EFFECTS OF TRANSLOCATION ON A LARGE RED-COCKADED WOODPECKER POPULATION

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Abstract: The red-cockaded woodpecker (*Picoides borealis*) population on private properties in the Red Hills region of south Georgia is large enough (180 active clusters) to support translocation of some subadults to other areas for conservation purposes. We established the goal that individuals should only be removed from the Red Hills if the translocation has minimal negative effects on the population. Six treatment and control experimental areas (approximately 15 active clusters each) were established in 2000 according to the U.S. Fish and Wildlife Services translocation policy to monitor the effects of translocation of subadult red-cockaded woodpeckers on the Red Hills donor population. We used mean group size and percent change in the number of active clusters as indicators of population change. Twenty-four subadult birds were removed from the treatment areas and translocated to 2 recipient populations (20 individuals to the Avalon Plantation in north Florida and 4 to the Joseph Jones Ecological Research Center in south Georgia) in 2000 and 2001. Our study design and confounding influences did not allow us to definitively conclude whether the current translocation policy established by the U.S. Fish and Wildlife Service will negatively impact the donor population.

Key words: Red Hills, private land, south Georgia, north Florida, translocation, red-cockaded woodpecker, *Picoides borealis.*

The largest existing population of red-cockaded woodpeckers on private land is found on hunting plantations in the Red Hills physiographic region of north Florida and south Georgia. Over 200 red-cockaded woodpecker cavity tree clusters (active and inactive) in the Red Hills are currently spread over 37 different tracts owned by 35 different families (Figure 1). Approximately 59% of active clusters are on land that is under permanent conservation easement, safe harbor agreements (completed or pending), or conservation lease. To date, conservative timber management practices have favored the species in the Red Hills.

Translocation of subadult red-cockaded woodpeckers is a widely accepted conservation strategy to stabilize small, demographically isolated populations. Moreover, translocation was recommended in 64% of the 314 approved recovery plans for endangered species within the United States (Tear et al. 1993). Although red-cockaded woodpecker translocation effects prior to 1987 met with limited success (Odum 1983, Reinman 1984), recent technical improvements in translocation have led to augmentation of solitary bird groups (DeFazio et al. 1987, Hess and Costa 1995) and to creation of new groups (Rudolph et al. 1992, Allen et al. 1993, Franzreb 1999). Definitions of success for these efforts focused on the retention rates of the individuals released at the recipient population. Few, if any, studies have focused on the effects translocation has on the donor population. We monitored the effects of removal of subadult red-cockaded woodpeckers for translocation by comparing mean group size and mean percent change in the number of active clusters in treatment and control groups. We used 2 indices of negative effects on the donor population: (1) 10% decline in the number of groups within the treatment areas in any 1 year or cumulatively over the 3-year period in excess of comparative changes in the control areas, and (2) a decline in group size in 10% of the groups within the treatment areas in any 1 year or cumulatively over the 3-year period in excess of comparative changes in the control areas.

Prior to 2000, the Red Hills had not served as a donor population for translocation. The health, size, and location of the Red Hills woodpecker population make it attractive as a donor population for translocating individuals to small populations that have ability to expand. The Red Hills population has remained stable during the past decade (Engstrom and Baker 1995, Cox and Engstrom 2001). Data indicate that the population is healthy in terms of group size, productivity (Engstrom of high removals might not damage the population, but the effects of multiple years of removal will need to be closely monitored. Activities that help increase group size may reduce the impact of translocation on the population. Carrie et al. (1998) found that the number of birds per group was increased when clusters were supplemented with artificial cavities. These cavities can reduce the mortality rates of young birds, as they are quickly able to find roost sites. If this is true, cavity provisioning may be an effective tool to minimize the effects of translocation on donor groups.

ACKNOWLEDGMENTS

I would like to thank those who made valuable comments and contributions to an earlier draft of this manuscript: Frances James, Sue Daniels, and Ralph Costa. I also would like to thank the many people who have helped gather population data on the ANF especially: Eric Walters, Bart Kicklighter, Patty Kelly, Greg Hagen, Matt Schrader, Nancy Jordan, and John Davis.

