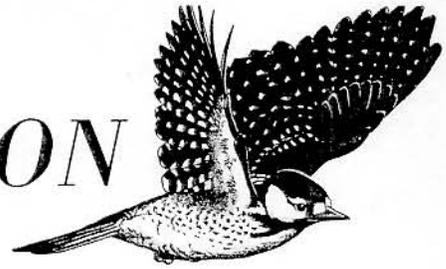


C H A P T E R 6
TRANSLOCATION



**THE EFFECT OF USING A "SOFT"
RELEASE ON TRANSLOCATION
SUCCESS OF RED-COCKADED WOOD-
PECKERS**

KATHLEEN E. FRANZREB, Southern Appalachian Mountains Cooperative Ecosystems Studies Unit, USDA Forest Service, Southern Research Station, Department of Forestry, Wildlife, and Fisheries, University of Tennessee, Knoxville, TN 37996

Abstract: Translocations of the endangered red-cockaded woodpecker have been conducted since 1986 to enhance critically small subpopulations, to minimize the likelihood of local extirpations, and to reduce the adverse effects of fragmentation and isolation among existing populations. Such attempts have resulted in mixed success as many translocated birds either disappeared shortly after release or returned to the capture site. All such previous releases were "hard" releases in which the bird was captured, transported to the release cluster, and released shortly thereafter. I used a "soft" release approach whereby red-cockaded woodpeckers were captured, transported to the release location, and maintained in a large, portable mobile aviary at the release cluster for 9 to 14 days. I tested 22 birds in the aviary to determine whether translocation success could be increased by housing the birds in a mobile aviary at the release cluster on the Savannah River Site, South Carolina. Of the 13 birds who completed the test, the translocation success rate was 61.5%, not significantly different from the 63.2% obtained during earlier hard releases conducted at the same location. It may be that a longer period of confinement in the aviary is necessary

to instill site fidelity in the birds, but extending the time period would need to be weighed against the additional costs and the increased potential for bird loss.

Key words: aviary, Savannah River Site, South Carolina, translocation.

Recovery activities for the endangered red-cockaded woodpecker (*Picoides borealis*) have emphasized enhancing habitat management activities in existing larger populations as well as intensive population management aimed at restoring small populations. Red-cockaded woodpeckers are cooperative breeders endemic to open pine woodlands of the southeast (Lennartz et al. 1987, Walters et al. 1988a). Cavities that they construct in living pine trees are used for nesting and for nightly roosting throughout the year. Artificial cavities constructed by installing inserts (Allen 1991) or drilling cavities (Copeyon 1990) are readily accepted by the birds and allow use of sites for nesting and roosting that would otherwise have been unsuitable.

Translocation of red-cockaded woodpeckers is a useful tool to augment critically small populations (Gaines et al. 1995, Hess and Costa 1995), to help minimize the potentially adverse genetic consequences of small population size (Haig and Nordstrom 1991), and to facilitate population recovery after catastrophic events. Translocations are being increasingly used to bolster small, isolated red-cockaded woodpecker populations (U.S. Fish and Wildlife Service 2003). Success rates for previous translocations have varied substantially and have not been entirely satisfactory (Odom 1983, DeFazio et al. 1987, Rudolph et al. 1992, Allen et

al. 1993, Costa and Kennedy 1994, Hess and Costa 1995, Reinman 1995, Franzreb 1999). Carrie et al. (1999) released 17 subadult red-cockaded woodpeckers, including 5 potential pairs, in close proximity to each other and near other birds in pre-existing clusters. Twelve of these birds, 6 males and 6 females, remained in the general area and were later found to be members of breeding pairs, resulting in a success rate of 71% (Carrie et al. 1999). Of the 143 red-cockaded woodpeckers that were translocated from 1989 to 1994, the success rate was 62% ($n = 77$) for females, 42% ($n = 12$) for males, and 33% ($n = 27$) for pairs (Costa and Kennedy 1994). The success rate of Carrie et al. (1999) was relatively high in relation to the rates summarized by Costa and Kennedy (1994). The definitions for success reported by Costa and Kennedy (1994) varied widely, ranging from only that a bird interact well in a pair to breeding and/or fledging of at least 1 young. The differences observed in translocation success rates can be attributed, in part, to protocols used, including number, age, and sex of birds moved (Costa and Kennedy 1994); habitat conditions at the release cluster (Hess and Costa 1995), and on how success is defined (Costa and Kennedy 1994, Carrie et al. 1999, Franzreb 1999). Regardless of how one defines a successful translocation, if the likelihood that translocated birds will remain at the recipient location could be improved, it would have positive consequences for the recovery of this species.

