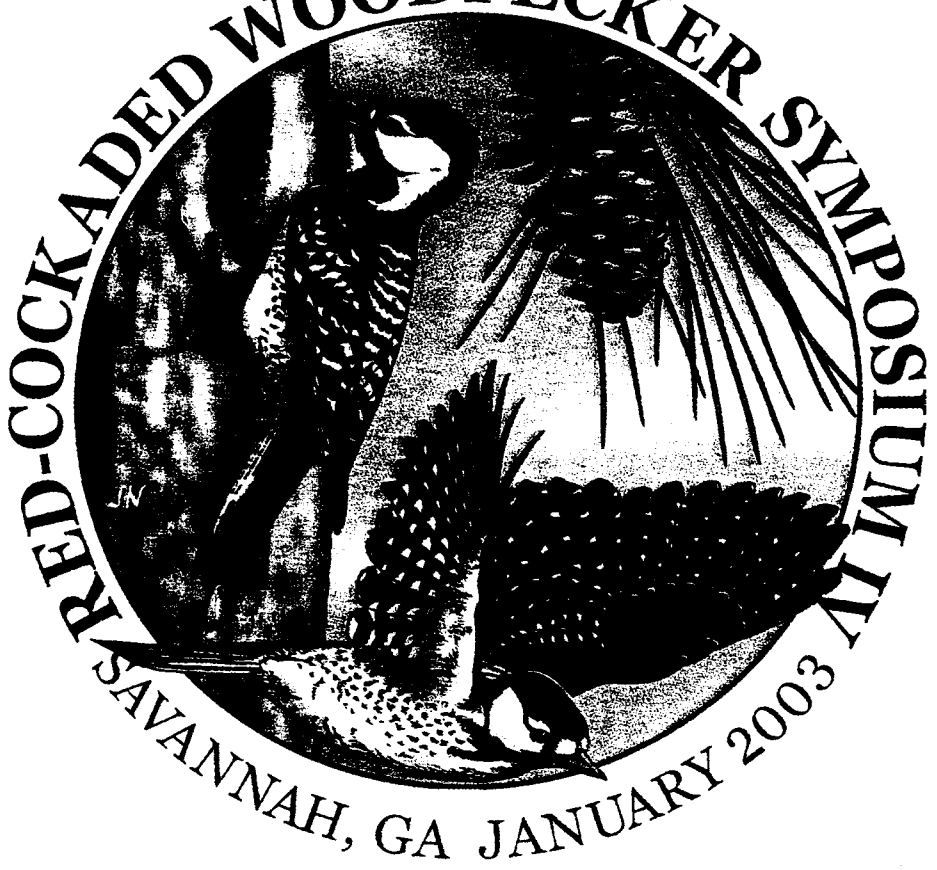
RED-COCKADEDWOODPECKER: ROAD TO RECOVERY



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DOWN FOR THE COUNT? RED-COCKADED WOODPECKER RESTORATION ON ICHAUWAY

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Abstract: The Ichauway red-cockaded woodpecker (*Picoides borealis*) population in Georgia consisted of 8 individuals in 1994, but fell to 1 male by 1997. The collapse of the population is attributed to an absence of trees infected with red heart rot (*Phellinus pini*), landscape fragmentation with associated demographic isolation, and past management practices, specifically historical snag and deadwood removal.

In March of 1999 the Joseph W. Jones Ecological Research Center (JWJERC) at Ichauway began restoration of a red-cockaded woodpecker population constrained by a lack of suitable cavities. A baseline survey found only 8 usable cavities scattered across 8,000 ha (>20,000 ac) of suitable habitat. Four artificial cavity inserts were installed at 20 cluster locations, on 600 m (0.4 mi) intervals in approximately 600 ha (>1500 ac) of longleaf pine habitat. The first translocated subadult was a female that paired with the remaining solitary male red-cockaded woodpecker in 1999. Seventeen subadult red-cockaded woodpeckers were translocated to JWJERC from the spring of 1999 to fall of 2001; 14 remained on site. The red-cockaded woodpecker population expanded from 1 active cluster in 1999 to 9 active clusters in 2002.

