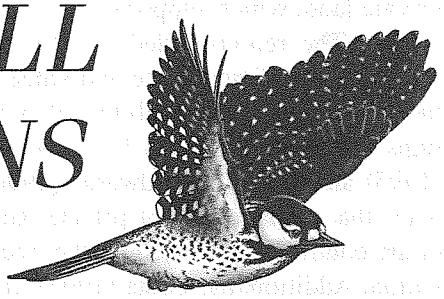
CHAPTER 7

SAVING SMALL POPULATIONS



REINTRODUCTION OF THE FIRST RED-COCKADED WOODPECKERS INTO UNOCCUPIED HABITAT: A PRIVATE LAND AND CONSERVATION SUCCESS STORY

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Abstract: In March 1998, the Turner Endangered Species Fund in cooperation with the U.S. Fish and Wildlife Service initiated an effort to reintroduce red-cockaded woodpeckers (*Picoides borealis*) to the Avalon Plantation in north Florida. This effort was the first attempt by a private landowner, state agency, or federal agency to reintroduce a population of red-cockaded woodpeckers where no founder population existed and into a forest that did not previously support the species. The objectives of the project were to establish a population of red-cockaded woodpeckers that would persist with minimal management and develop reintroduction techniques that could be used to promote recovery of the species elsewhere. By July 2002, the population consisted of 58 birds, including 10 potential breeding groups and 4 solitary males in 14 clusters. We attribute success of the reintroduction to the new technique of simultaneous multiple pair translocations, artificial cavity installations, extensive and intensive cavity monitoring, and the high quality habitat on the plantation. In this paper we discuss those and other aspects of the reintroduction effort.

Key words: translocation, reintroduction, private land, Avalon Plantation, Florida, *Picoides borealis*, red-cockaded woodpecker.

All endangered species reintroduction programs face substantial biological, logistical, economic, social, and political challenges. Moreover, reintroduction efforts involve risks, for the individuals released, the species, and recipient ecological communities (Griffith et al. 1989, Wolf et al. 1996). Nonetheless, reintroduction has become a widely used conservation tool and was recommended in 64% of the 314 approved recovery plans for endangered species within the United States (Tear et al. 1993). Mindful of the challenges and risks, in 1998, the Turner Endangered Species Fund in cooperation with the U.S. Fish and Wildlife Service (USFWS) initiated a program to establish red-cockaded woodpeckers (*Picoides borealis*) on the Avalon Plantation (Avalon) in north Florida (Hagan and Costa 2001). This effort was the first attempt to reintroduce a population of woodpeckers where no founder population existed and into a forest that did not previously support the species. Although the plantation is within the historic range of the species, there is no evidence that the existing forest ever supported red-cockaded woodpeckers. Success at

Avalon will, therefore, represent a significant step forward for conservation of the species, particularly on private land, which supports few viable populations.

The red-cockaded woodpecker recovery plan recognizes the importance and value of private land to the conservation and viability of woodpecker populations (U.S. Fish and Wildlife Service 2003). Costa (1995) and Costa and Edwards (1996) discuss various ways that management of private land populations can or are contributing to woodpecker recovery and conservation. Additionally, Costa (1997), in summarizing the USFWS first 5 years of its private lands conservation strategy, emphasized how private land habitats are helping save, maintain, and/or increase extant private land populations. Accordingly, the objectives of the Avalon project were to (1) restore a population of red-cockaded to Avalon that would persist with minimal management, and (2) develop reintroduction techniques that could be used to promote recovery of the species throughout its range.