By late 1985, the population of red-cockaded woodpeckers at the Savannah River Site, South Carolina, a National Environmental Research Park, had declined to 4 birds (1 pair and 2 additional solitary males) (Gaines et al. 1995). An ambitious proactive management strategy was enacted to reverse this decline (Franzreb 1997a). A major component of the recovery strategy was translocating red-cockaded woodpeckers. From 1986 to 1995, 54 birds were translocated to the Savannah River Site from off-site donor populations or within the population to encourage pair formation and reproduction using a "hard" release (Franzreb 1999). The translocation was considered successful if the bird remained at, or in the vicinity of, the release cluster for at least 30 days after release. Of the 49 birds translocated (excluding 5 nestlings), 31 translocated birds remained near or at the release cluster for at least 30 days for a 63.2% success rate. By late July 1996, 51.0% of these 31 birds had reproduced. In many of the unsuccessful cases, the bird either returned to the capture cluster or disappeared almost immediately after release (Franzreb 1999).

Previous translocation work with red-cockaded woodpeckers involved "hard" releases in which a bird was captured, transported to the release cluster, and then released immediately or early the next morning. In an effort to improve translocation success, I tested whether a "soft" release in which birds were kept in captivity for 9 to 14 days at a release cluster in a mobile aviary would increase the likelihood that they would remain there once released.

The possible use of a mobile aviary to enhance translocation success generated increased interest several years ago when the U.S. Fish and Wildlife Service began issuing Section 10 permits to non-industrial forest landowners under the Endangered Species Act of 1973, as amended, to allow the "incidental take" of red-cockaded woodpeckers. Permittees are required to mitigate impacts to red-cockaded woodpeckers by establishing new recruitment clusters and/or by translocating subadults to unoccupied clusters (Costa 1997). Since 1995, the U.S. Fish and Wildlife Service has issued permits to allow 27 groups of red-cockaded woodpeckers to be impacted or removed (U.S. Fish and Wildlife Service 2003). If using a soft release method resulted in greater translocation success than a hard release, a mobile aviary would offer an additional mechanism by which more birds could be "taken" and successfully translocated.

This study consisted of 3 phases: (1) designing, constructing, and testing the aviary for durability (Franzreb 1997b, Edwards et al. 1999); (2) testing the aviary to determine if red-cockaded woodpeckers could be maintained safely in it (Franzreb 1998); and (3) evaluating whether the success of translocating red-cockaded woodpeckers could be enhanced through the use of a mobile aviary at the release cluster so that translocation efforts could be more productive. Red-bellied woodpeckers (*Melanerpes carolinus*) served as surrogates for the endangered red-cockaded woodpecker in the initial testing of the aviary. Results of the surrogate tests are reported in Franzreb (1998). This paper reports on phase (3).

STUDY AREA AND METHODS

The study was conducted on the Savannah River Site, a 78,000-ha (192,660-ac) National Environmental Research Park under the jurisdiction of the Department of Energy. The Savannah River Site lies within the Upper Coastal Plain physiographic region, in Aiken, Allendale, and Barnwell counties, South Carolina. A