Red-cockaded woodpecker restoration at Ichauway focuses on cavity and habitat management. Flying squirrels (*Glaucomys volans*) are removed during the breeding season and cavities damaged by water, birds or squirrel occupancy are replaced. Habitat is managed with growing and dormant season prescribed fires on a 2-year rotation and mechanical removal of midstory hardwoods. The red-cockaded woodpecker population at

Ichauway is enrolled in a safe harbor management agreement and serves as the private lands mitigation site for the Red-cockaded Woodpecker Conservation Plan for the Georgia Department of Natural Resources (GDNR).

Key words: small population management, restoration, cavity management, private lands, safe harbor management agreements, translocation, kleptoparasites, red heart rot (*Phellinus pini*), flying squirrels (*Glaucomys volans*), Georgia.

For the past 30 years, small isolated red-cockaded woodpecker populations on private forest lands have been extirpated across the southeast (Baker 1981, 1995, James 1995, Ozier et al. 2003). These populations survived initial habitat degradation during the early 1900s and persisted in small patches of suitable habitat; however, the number of isolated groups on private lands continued to decline. Baker and Thompson (1989) found a 60% decrease from 42 to 17 active clusters on isolated tracts of non-industrial private forest land from 1980 to 1989 in the state of Georgia. In 1999 the GDNR, in cooperation with the U.S. Fish and Wildlife Service (USFWS) and other partners, developed a conservation plan for the red-cockaded woodpecker on private lands in Georgia.

The conservation plan goals are to use safe harbor management agreements or, under specific conditions, a Mitigated Incidental Take (MIT) permit to salvage small isolated red-cockaded woodpecker populations (Costa 1995, GDNR 1999). Creating a mitigation bank on private lands was necessary to credit private land owners when the MIT option is chosen. For the mitigation bank to be successful, a red-cockaded woodpecker population needed to be established to receive birds removed from private lands.

The JWJERC agreed to develop a population of red-cockaded woodpeckers and act as the mitigation site. The red-cockaded woodpecker population on Ichauway persisted for over 90 years after the initial degradation of habitat in the early 20th century. Despite persisting through

many bottlenecks, the red-cockaded woodpecker population at Ichauway dropped to 1 remaining male in 1997. Here we examine the factors involved in the population collapse and the current red-cockaded woodpecker restoration efforts underway at Ichauway.

STUDY AREA

Ichauway is the 11,733 ha (29,000 ac) outdoor laboratory of the JWJERC located in Baker County in the Dougherty Plain of southwestern Georgia. Ichauway Plantation was assembled by Robert W. Woodruff, long term chairman of The Coca-Cola Company, during the 1920s from small farms. Woodruff recognized the unique natural characteristics of the land and for 70 years maintained an extensive tract of longleaf pine (*Pinus palustris*) and wiregrass (*Aristida beyrichiana*) for quail hunting. Following Woodruff's death the Robert W. Woodruff Foundation established the JWJERC at Ichauway in 1991.

Ichauway lies on a karst topography with local relief ranging from 3-9 m (10 to 30 ft), with sandy soils and drainage classes ranging from excessively drained sands to very poorly drained clays. The property contains approximately 8,000 ha (20,000 ac) of upland pine grassland habitats, with the remainder consisting of agricultural fields, wetlands, and riparian hardwood hammocks. The pine forests at Ichauway was intensively harvested at the turn of the century, but today prospers from over 80 years of persistent management with prescribed fire and single tree selection silviculture. Upland pine habitats at Ichauway are dominated by longleaf pine and either a wiregrass or broom sedge (*Andropogon virginicus*) old field understory. Basal area ranges from 9-15 m^2/ha (40-60 ft^2/ac) with pines being widely spaced. Upland hardwood is localized to fire shadows around roads, field edges, wildlife food plots and wetland depressions.

