bird of unidentified age and sex at another. The SRP red-cockaded population has declined despite increases in pine forest area, because decades are required for new nesting habitat to develop (U.S. Fish and Wildl. Serv. 1985).

The Francis Marion National Forest (FMNF), which occupies 100,936 ha in the Coastal Plain of Berkeley and Charleston counties, South Carolina, was the source of birds for translocation to SRP. The FMNF was chosen because it has more than 400 clans of red-cockaded woodpeckers (Lennartz et al. 1983).

Before birds were introduced, existing and potential red-cockaded woodpecker habitat was improved by thinning from below, controlling hardwoods, and controlled burning. Treated areas included abandoned colonies and old-growth pine stands. Old-growth stands were preserved and managed as potential colony sites.

Several strategies were possible for translocation of red-cockaded woodpeckers from the FMNF to SRP: (1) foster translocated eggs, (2) foster translocated nestlings, (3) translocate individual adults, or (4) translocate a pair or social group. Translocation strategies were chosen based on the resident situation. Bachelor males in 2 SRP colonies had established territories and represented a potential mate for a translocated female. Yearling females were selected for translocation, because they generally disperse and have no established home range (Lennartz et al. 1987). In addition, yearling females as dispersers are subject to high mortality, and therefore are not likely to be incorporated into the FMNF population. When the remaining indigenous pair nested, an opportunity was created to foster translocated eggs or nestlings. Because it is difficult to extract eggs from a cavity without damage, we decided to foster nestlings.

During the 1985 nesting season on FMNF, 7 females were located and color banded as nestlings. In April 1986, 4 females were roosting in their natal home ranges. On 8 April 1986, 2 were trapped with small mist nets on wire frames placed over their cavity after they went to roost (Jackson 1977). Trapped birds were placed in separate boxes with interior dimensions of 24.1 × 27.9 by 45.7 cm. Each box consisted of a wood bottom, 2 wooden sides, 2 screen sides, and a cloth top. Inside the box, carpet was placed on each wooden side to give the birds something to grasp onto, and thus allow them to rest in a natural position during the 200 km transport by vehicle to SRP. Birds were translocated at night to minimize stress. At approximately 2300 hours on the evening of transport, the females were inserted into an inactive cavity in each of the colonies that had only 1 male. The cavity entrances then were covered with wire screen secured by thumbtacks to prevent the birds from flushing in the dark. Next morning, a string attached to the screen was used to uncover the cavity entrances when the resident males exited their cavities (0600 hours). After 1 week, the introduced female in the first colony had not been observed so a second female was introduced in the same manner.

In preparation for nestling translocation, 6 colonies on FMNF were monitored during the 1987 breeding season to locate nests closely matched in age with that of the indigenous SRP pair. On 29 April, 1 FMNF pair began incubating 4 eggs, and

on 30 April, the indigenous SRP pair began incubating 3 eggs. Both pairs hatched 3 eggs on 9 or 10 May. At 1945 hours on 18 May at FMNF, when the nestlings were 10 or 11 days old, 3 were removed with a noose from the nest cavity, color banded, and weighed. At 2000 hours the smallest bird was returned to the cavity, and the 2 largest were placed in a padded plastic cup (7.6×8.9 cm), fitted securely in a styrofoam cooler ($22 \times 42 \times 34$ cm), and transported to SRP. Inside the cooler, an incubator maintained the temperature at 34° C. To eliminate light disturbance from the incubator, a baffle was installed in the middle of the cooler, and a dark cloth was placed over the bird's container. To prevent desiccation, 2 sponges saturated with water were placed beside the bird's container. The birds were left inside the cooler during the entire night.

At 0630 hours on 19 May at SRP, 3 nestlings were removed with a noose from the nest cavity, color banded, and weighed. At 0645 hours the 2 FMNF nestlings and the smallest SRP nestling were inserted into the nest cavity, and the 2 largest SRP nestlings were placed in the cooler and transported to FMNF. Nestlings were fed corn grubs (*Sarcophaga bullata*) as recommended by R. E. Seibels (pers. commun.). Feeding was attempted every 15 minutes from 0730 hours until 0915 hours. One nestling fed sporadically consuming 9 grubs, while the other fed repeatedly consuming 18 grubs. At 0955 hours at FMNF both SRP nestlings were inserted into the nest cavity containing the remaining FMNF nestling.

Red-cockaded woodpeckers commonly compete with flying squirrels for cavities (Dennis 1971, Jackson 1978, Harlow and Lennartz 1983). Therefore, flying squirrel activity was monitored prior to the 1986 introductions by regularly climbing all cavity trees in all active colonies. One week prior to the translocation, cavities unoccupied by red-cockadedes were plugged to prevent flying squirrels from moving in. Cavities were unplugged when the birds were released to allow females their choice of cavities. Nest box traps were installed on all cavity trees in all active colonies on 29 and 30 April 1986. Nest boxes were constructed according to specifications by Sonenshine et al. (1973) and placed at a height of 1.8 m. Cavities and nest boxes were checked 3, 9, and 2 times during April, May, and June, respectively. Beginning in July, cavities and nest boxes were checked monthly.