As previously noted, there has been no other attempt to establish a woodpecker population *de novo*. Therefore, it was difficult to generate a realistic population objective and estimate the time required to achieve that objective. Fortunately, some insight was available from experience gained at the Savannah River Station (SRS), a Department of Energy facility in South Carolina. As of 1985 the SRS supported 3 groups of woodpeckers: 1 breeding pair and 2 solitary males (Gaines et al. 1995). Since then SRS staff have actively promoted population growth (Franzreb 1997*a*) and in 2002 the site supported 41 potential breeding groups (P. Johnston, U.S. Forest Service, personal communication). Population growth occurred because of continuous and well-planned translocations, provisioning significant numbers of artificial cavities, extensive and intensive monitoring, a comprehensive flying squirrel control program, and adequate funding (Gaines et al. 1995, Franzreb 1997*a*).

Based on the SRS success and the characteristics of the pine forest at Avalon, we determined that 25-30 potential breeding groups that persist with minimal management was a realistic population objective. Moreover, it seemed reasonable to expect that 5 to 10 years of active management would be required to achieve this objective. We realized that once the population objective was reached, it would likely be necessary to periodically translocate woodpeckers to the property to maintain all groups as potential breeding groups, and ensure the genetic health of the population (Haig and Nordstrom 1991, Haig et al. 1993). However, Crowder et al. (1998) suggested that populations of 20 and possibly 10 groups that were maximally aggregated on a landscape might be able to persist over a relatively long time, i.e., 20 years or more, even without immigration (translocations) or intensive management. Furthermore, tending to the demographics of the population (i.e., augmenting solitary bird groups), would in itself, help ensure the genetic health of the population.

STUDY AREA

Avalon is located in Jefferson County, Florida approximately 35 km east of Tallahassee. It is the southern-most plantation in the Red Hills physiographic region of north Florida and south Georgia. The project area encompasses 3,450 ha, which are located in the central portion of the 13,080-ha property.

The plantation is an excellent example of a managed bobwhite quail (*Colinus virginiana*) hunting plantation, and has been maintained as such since the 1930s. It contains several distinct ecological communities including upland habitats mostly dominated by loblolly pine (*Pinus taeda)* and slash pine (*P. elliottii*), pine flatwoods, swamp forest communities, and wetlands. The groundcover is typical old-field vegetation heavily infused with encroaching hardwood species, which are managed through prescriptive use of fire and mechanized equipment. Forest management practices implemented by W. Leon Neel provide excellent red-cockaded woodpecker habitat. Maintenance of a standing forest with selective timber harvests and retention of older trees are standard management practices.

In December 1988, the owner donated a 3,450-ha conservation easement to The Nature Conservancy. The easement recognizes the natural, scenic, aesthetic, and special character of the plantation and serves to ensure the conservation and protection of the property as a relatively natural habitat of fish, wildlife, and plants. The easement tacitly recognizes Avalon's substantial value as a natural, ecological, and scientific resource, and the owner's personal commitment to conservation of biological diversity.

METHODS

Because the red-cockaded woodpecker never inhabited Avalon's existing forest, translocations and creation of numerous artificial cavities were essential components

of this project. For myriad reasons, red-cockaded woodpecker translocation efforts prior to 1987 met with limited success (Odum 1983, Reinman 1984). However, with recent improvements in the technique, translocations have been used to successfully augment solitary bird groups (Hess and Costa 1995) and to create new groups (Rudolph et al. 1992, Allen et al. 1993). Translocation of unrelated, subadult pairs is a widely accepted conservation and population management technique and a critical recovery program (U.S. Fish and Wildlife Service 2003). Since subadult males usually do not breed (Walters 1990b) and subadult females usually disperse from their natal territory (Lennartz et al. 1987) and experience high rates of mortality (Walters et al. 1988a), translocating limited numbers of these individuals should have minimal impacts on donor populations.

Donor Populations

In general, to qualify as a donor, populations must meet 1 of the following conditions: (1) contain at least 100 active clusters and be stable or increasing; (2) be recovered or at its population goal and be stable or increasing; or (3) be within 75% of its population goal, at least 50 active clusters in size, and stable or increasing (U.S. Fish and Wildlife Service 2003). Additional factors, such as geographic distance, physiographic province, and forest type influence whether a donor population can donate birds to a particular recipient site. Based on all considerations, the red-cockaded woodpecker populations inhabiting the Apalachicola National Forest of north Florida and the Red Hills region of south Georgia were selected as donor populations for the Avalon project.