Population size and dynamics of red-cockaded woodpeckers on Ichauway before 1986 are unknown. Baker's (1981) inventory of the red-cockaded woodpecker population in Georgia from 1966 to 1980 did not include the location of any active clusters in Baker County. Persistence of the Ichauway red-cockaded woodpecker population was impacted by the young

age structure of the forest, deadwood management practices, and landscape fragmentation of suitable habitat.

Presently, the forest at Ichauway is a second generation longleaf pine stand dominated by 75-95 year-old trees. Areas that were not harvested for timber and converted to agriculture were turpentined. Today these areas have intact native wiregrass ground cover. After the initial timbering during the early 20th century the turpentine woodlots held the remaining patches of old trees with red heart and red-cockaded woodpecker cavities. The change towards management of quail (*Colinus virginianus*) in the 1930s shifted timber harvest to old, cat-faced turpentine trees because such trees created fire hazards for the annual prescribed fires that maintained the property. Subsequently, trees suitable for red-cockaded woodpecker cavity development became scarce due to the forest's young age structure and the lack of heart rot.

Lack of suitable cavity trees was exacerbated by a pulpwood operation which removed all lightning-struck or dead trees, thereby intensifying competition for nesting and roosting cavities by other primary and secondary cavity nesters. Limitation of cavities was corroborated by the 1986 Natural Features Inventory of Ichauway Plantation which found eastern bluebirds (*Sialia sialis*) to be "unusually scarce considering the abundance of open, lightly wooded habitats on the Plantation" (Lynch et al. 1986). The pulpwood operation was discontinued in 1989 and the number of snags has since risen dramatically.

During the 1960s agricultural practices within southwest Georgia changed with the introduction of center pivot irrigation. This technology promoted conversion of the landscape to agricultural habitats resulting in additional fragmentation and isolation of Ichauway as an island of suitable habitat (Fig. 1). In the mid 1990s, the Cyrene Turpentine Co. in Decatur County had the closest population of red-cockaded woodpeckers. This population was extirpated in the late 1990s (Jim Ozier, GDNR, personal communication). Currently the nearest red-cockaded woodpecker population is 40 km (25 mi) south, at International Paper's Southlands Forest in Bainbridge, Georgia. Thus, constraints on cavity development, availability of suitable cavities,

and the low probability of immigration to Ichauway limited the red-cockaded woodpeckers ability to persist.

BASELINE SURVEY

In 1986 Wilson Baker found 2 active red-cockaded woodpecker clusters, one containing a solitary bird of unknown sex and the other containing a pair (Lynch et al. 1986). No birds were observed in either cluster in 1991. In 1992, a site-wide baseline survey for red-cockaded woodpecker cavities consisted of 3 employees on 4-wheelers approximately 50-75 m (165-240 ft) apart on parallel transects searching for any tree with red-cockaded woodpecker activity (i.e., start hole, cavity or enlarged cavity). This survey covered all suitable habitat over an 18 month period. Long time employees were also instrumental in locating old inactive red-cockaded woodpecker trees. Once red-cockaded woodpecker cavities were located, roost counts were conducted at dawn and dusk. Attempts were made to capture and band all adult birds and nestlings. A red-cockaded woodpecker playback tape was used at all clusters to aid in determining the presence or absence of red-cockaded woodpeckers. All suitable red-cockaded woodpecker trees were surveyed to determine status. The baseline survey resulted in locating 11 historic clusters (ranging from 1 to several trees) totaling 43 trees (Fig. 1). In 2002, these trees were found in the following condition: 17 enlarged cavities >7.5 cm (>3 in), 6 dead trees, 7 suitable inactive cavities, and 13 trees with possible old start activity. The 7 suitable cavities were widely dispersed in clusters 3, 4 and 8 (Fig. 1).