Results and Discussion

Red-cockaded Woodpecker Translocation

After the releases, the pair in the first colony remained together for 30 minutes and the pair in the second colony remained together for 3 hours. Neither female was observed roosting at her release site that evening, and the female placed in the first colony was not seen for 2 weeks. One week after the initial release in the first colony, we assumed that the first female had died or departed from the area, and a second female was released into the colony on the morning of 16 April 1986. This female separated from the resident male after 45 minutes, and was not observed roosting in the colony after her release. However, the first introduced female was

observed roosting in the first colony in the open on 22 April 1986 and in a cavity on 30 April 1986. Subsequently, the birds displayed mating behavior.

The female in the second colony was first observed roosting in the open on 12 April 1986 and in a cavity on 17 April 1986. She was also observed entering the male's cavity on 17 April 1986. This behavior indicated the probability of a mated pair.

Subsequent to the translocations, the indigenous pair nested and fledged a male and a female. The new pair in the second colony nested and fledged a male and a female. The second female returned to the first colony in mid-May. Both females remained with the resident male, but no nesting occurred. The introduction increased the 1986 post-nesting SRP red-cockaded population from 6 to 11 birds, the number of breeding pairs and nests from 1 to 2.

The first introduced female in the first colony was last seen on 24 June 1986. During the last week of July 1986, the second female was observed roosting in an abandoned colony approximately 1520 m from the first colony. However, this female would join the male in the first colony each morning and begin foraging. In November 1986, the second female began roosting in the first colony. The juvenile male and female in the second colony were last seen on 24 July 1986 and 27 August 1986, respectively. Their disappearance could be either the result of dispersal or natural mortality.

In April 1987, 1 year after translocations, pairs formed in both the first and second colonies remained intact and nested. The pair in the first colony fledged a female, and the pair in the second colony fledged a male and 2 females. Thus, the introduction increased the number of breeding pairs to 3.

Fostering of transported nestlings was successful. The SRP pair fledged a male plus the fostered male and female from FMNF. In addition, the FMNF pair fledged a male plus the 2 fostered females from SRP.

Flying Squirrel Control

In April 1986, a large influx of flying squirrels threatened red-cockaded nesting in all active colonies. Dennis (1971) and Jackson (1978) found alternate use of cavities by squirrels and red-cockaded. Harlow and Lennartz (1983) reported that interspecific competition (including flying squirrels) for red-cockaded cavities prevented 2 different clans from nesting. In both instances, alternate cavities were not available for the displaced woodpeckers. In April, flying squirrels had displaced female red-cockaded from their cavities in all active colonies at SRP. To reduce competition for cavities, flying squirrels were controlled in the active colonies.

From April 1986 through March 1987, 75 flying squirrels were removed from active red-cockaded woodpecker colonies (Table 1). Large influxes of squirrels occurred in April, August, and November (≥ 11 per month). Influxes were much less in other months (≤ 6 per month). Squirrels were removed from cavities in 8 of 11 months. Until August, squirrels did not use nest boxes frequently, but 77% (33/43) of the squirrels removed from August through March were found in nest boxes.

Table 1. The number of flying squirrels removed from nest boxes and cavities in active red-cockaded woodpecker colonies from April 1986 through March 1987 on the Savannah River Plant, Barnwell and Aiken counties, South Carolina.

Month	Box	Cavity	Total
Apr	^a	25	25
May	0	5	5
Jun	0	0	0
Jul	1	1	2
Aug	10	1	11
Sep	0	2	2
Oct	^b	^b	^b
Nov	11	3	14
Dec	5	1	6
Jan	0	3	3
Feb	4	0	4
Mar	3	0	3

^aNest boxes not installed before monthly check.

^bColony not checked.

Results indicated that nest boxes intercepted the majority of flying squirrels found in the colonies since August. Thus, the establishment of nest boxes in active colonies may have reduced squirrel use of cavities.

Management Implications

Translocation of yearling females into colonies with resident bachelor males shortly before the breeding season may be a valid management strategy to increase the number of individuals in small, isolated red-cockaded populations. Translocated birds undergo a transition period before taking up residence at the release site. In our study, the transition period lasted from 4 days to 4 weeks. Odom et al. (1982) noted that translocated red-cockaded woodpeckers required several days to weeks to locate and begin using cavity inserts. Therefore, it is critical that the birds be allowed ample time to become established before additional birds are translocated to the same colony site.

Especially for birds recently released into a new area, roosting outside cavities probably increases vulnerability to avian predators (Odom et al. 1982). Reducing competition for red-cockaded cavities with squirrels is important, especially for translocated birds and small red-cockaded populations. The establishment of nest boxes on cavity trees in active colonies facilitates squirrel capture and removal, and may also reduce squirrel use of cavities.

The translocation of birds is only a stop-gap measure for particular situations, and is still experimental. Long-term monitoring is needed to determine the effectiveness of translocation as a management strategy. The species' prospect for sur-

vival ultimately depends on providing suitable habitat for the red-cockadededs (U.S. Fish and Wildl. Serv. 1985).

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