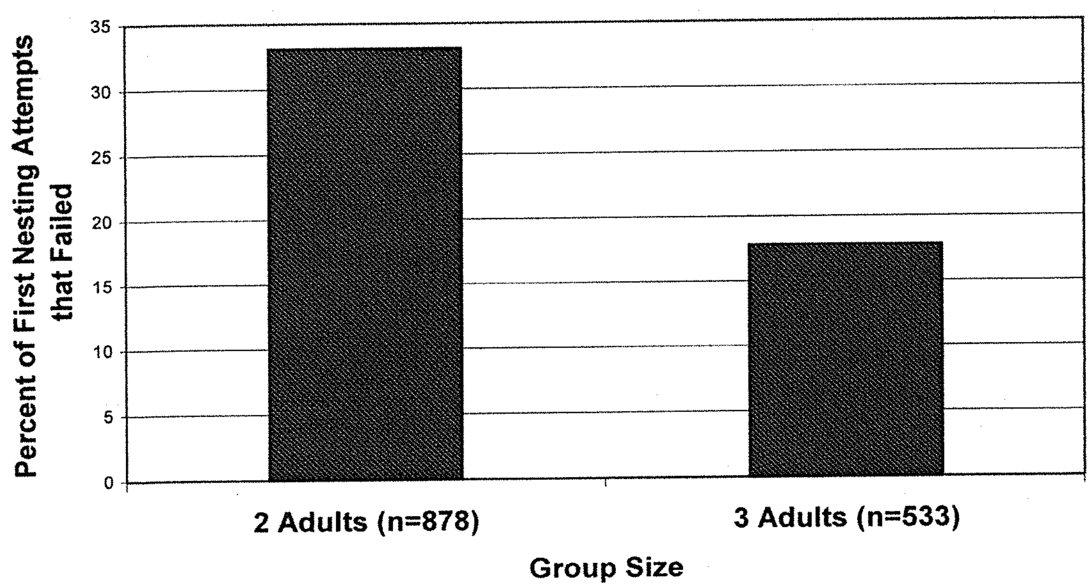

Figure 5. Failure rate of first nests of red-cockaded woodpeckers for groups containing 2 and 3 adults on the Apalachicola Ranger District (Pearson X^2 =38.54, *P*= 0.000)(1992-2002).

and Sanders 1997; Table 1), and neighborhood size (Engstrom and Mikusinski 1998) even though threats to the population are increasing. Urbanization, forest fragmentation, and intensification of timber production are a few of the challenges.

STUDY AREA AND METHODS

Our 8,000-ha study area was divided among 7 different land ownerships and contained 78 active and 28 inactive clusters based on the most recent regional survey (Cox and Engstrom 2001). This area harbors some of the best remaining examples of native plant communities in the Southeastern United States, including high quality old-growth longleaf pine (*Pinus palustris*) (Engstrom and Sanders 1997). Frequent prescribed burning, maintenance of a standing forest with selective timber harvests, and protection of native groundcover are standard management practices (Engstrom and Baker 1995).

We established 6 treatment and control experimental areas within our study area (Figure 2). Neighborhood sizes of treatment and control experimental areas were matched visually (Table 1). For example, treatment and control experimental areas (Figure 2) were spread across 2 or 3 properties to minimize the bias that might result from the effects of a single type of land management.

According to the U.S. Fish and Wildlife Services' 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 the purpose of translocation. All subadult female fledglings were available for translocation. Group size was determined at the time of nesting or feeding young. Clutch size, number of nestlings, and number of fledglings were measured for all nests. The number of active and inactive clusters in each experimental area was determined at the beginning of each breeding season to derive the percent change observed between years.