POPULATION COLLAPSE

Population monitoring began in April of 1991 when a nesting pair was located at cluster 3. The pair produced 1 male and 1 fledgling of unknown sex that year. The following winter the nest tree in cluster 3, containing 4 red-cockaded woodpecker cavities, died. Loss of this tree accelerated the decline of red-cockaded woodpeckers on Ichauway. In 1992 2 unidentified adults were found at cluster 4 and a pair persisted at cluster 3. Reproduction was monitored in 1993 and the population grew to 9 birds. Only 8 red-cockaded woodpeckers were banded on the property

with all of them originating from either cluster 3 or 4 (Fig. 1). A pair of birds in cluster 5 was never banded and disappeared during 1994, leaving the population at 7 birds. In 1995 the population fell to 4 individuals in 2 active clusters and in 1996 declined to 3 male birds. In 1997 the population fell to one remaining male bird at cluster 4 (Fig. 2). Using the playback tape no other woodpeckers were found from 1997 to February 1999. The baseline for the safe harbor management agreement was set at one group.

CAVITY CREATION AND MANAGEMENT

Four artificial insert cavities (Allen 1991) were installed at 10 clusters in 1999; 5 more clusters were established in the fall of 2000 and 2002 for a total of 20 clusters to date. Mean distance between clusters is 635 m, range 339-1100 m (~0.4 mi). Additional inserts were installed as needed, and 18 inserts were cut out of trees with a chainsaw and replaced when cavities persistently retained water, contained a worn entrance tunnel, or sap intruded the cavity chamber. Inserts needing replacement typically had a shortened entrance tunnel that allowed water to regularly flood the cavity chamber and were more commonly occupied by a red-headed (*Melanerpes erythrocephalus*) or red-bellied (*Melanerpes carolinus*) woodpecker. Red-cockaded woodpecker and red-bellied woodpeckers have excavated holes exposing the shims or the interior of the tree in 14% of the artificial inserts. All red-cockaded woodpecker clusters established for more than 2 years have a minimum of 1 start, but as of 2002 none have completed a natural cavity.

TRANSLOCATIONS

Thirteen of the 17 translocated red-cockaded woodpecker subadults were moved from various donor sites to Ichauway at night. These birds were placed in screened cavities and released at dawn the following morning. The remaining 4 birds were caught in the morning, fed legless crickets throughout the day, placed in a screened cavity during the evening and released the following morning at dawn. Prior to translocation events all cavities in recruitment clusters were cleaned, screened off, scraped, and re-painted to appear active. Translocation was

considered successful if the bird paired the following nesting season or remained on site throughout the following breeding season.

Population augmentation began in March of 1999 with the translocation of a subadult female from Piedmont National Wildlife Refuge. This bird paired with the remaining solitary male. During the winter of 1999-2000 3 male and 3 female subadults from Fort Benning and 2 male and 2 female subadults from Fort Stewart were translocated to Ichauway. Seven of the 10 birds were retained into the next breeding season. Three potential breeding groups and 1 solitary male group were established. In November of 2000 a male and female were translocated from the Red Hills. These birds did not remain together but filled breeding vacancies at other clusters. In November of 2001 we received a subadult male and female from the Red Hills and a subadult male and female from Fort Benning. The Fort Benning pair moved from their release cluster nested in a different cluster, and the Red Hills pair split with the male filling a breeding vacancy on another territory and the female became a floater. Fourteen of the 17 (82%) translocated subadult birds were recruited into the breeding population or remained throughout their first breeding season. The first female translocated in 1999 is the only bird to remain in its release cluster. Three of the 8 potential pairs released together formed a pair bond and subsequently reproduced.