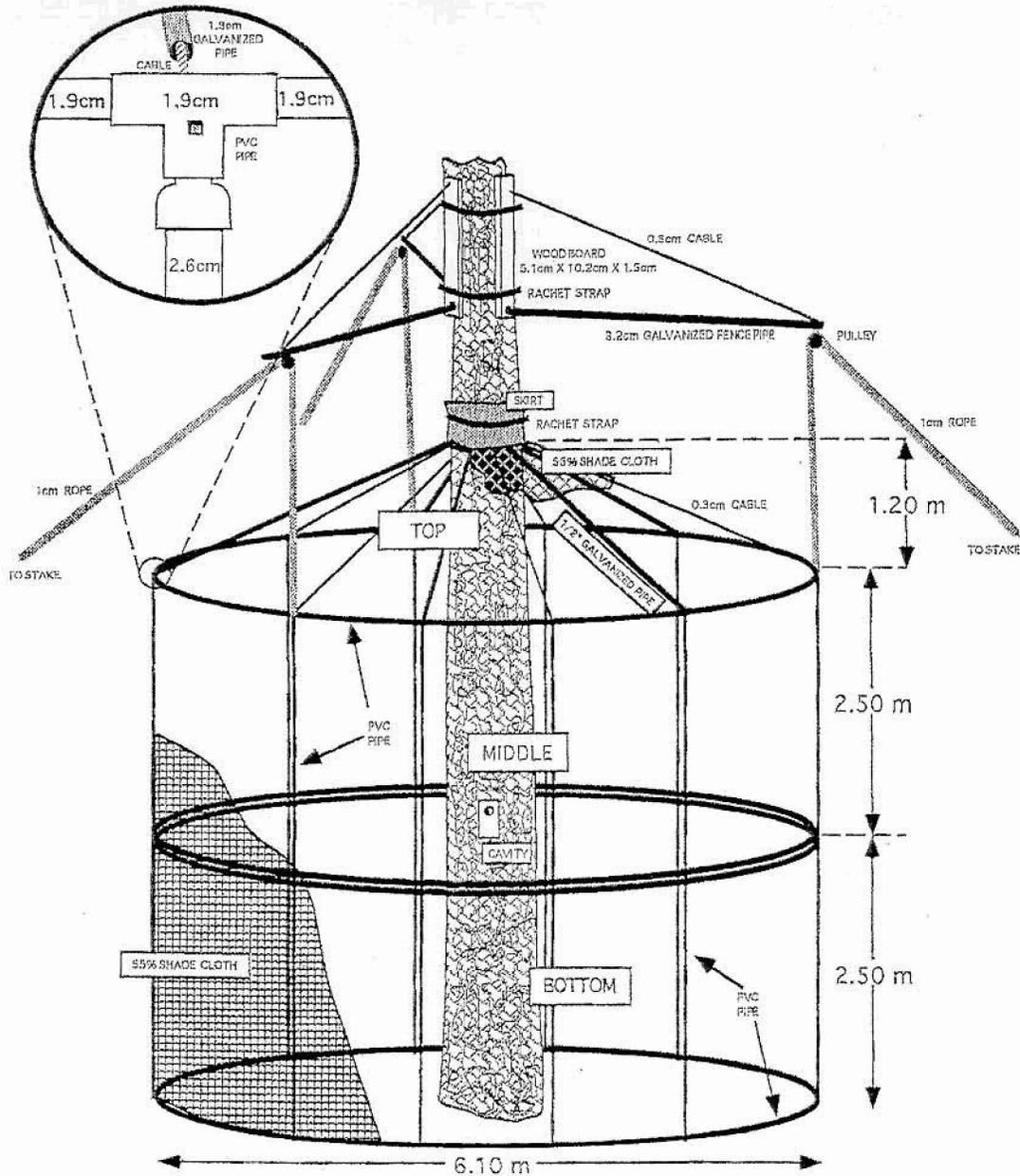


Figure 1. Diagram of mobile aviary designed for the red-cockaded woodpecker

more complete description of its land use and management history is provided by White and Gaines (2000).

Two versions of the aviary were used ranging in diameter from 4.7 m (15.5 ft) to 6.1 m (20.1 ft) with a total height of 5.1 m (16.8 ft) to 6.2 m (20.5 ft), respectively (Figure 1, also see Franzreb 1997b and Edwards et al. 1999). A description of the design and installation is provided by Franzreb (1997b) and Edwards et al. (1999). As red-cockaded woodpeckers use cavities for roosting on a nightly basis, each tree selected for use with the aviary in this study had an artificial cavity insert located about 3.0 m (9.9 ft) from the ground. The

aviary was erected around the cavity tree.