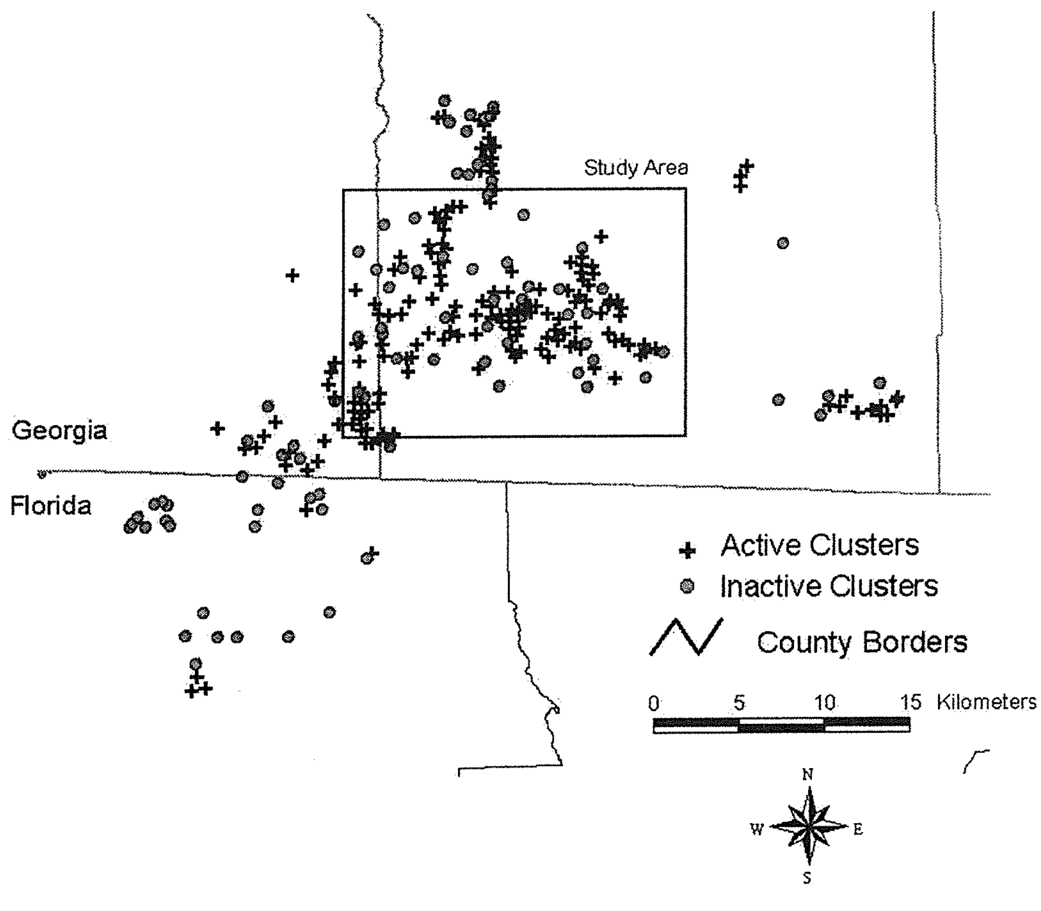

Figure 1. Red-cockaded woodpecker population in the Red Hills in 2000

We attempted to band, with unique color band combinations, all nestling red-cockaded woodpeckers and as many adults as possible in the study area each year. Chicks were removed from the nest with a monofilament noose attached to a plastic tube (Jackson 1982). Nestlings were banded between 5-10 days old. Adults were captured at roost time or at dawn as they exited the cavity using a standard hoop net attached to a telescopic pole. Subadult birds available for translocation were removed in the fall and winter of 2000-2002. We used standard translocation techniques (DeFazio et al 1987, Rudolph et al. 1992). Individuals were only removed from the treatment experimental areas.

We used Systat (Wilkinson 1998) for statistical analyses. The analyses included summary statistics, *t*-tests, and analysis of variance (ANOVA) with *P*-values adjusted for multiple comparisons using Bonferroni approximations (Wilkinson 1998).

RESULTS

We removed 24 subadult birds from 19 treatment clusters in 2000 and 2001. Five clusters contributed 2 birds, while the remaining 14 contributed a single bird. The distribution of birds eligible for translocation was not consistent among treatment groups as is evident by considering the total number of fledglings produced by individual clusters (Figure 2). During the 3-year study period, we detected no differences between the treatment and control areas in clutch size ($t_{1,149}$ = -1.85, P = 0.971), number of nestlings ($t_{1,149}$ = -2.110, P = 0.146), or number of fledglings ($t_{1,170}$=-0.50, P = 1.00) (Table 1). The number of nestlings was marginally higher in treatment clusters (Table 1). The number of adults per group was not statistically different between the treatment and control areas ($t_{1,240}$ = -1.09, P = 1.00).