Apalachicola National Forest—The red-cockaded woodpecker population on the Apalachicola Ranger District, Apalachicola National Forest (ANF) is larger than any other and is officially "recovered" since it is estimated to have an effective population size of over 350 potential breeding groups (U.S. Fish and Wildlife Service 2003). The ANF has been a significant donor population since 1989, contributing dozens of subadult woodpeckers to numerous populations (Hess and Costa 1995). For the first 2 years of the project (1998 and 1999), we relied on birds translocated from the Apalachicola Ranger District of the ANF because of concerns that the Wakulla Ranger District's subpopulation was declining (James 1991).

Red Hills.—The Red Hills region of south Georgia supports at least 180 active clusters, making it the largest population of woodpeckers on private land and the eighth largest population overall (U.S. Fish and Wildlife Service, unpublished data). Prior to 2000, the Red Hills had not served as a donor population. To ensure that the population did not suffer declines as a result of translocations, data were collected on annual recruitment, percent of clusters occupied by potential breeding groups, percent of clusters occupied by solitary males, and percent retention of breeding males and females.

Translocations

The Apalachicola Ranger District, ANF was used as the donor population in 1998 and 1999. Preparations for translocations began in April 1998 when in cooperation with the U.S. Forest Service we began banding red-cockaded woodpecker nestlings. This effort supplemented the Forest Service's annual banding effort. From 2000-2001 we used the Red Hills region of south Georgia as our donor population. In addition to supporting the Avalon project, these translocations were part of a research project to monitor the effects of removing subadult red-cockaded woodpeckers on the donor population. Following the USFWS translocation policy (U.S. Fish and Wildlife Service 2003), only subadult males that fledged from groups with at least 1 helper or with 1 other male sibling were removed for translocation. All subadult female fledglings were available for translocation. Individuals selected for translocation were removed during the fall and winter.

Birds selected for translocation were trapped, transported, and released using standard techniques (DeFazio et al. 1987). During the 4 years of translocations (1998-2001), 10 birds (5 pairs of unrelated subadult males and females) were trapped on the same night and translocated to appropriate recruitment clusters on Avalon. All birds were released simultaneously at dawn. Following release, birds were left unmonitored for the first week. This allowed birds adequate time to adjust to their new environment without human interaction. After the adjustment period, each release and recruitment cluster was monitored daily for signs of cavity tree activity. We conducted daily visits for 1 month post-release, at which time weekly visits were initiated.

Birds were monitored weekly until the following breeding season to assess social interactions between newly released birds and established birds, movements between clusters, and breeding status. Translocations were considered successful if the individuals remained on the plantation through the next breeding season.

Release Clusters

Because the plantation contained no natural cavities, the founder population relied solely upon artificial cavities. After careful evaluation of the 2 approved artificial cavity techniques, drilled cavities (Copeyon 1990) or artificial inserts (Allen 1991) we concluded that artificial inserts were most suitable for our situation, because the trees on Avalon are relatively young (60-70 years), vigorous growers (>8.9 cm sapwood), and large size (>76.30 cm dbh).

Release clusters were selected based on amount and height of hardwood midstory (sparse and <1 m), presence of adequate foraging habitat, and its spatial relationship to other clusters. All release clusters were located within 0.5 km of one another. Because red-cockaded woodpeckers typically disperse after release (Allen et al. 1993), and to maximize retention of released birds, we provided at least 1additional recruitment cluster within 0.4-1 km of each release cluster. A minimum of 4 inserts was provided in each release and recruitment cluster.