Red-cockaded woodpeckers were captured at the Savannah River Site using nets attached to telescoping poles and moved to the release cluster in a wooden holding box. Birds were either placed into the cavity insert and held there overnight using wire hardware cloth nailed over the cavity entrance and released early the following morning within the aviary, or were captured early in the morning and taken to the aviary for immediate release. Birds were weighed upon capture and reweighed 1 - 2 days prior to release or upon necropsy. In several cases, birds did not roost in the

cavity shortly before release and, consequently, could not be recaptured for reweighing. Earlier research revealed that the distance a red-cockaded woodpecker was translocated had an effect on translocation success (Franzreb 1999). It was recommended that the distance between the capture and release clusters be at least 7 km (4.4 mi) to discourage homing by the birds (Franzreb 1999). Birds in this study were moved more than 7 km (4.4 mi) and the mean distance moved was 36.0 km (22.5 mi).

Available food resources within the aviary included suet, fresh oranges, grapes, potato slices, crickets, and meal worms. A minimum of 30 to 150 crickets per day were available. In later tests, meal worms were made available in a dispenser affixed to the side of the aviary. Meal worms were later replaced with wax worms to increase the fat content of the food. Water was available *ad libitum* from an earthen bowl on the ground of the aviary in the first test, and then later from a gravity-fed water dispenser. All food and water resources were checked and replenished on a daily basis, as needed.

Birds were maintained in the aviary for 9 to 14 days and monitored closely. An observer, located behind a blind, watched the birds after release into the aviary and recorded where the bird moved, how it behaved, how often it drank, and feeding behavior (when, where, and what it selected to eat). When it was time for the release, part of the aviary was opened to allow the bird to exit on its own.

As the result of the 2 fatalities of red-cockaded woodpeckers described in Franzreb (1998), we modified our monitoring procedures to more closely assess whether the bird was adjusting adequately to confinement. During the first day of the bird's confinement in the aviary, we observed the bird from an inconspicuous location to determine whether it had found the food supplies and was eating well. If a bird had not started to eat by 1400 hrs of the day it was freed in the aviary, we released it. In those situations we did not attempt to reweigh the bird as that would have subjected it to additional stress.

Field trials using 22 red-cockaded woodpeckers were conducted between 21 March 1995 and 16 March 2000. If a bird remained at, or in the vicinity of, the release cluster for at least 30 days after release, the translocation trial was regarded as a success. As the objective of this study was to assess whether maintaining a bird in confinement for 9 to 14 days at the release cluster would increase translocation success, the results for only those birds that concluded the test were

included in the analysis. A G-test (Sokal and Rohlf 1969) was used to test whether the translocation success rate using the soft release approach differed from the 49 hard releases that had been done at this same location from 1986 to 1995 (Franzreb 1999).

Permission to conduct the experiments was obtained from the U.S. Fish and Wildlife Service and my existing permit was modified to allow maintaining red-cockaded woodpeckers in captivity.

RESULTS

The aviary was field tested prior to placing a bird inside to determine how it would withstand various weather conditions. As a result of these tests, the poly-vinyl chloride (PVC) pipe forming the aviary frame was upgraded from schedule 40 to schedule 80 to minimize the likelihood that plastic connections would pull apart causing the aviary to collapse. Even with this modification, the aviary structure failed on 2 occasions when strong winds caused numerous PVC connectors to snap and break apart. Exposure of the PVC pipe to the ultraviolet rays in sunlight may have caused the pipe to become brittle and weak, thus predisposing it to breaking.

Of the available food items, red-cockaded woodpeckers preferred crickets, using other foods sparingly. In later tests, some of the red-cockaded woodpeckers used a large number of meal worms and wax worms. Birds were observed drinking.

In March 1995, the first red-cockaded woodpecker, a female, was maintained in the aviary for 9 days. During her 9 days in captivity, she adjusted quickly, her body mass declined slightly from 42.5 g (1.49 oz) to 42.0 g (1.47 oz), and she appeared to be in good health, thus suggesting that a red-cockaded woodpecker could be maintained in the aviary for a short period of time. When this bird was recaptured in the aviary, she was moved to another cluster on the Savannah River Site that contained a solitary male and released. Because this was a trial period for the technique, her results are not included in those analyzed to determine the efficacy of translocation using the aviary.