HABITAT MANAGEMENT

The area designated for red-cockaded woodpecker restoration falls within the conservation land management zone at Ichauway. Conservation zone management goals are to rehabilitate the land base to native communities. The area for red-cockaded woodpecker restoration was chosen for its large continuous tracts of longleaf pine and its location relative to the 1 red-cockaded woodpecker that remained on the property in 1999. In 1999, intensive quail management was discontinued in the restoration area and all quail wildlife food plots were dropped from management. Habitat management include both dormant and growing season prescribed fire on a 2-year rotation, reforestation of longleaf pine in agricultural fields, and

removal of hardwood midstory in red-cockaded woodpecker nesting and foraging habitat. Hardwood midstory was generally localized to fire shadows and was removed with a Brown-tree mower or Hydro-Axe feller buncher. Large stumps created by the feller buncher were treated with picloram to kill the root stock. Mechanical hardwood midstory removal will continue until hardwoods can be maintained with regular prescribed fires.

Habitat within the clusters and throughout the restoration area has been actively managed with over 199 ha (498 ac) of hardwood control. Intensive hardwood removal has occurred on another 100.4 ha (251 ac) of adjacent mixed hardwood-pine habitat that is being rehabilitated to upland pine habitat. The remaining agricultural fields within the management area have been planted in longleaf pine with over 64 ha (160 ac) planted in the past 2 years.

The red-cockaded woodpecker restoration area occupies habitat that is the result of persistent prescribed fire management over the past 70 years. Annual dormant season prescribed fires and single tree selection silviculture offer excellent habitat for restoration. The overall translocation success of 82% may have been due to the high quality of the habitat's structure. However, translocation success may also have been aided by the large expanse of agricultural habitat that borders the restoration area to the west and north, thereby constraining bird dispersal (Fig. 1).

POPULATION MONITORING

All individuals were uniquely color banded and subsequently identified with spotting scopes a minimum of once a quarter throughout the year. Nestlings were banded between 5-10 days of age and fledglings identified and sexed with spotting scopes. Once each month all cavities were inspected with a video probe and cleaned with a vacuum cleaner, if necessary. Flying squirrels were removed and disciplined or translocated to another location on the property. Avian kleptoparasites were not disturbed until their nesting attempt was complete. All cavities were opened and available during translocation events in the fall, but after 2 months all cavity trees in a portion of the recruitment clusters were screened to reduce occupation and deterioration of

cavities by kleptoparasites. Cavity screens were removed in August to attract dispersing red-cockaded woodpecker fledglings. Beginning in March cavity trees in active clusters were inspected with a video probe and cleaned on a 14 day rotation. During the nesting season all cavity trees in active clusters were inspected and cleaned on a 7 day rotation; post-fledging, a 14 day rotation was resumed to the end of August.

In 1999 the remaining red-cockaded woodpecker male and a female from Piedmont National Wildlife Refuge paired and produced 2 fledglings. In 2000 all three pairs of second-year birds attempted to nest but only 1 fledged young. The older pair's first and second nest attempts were depredated. The nest tree was an old natural cavity that did not have sufficient resin flow. No progeny from the original solitary male remains in the current population. In 2001 all 5 pairs successfully nested and produced a total of 8 fledglings. Four of the 8 fledglings were present as helpers or floaters during the next breeding season. In 2002 all 6 pairs nested and produced a total of 13 fledglings. Two of the 6 pairs were assisted by a helper. Since 1999, 3 breeding vacancies were quickly filled by translocated birds. A surplus of floating females occurred during the 2001 and 2002 breeding seasons. Currently the population stands at 9 active clusters totaling 28 birds (Fig. 2).