Monitoring Program

An intensive and extensive monitoring program was implemented to document the results of the reintroductions. A significant component of many small red-cockaded woodpecker population expansion programs has been competitor and predator control (Allen et al. 1993, Gaines et al 1995). Southern flying squirrels (*Glaucomys volans*), red-cockaded woodpecker cavity competitors (Carter et al. 1989), have been identified as a potential factor affecting woodpecker expansion and reproduction (Laves 1996). Furthermore, the relationships between hardwood midstory and flying squirrels have been studied with results suggesting a correlation between hardwood midstory abundance and flying squirrel presence (Loeb et al. 1992). An intensive flying squirrel monitoring program (bi-weekly examinations of all cavities) during the initial phase of reintroductions was required to assess the species relationship with the newly released woodpeckers.

The ability to identify individual birds in small populations is critical for determining sex and age, breeding status, demographic status, and genealogy. Therefore, all red-cockaded woodpeckers involved in the project were marked with individual leg bands. Translocated birds were banded as nestlings at the donor population and all chicks produced on the plantation were banded between the ages of 5-10 days old. If nestlings were missed or could not be captured, they were banded upon fledging or as adults.

Habitat Management

As stated previously, Avalon is an excellent example of a north Florida hunting plantation, and is being managed to maximize production of bobwhite quail. The foundation of Avalon's habitat management is an aggressive prescribed burning program. Approximately 65% of the upland pine communities are burned annually, with the majority of burning occurring in the months of March and April. The resultant open, park-like conditions represent ideal habitat for the species (Hooper et al. 1980). Accordingly, Avalon's current habitat management program required no changes to produce and maintain suitable nesting and foraging habitat for the red-cockaded woodpecker.

RESULTS

Forty (20 males (M), 20 females (F)) subadult red-cockaded woodpeckers were released between November 1998 and October 2001. Of these, 28 (16 M, 12 F) established residency on the plantation. Thirty percent (n = 12; 4 M, 8 F) of all translocated birds were not incorporated into the population (assumed to have died or emigrated from the property). By July 2002, 10 potential breeding groups and 4 solitary males had established territories. We experienced a 50% retention rate after the first year of release (1998), as compared

Table 1. Annual retention rates of released red-cockaded woodpeckers on Avalon Plantation from 1998 – 2001.

Donor Population	Year	# Birds Released	Retention (rates)
Apalachicola	1998	10	5 (50%)
Apalachicola	1999	10	7 (70%)
Red Hills	2000	10	8 (80%)
Red Hills	2001	10	8 (80%)

with an 80% retention rate in the fourth year of release (2001) (Table 1). Due to the lower retention rates in the earlier years, we experienced higher retention rates (80%) associated with translocations from the Red Hills, as compared with a 60% retention rate with individuals released from the Apalachicola National Forest. All individuals dispersed from their release cluster. Moreover, no individuals that were released together remained together. Birds relocated to adjacent release or recruitment clusters an average of 0.6 km away (range = 0.4-1.6 km).

Breeding success was documented in 1999, the first breeding season after reintroductions. In all of the following years (2000-2002), breeding success was also documented from birds released the prior fall. A total of 38 fledglings were produced on the plantation (Table 2).

A total of 87 artificial inserts were installed on the plantation in 19 clusters (active or recruitment). Six natural cavities and 9 active starts have been documented. Only 1 natural cavity has served as a nest tree to date.

Our intensive cavity monitoring program lead to the removal of 150 southern flying squirrels from 1999-2000. Squirrels were removed from both active and recruitment clusters (Table 3). The monitoring was eliminated after year 2000; no negative effects were experienced after 2000.

DISCUSSION

A significant concern with any restoration effort involving reintroductions is achieving the desired retention rates at the restoration sites. Our results suggest that reintroduction of multiple (5) subadult potential pairs simultaneously released was an effective technique for establishing a new breeding population of red-cockaded woodpeckers in previously unoccupied habitat. As suggested by Rudolph et al. (1992) and demonstrated at Avalon, reintroduction of multiple pairs in resident populations may help create breeding groups in vacant habitat that may have otherwise remained vacant. Furthermore, releasing multiple pairs in close proximity to one another apparently provided the necessary social interaction with members of nearby groups to facilitate establishment of breeding groups. The increased success rate in years 2-5 demonstrated the advantage of releasing birds near existing groups. Furthermore, the increased retention rates experienced with individuals from the Red Hills translocations may indicate an advantage of having similar habitats associated with the donor and recipient populations. However, in years 3 and 4 when birds were removed from the Red Hills, there were also more opportunities for retention given the steadily increasing population.