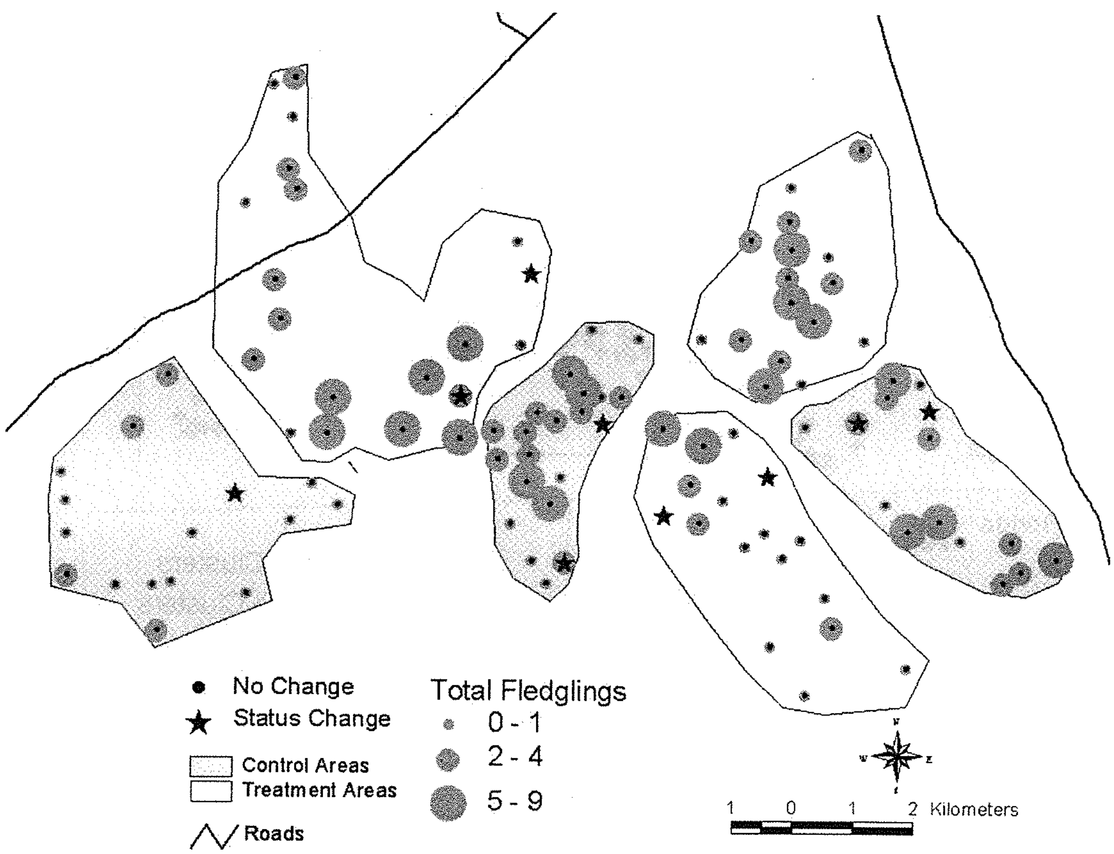

Figure 2. Study subpopulations of red-cockaded woodpeckers within the Red Hills, Georgia. Control areas are indicated in shading and treatment areas are not shaded. Clusters that changed status are indicated by a star symbol.

Five clusters in the control areas changed status (i.e., 1 cluster went from inactive to active and 4 clusters went from active to inactive) and 4 clusters in the treatment areas changed status from active to inactive during the 3-year study period. Thus, we observed no statistically significant differences between the treatment and control experimental areas.

We ran an ANOVA using (1) treatment as an independent variable, (2) number of adults and number of fledglings as dependent variables, and (3) year and landownership as covariates. Tests for effects of independent variables and covariates showed there were no significant differences between treatment and control groups; however, landownership had the highest *F*-statistics when comparing both the number of adults ($F_{1,141} = 1.88$, $P = 0.17$) and the number of fledglings ($F_{1,141} = 3.16$, $P = 0.08$) between treatment and control groups. These results suggest landownership (and the experimental areas) had some effect on productivity and group sizes (Figure 2). Number of fledglings used in the analysis was calculated using only those clusters that had eggs at some point during the nesting season. For the remaining effects, year had a higher *F*-statistic in the comparison of the number of fledglings ($F_{1,141} = 1.31$, $P = 0.25$), while treatment had a larger F-statistic in the comparison of number of adults ($F_{1,141} = 1.05$, $P = 0.31$).

DISCUSSION

A formal study design in which red-cockaded woodpecker population parameters accurately reflect "population health" and a sample size necessary to detect subtle, long-term changes is a formidable challenge, especially in a population that is a patchwork of property ownerships. We failed to detect a difference of group size between the treatment and control areas nor did we detect a negative trend over the study period. The loss of 4 groups from the treatment areas during the study period is very close to the 10% decline that we established as an indicator that subadult removal was having a negative effect on the study population. However, statistically, the decline observed in the treatment areas was not statistically different then that observed in the control areas.