A male red-cockaded woodpecker was maintained in the aviary during March-April 1996 for 12 days (Table 1). By day 9 his mass had decreased from 49.0 g (1.72 oz) to 36.0 g (1.26 oz), a reduction of 26.5%. In all other respects, he appeared normal. The feeding funnel that contained the crickets had accumulated woodpecker feces and small pieces of

sloughed-off bark, making it possible for the crickets to climb out of the funnel and escape. As the result of the unanticipated loss of crickets from the feeder, the availability of food for the male may have been limited. During his last 2 days in captivity, the number of crickets was increased from 50 to 150 per day, and he spent considerable time foraging on them. After his release, he frequently returned to the artificial cavity insert in the aviary to roost at night. This bird remained at the release cluster.

In the next 2 tests using a male and female, the birds became ill after being placed in the aviary. The male was found alive on the fourth day of captivity, lying on the ground, but died that evening after being taken to a local veterinarian. The necropsy report states, "moderate emaciation, subacute skeletal muscle necrosis, mild acute renal gout" and notes that the bird had no apparent body fat, but that ingesta were found in the stomach (Drs. N. J. Thomas and K. A. Converse, U.S. Geological Survey, Biological Resources Division, National Wildlife Health Center, Madison, WI, personal communication). The second bird, a female, was found dead on the ground less than 24 hrs after being captured and released into the aviary. The necropsy report on the

female states, "cause of death undetermined" (Drs. N. J. Thomas and K. A. Converse, U.S. Geological Survey, Biological Resources Division, National Wildlife Health Center, Madison, WI, personal communication). Both birds had lost a considerable amount of mass, 10.6 g (0.37 oz) and 7.0 g (0.25 oz), respectively, during their brief captivity which may have resulted from stress and/or a reduction in the time allocated to feeding.

To minimize the likelihood that additional birds would be lost, the U.S. Fish and Wildlife Service instituted a policy that any bird that had not begun to feed normally by 1400 hrs on the day it was freed within the aviary would be released. For the remaining trials, birds had access to wax worms, which are considerably higher in fat content than are meal worms and were readily consumed. As the study was designed to evaluate whether maintaining birds in an aviary would increase the likelihood that once released they would remain near the release location, the 2 individuals who died shortly after being placed in captivity were excluded from the analysis. We believe that the modifications in our testing protocol that were made as the result of these 2 deaths prevented future deaths of the test subjects.

Table 1. Response of red-cockaded woodpeckers to captivity in a mobile aviary during translocation experiments, 1996 to 2000, Savannah River Site, South Carolina.

Sex	Age (yrs)	Date Placed in Aviary	Date Released or Died	Weight (g) at Capture	Weight (g) When Released ^a	Weight Change (g) ^a	Percent Weight Change ^a	Outcome
M	< 1	3/25/96	4/5/96	49.0	36.0	-13.0	-26.5%	stayed ^b
M	< 1	10/9/96	10/13/96	46.0	(35.4)	(-10.6)	(-23.0%)	died
F	2	2/4/97	2/5/97	44.0	(37.0)	(-7.0)	(-15.9%)	died
M	< 1	2/4/97	2/18/97	57.5	45.0	-12.5	-21.7%	stayed ^c
M	< 1	2/20/97	3/5/97	46.0	45.0	-1.0	-2.1%	moved ^d
M	< 1	3/6/97	3/20/97	48.0	45.5	-2.5	-5.2%	disappeared
M	< 1	10/8/97	10/21/97	44.0	44.5	+0.5	+1.1%	stayed
M	< 1	10/30/97	11/13/97	44.0	43.5	-0.5	-1.1%	stayed
M	< 1	2/20/98	3/4/98	47.5	na	na	na	went home
M	< 1	10/21/98	11/4/98	48.0	46.5	-1.5	-5.7%	stayed
M	< 1	11/17/98	12/01/98	47.5	na	na	na	stayed
M	< 1	2/3/99	2/17/99	43.5	46.0	2.5	3.1%	stayed
M	< 1	10/28/99	11/9/99	49.5	na	na	na	stayed
M	< 1	1/7/00	1/21/00	45.0	45.0	0	0	disappeared
M	< 1	2/11/00	2/24/00	49.0	na	na	na	disappeared
Mean				47.2	44.1	-3.1	-6.5	

^aValues in parentheses are not included in calculating mean values as these 2 individuals died soon after the tests began.

^bStayed = bird remained in vicinity of release cluster for at least 30 days after release.