All released individuals underwent an adjustment period in which we observed considerable movement and exploration of adjacent occupied and unoccupied clusters. Our results suggest that to maximize the retention of introduced birds, the distribution and availability of suitable cavities (recruitment clusters) surrounding release clusters is an important factor contributing to success. Moreover, our most successful release clusters were located within 1 km of an available recruitment cluster. Such an array allowed wide-ranging birds the opportunity to discover other clusters as well as interact with other individuals.

The level of success achieved on Avalon is remarkable and exceeded the expected success rate. By 2002, the translocation of 40 individuals resulted in establishment of 10 potential breeding groups and 4 solitary males for a total of 58 individuals, including offspring. This rate of establishment (70%) into the population compares very favorably with annual survival rates of subadults and non-breeders in long

Table 2. Mean red-cockaded woodpecker breeding season data for Avalon Plantation. Nestlings were counted if they reached banding age (5-10 days old); sample size is given in parentheses.

	1999	2000	2001	2002
Clutch Size	3.5	3.5	3.66	3.71
Nestlings	2.00 (4)	2.25 (9)	2.00 (12)	2.29 (16)
Fledglings	2.00 (4)	2.00 (8)	1.83 (11)	2.14 (15)
Group Size	1.66	2.8	2.67	3.11

Table 3. Number of squirrels removed from active and inactive clusters on Avalon Plantation.

	1999		2000	
	# Clusters	# Squirrels	# Clusters	# Squirrels
Active	3	24	5	33
Inactive	7	47	7	46

established populations (Walters et al. 1988*a*). The observed establishment rate exceeds success rates of most previous translocation attempts (Hess and Costa 1995). We attributed success to releasing numerous birds (5 potential pairs) simultaneously into the population over multiple years. Previous translocations of red-cockaded woodpeckers involving small numbers of individuals over a short period resulted in minimal establishment rates (Reinman 1984, Rudolph et al. 1992, and Hess and Costa 1995). However, more recent translocation programs have seen an increase in success rates (Carrie et al. 1999, Franzreb 1999).

Our results demonstrated the importance of releasing individuals into high quality habitat. The plantation management practices were ideally suited for red-cockaded woodpeckers and required no change. Maintenance of a standing forest with selective timber harvests and retention of older trees are standard management practices on Avalon. This approach to forest management guarantees an adequate supply of foraging habitat and, with time, trees old enough to serve as cavity trees. Additionally, we consider the aggressive prescribed burning program, which maintains a midstory free, open park-like forest structure with herbaceous or low woody groundcover, to be a critical factor to our success of establishing a new population.

Our success was dependent on extensive preparation. Reintroduction was a successful technique and established this population because the basic ecological needs of the species were met. Release and recruitment clusters contained a minimum of 4 suitable cavities and sparse midstory. Additionally, release clusters were within a small geographic area. The distribution of suitable cavities (recruitment clusters) surrounding the release clusters was an important factor in our success given the birds considerable movements post release.

MANAGEMENT IMPLICATIONS

Our results demonstrated that it was possible to create a population *de novo* through direct reintroductions. We recommend that in small populations, managers need to evaluate if the original cause for decline is still suppressing the population prior to implementing translocations. We believe it is imperative managers eliminate the original cause of the population decline for translocations to prove successful. Similarly, prior to initiating reintroduction programs, managers must ensure that sufficient quantities of high quality habitat are available to rapidly establish a population of at least 10 potential breeding groups.