Because of our experimental design, the lack of differences between the treatment and control experimental areas may not accurately reflect the effect of translocations. First, the experimental areas are not demographically isolated. Individuals could easily move between and among treatment and control experimental areas and the population matrix outside the study area. This degree of movement could obscure negative effects of translocation. Second, although we mixed properties within treatment and control experimental areas, we may have confounded our treatment and control experimental areas with a property effect. The geographic pattern of productivity suggests as much (Figure 2). Third, the number of active clusters in both treatment and control experimental areas declined. Thus, even though we found no differences between the experimental areas, our experimental design, which permitted movement of birds between experimental areas, prevented us from determining whether or not translocation had detrimental effects within the study area. A better study design would include 6 demographically isolated populations of sufficient size under single

Table 1. Summary demographic and population statistics for clusters of red-cockaded woodpeckers monitored in the Red Hills region. Statistical tests showed no significant differences between Treatment and Control groups. Standard deviations are provided in parentheses.

Group/ Year	Active: Inactive	Adults per Cluster	Fledged Young	Females: Males	Nests	Clutch Size	Failed Nests	No Nesting Attempt
Treatment								
2000	41:13:00	2.54 (0.77)	1.46 (0.90)	19:15	28	3.27 (0.72)	8	7
2001	39:15:00	2.40 (0.68)	1.72 (0.59)	20:27	32	3.33 (0.66)	4	3
2002	37:17:00	2.91 (0.67)	1.82 (0.96)	21:16	26	3.46 (0.66)	8	4
Subtotal	39:15:00	2.61 (0.73)	1.66 (0.82)	60:58:00	57	3.35 (0.68)	16	18
Control								
2000	41:13:00	2.73 (0.86)	1.60 (0.65)	17:20	29	3.28 (0.71)	4	8
2001	35:19:00	2.29 (0.58)	1.60 (0.71)	17:19	30	3.09 (0.53)	7	5
2002	37:17:00	2.46 (0.63)	1.41 (0.65)	14:13	24	3.29 (0.47)	3	6
Subtotal	37.7:16.3	2.50 (0.72)	1.54 (0.67)	48:52:00	62	3.22 (0.60)	14	19
Totals	38.3:15.7	2.56 (0.72)	1.60 (0.75)	108:110	169	3.29 (0.64)	30	37

management strategies, but such conditions do not exist in the Red Hills. Application of computer simulations (Walters et al. 2002*a*) should be considered.

The number of failed nests and the number of groups that did not nest in a given year raise concerns about the Red Hills population's health, regardless of the potential effects of translocation. We observed losses of nest cavities when prescribed fire burned the resin around the cavity. Such loss is easily preventable, through vigilance and special precautions on the part of landowners and land managers. Realistically, protection of the most vulnerable nesting and roosting cavities (i.e., low and resinous) will likely only be achieved by more intensive monitoring, preferably by a biologist dedicated to work with landowners in the Red Hills region. We also noted instances of intense interactions with cavity kleptoparasites (Kappes 1997) that seemed to result in some nesting failures. For example, dead young found in 1 of the groups monitored appeared to be struck by the bill of a woodpecker. Red-headed woodpeckers (*Melanerpes erythrocephalus*) were very vocal and active in the vicinity of the destroyed nest. We believe that on this property artificial cavities might alleviate pressure from kleptoparasites. Implementation of artificial cavity programs will be easiest on those properties that have safe harbor agreements, conservation easements, or both. Efforts to recruit Red Hills landowners to place their property under a level of conservation protection for the red-cockaded woodpecker are ongoing.

Additional attention to the spatial configuration of donor clusters and which birds are removed may also be warranted. For example, we noted 2 instances where removal of an eligible female might have affected a solitary male cluster nearby. On the other hand, a broad prohibition on removing subadult females from within specified distances of solitary males could seriously impede a translocation program in our region since it could encompass dozens of nearby clusters and also not account for the presence of other subadult females.

Translocation is a valuable conservation tool that has helped to enlarge woodpecker populations on many areas (Rudolph et al. 1992, Gaines et al. 1995, Carrie et al. 1999). Translocation did not appear to be harmful to the Red Hills donor population; we followed existing USFWS guidelines and the translocation effort was limited to a few years. To monitor the annual effects of translocation not only should the removal of subadult birds be assessed, but also particular attention should be given to the role additional factors (e.g. cavity limitations, kleptoparastism, and weather conditions) have on the population. These additional factors, in conjunction with translocation, may cause declines in the donor population.