^cBird remained at release cluster at least 30 days, but was found near capture cluster 8 months later.

^dBird moved 9.8 km from release cluster within first 30 days of release, where he remained.

Of the next 18 trials, 2 birds were released early because the aviary frame broke during high winds, thus jeopardizing their safety. Another bird was released when an unanticipated deer hunt was held that precluded our ability to properly monitor the bird while in the aviary. In 2 other cases (1 male, 1 female), the birds had to be released early because they did not begin to feed within the time required by our modified monitoring protocol. The last bird tested was not adequately monitored immediately after being released because of personnel shortages. Therefore, his status 30 days after release could not be determined. The results exclude these 6 birds. Each of the remaining 12 birds (all males) seemed to adjust well to confinement and survived. Mass changes in these individuals ranged from losing a maximum of 12.5 g (0.44 oz) to gaining 2.5 g (0.09 oz) during captivity (Table 1). The mean mass change for the 8 birds that were recaptured for reweighing was -1.9 g (-0.07 oz) (Table 1). These 12 birds, plus the second bird tested as described earlier, provided a sample size of 13, which were evaluated.

Of the 13 birds that completed the test, 8 (61.5%) remained at or near the release cluster for at least 30 days after release and were regarded as successful translocations. One additional bird moved 9.8 km (6.1 mi) from the release cluster and remained there. Three birds disappeared immediately after release and have not been observed again. An additional bird flew home to the capture cluster shortly after release.

Translocation experiments with 49 red-cockaded woodpeckers conducted at the Savannah River Site from 1986 to 1995 using a hard release resulted in a 63.2% success rate (Franzreb 1999). The translocation success rate using a mobile aviary at the release cluster was not significantly different from that obtained using a hard release ($G = 0.02$, $P > 0.75$).

DISCUSSION

Birds exposed to stressful conditions can lose weight even when feeding frequently on a good food source (Dr. Greg Massey, DVM, Hawaii Department of Fish and Wildlife, personal communication). The cause of the substantial mass loss of some of the red-cockaded woodpeckers during confinement could not be determined, but appeared to be minimized by the addition of a high fat food source in the form of wax worms. Providing the later-tested birds with wax worms greatly reduced the mass loss that was experienced by some birds that were tested earlier.

Not all birds responded positively to the aviary experience. Although most red-cockaded woodpeckers adjusted quickly to confinement, 2 did not and had to be released. The apparent reluctance of some individuals to adjust to confinement in the aviary remains a concern.

The mobile aviary has proven itself in terms of its design. Because maintaining birds in confinement requires careful monitoring, it is labor intensive and, therefore, relatively expensive. The results of this study do not indicate that maintaining red-cockaded woodpeckers in a mobile aviary enhance translocation success significantly. It may be that 9 to 14 days is not a long enough period of time for birds to recover from being translocated and to develop strong site fidelity. A longer period of confinement may be necessary to foster a higher translocation success rate. There are virtually no studies that have addressed the effect of confinement time on success of translocated individuals. Thus, under different circumstances, the use of a mobile aviary may increase success in translocated individuals, although it was not evident in this study.

ACKNOWLEDGMENTS

This research was funded by the Department of Energy, Savannah River Site, whose cooperation is gratefully acknowledged. Funding was provided by the Department of Energy-Savannah River Operations Office through the U.S. Forest Service Savannah River under Interagency Agreement DE-IA09-76SR00056. I thank R. N. Conner and J. I. Blake for critically reviewing the manuscript and B. Parresol for statistical review. I am indebted to C. Dachelet for his long standing field and technical support and to S. Schulze, D. Ussery, P. Johnston, J. Edwards, K. Laves, and K. Shinn for assistance in the field. J. Edwards provided improvements to the original aviary design. I thank the personnel of the Forest Service Savannah River (J. Blake, E. LeMaster, W. Jarvis, J. Irwin) for logistical support during the course of this study. I am grateful to Dr. K. Smith, Wildlife Disease Studies Unit, College of Veterinary Medicine, University of Georgia, Athens, GA, and Drs. N. J. Thomas and K. A. Converse, U.S. Geological Survey, Biological Resources Division, Madison, WI., for conducting necropsies on the woodpeckers.