CAVITY KLEPTOPARASITE CONTROL

Flying squirrels and nest material were removed as encountered. A total of 204, 159 and 176 flying squirrels were removed in 2000, 2001, and 2002, respectively. There was a slight decrease in flying squirrel abundance in cavities from a high of 22% in 2000 to 14% in 2002 (Fig. 3). The decrease in squirrel abundance was attributed to direct removal and elimination of hardwoods which probably reduced flying squirrel density. Another 15-20% of cavities were seasonally used by red headed woodpeckers and red-bellied woodpeckers, and secondary cavity nesters white breasted nuthatch (*Sitta carolinensis*), eastern blue bird, great crested flycatcher (*Myiarchus crinitus*), tufted titmouse (*Baeolophus bicolor*), wasp (*Hymenoptera*) or contained

water and/or nesting material (Fig. 3). Only 4 corn snakes (*Elaphe guttata*) were removed from red-cockaded woodpecker cavities over the past 3 years.

Cavity management focused on maintaining clean available cavities for birds in active and inactive clusters. Flying squirrel removal was an essential management action (Brown and Simpkins 2003, Gaines et al. 1995, Hagan et al. 2003, Hedman et al. 2003, Poirier et al. 2003) when establishing new red-cockaded woodpecker populations. Reducing cavity kleptoparasistes creates opportunities for red-cockaded woodpeckers to roost in cavities that would otherwise have been occupied and reduces the likelihood of nest depredation. The intensity of checking cavities in active clusters during the nesting season insured that each nest attempt resulted in fledglings. We had 100% nest success in 2001 and 2002. Flying squirrel removal will only be used until the population is able to sustain nest depredation and cavity kleptoparasitism.

RESEARCH INITIATIVES

Two obstacles to establishing a red-cockaded woodpecker population at Ichauway are creation of suitable cavities and keeping cavities available for use by red-cockaded woodpeckers. Two research programs have been initiated to address these bottlenecks. At Ichauway flying squirrels are a common component of the longleaf pine-grassland system. While some researchers have shown squirrel removal is likely unnecessary in larger populations (Conner et al. 1996, Mitchell et al. 1999), small populations may require flying squirrel management (U.S. Fish and Wildlife Service 2000). In order to establish populations on private lands, an alternative strategy must be found to reduce the conflict between flying squirrels and red-cockaded woodpeckers for cavities. A research project has been initiated to assess the use of external cavity boxes (Loeb and Hooper 1997) in clusters and the possible use of scent deterrence on red-cockaded woodpecker cavities to reduce flying squirrel kleptoparasitism.

Artificial insert cavities are only a short term solution to red-cockaded woodpecker restoration (Saenz et al. 2001, U.S. Fish and Wildlife Service 2000). Land mangers ultimately need red-cockaded woodpeckers to create cavities on their own (Harding and Walters 2002).

Throughout the 1960s and 1970s foresters placed priority on removing any trees with red heart conks (Conner et al. 2001). Red heart is present to a small degree on Ichauway but a conk has not been found to date. We have established a research project to assess if inoculation of trees with red heart will stimulate cavity development (Jack et al. 2003). While red-cockaded woodpeckers may be able to quickly create cavities in stands dominated with loblolly (*P. taeda*) or slash pine (*P. elliottii*) (Hagan et al. 2003) this has not been observed in longleaf pine habitats at Ichauway. Inoculating trees with red heart could provide managers with another tool to provide suitable trees for cavity excavation.

EDUCATION

Each year over 500 people are informed about red-cockaded woodpeckers through education and outreach programs at the JWJERC. Groups ranging from practicing natural resource professionals, visiting college classes, environmental policy makers to private landowners learn about red-cockaded woodpecker life history, restoration and management. As a participant in a safe harbor management agreement, we present the opportunities available to private landowners to contribute to the recovery of this endangered species.

FUTURE MANAGEMENT INITIATIVES

The collapse of the Ichauway red-cockaded woodpecker population mirrored the fate of small isolated populations on non-industrial private forest lands across the southeast (James 1995, U.S. Fish and Wildlife Service 2000). Lack of suitable cavities and kleptoparastism led to the near extirpation of red-cockaded woodpeckers on Ichauway despite available high quality foraging habitat. Success of the red-cockaded woodpecker restoration program is attributed to aggressive cavity, habitat and prescribed fire management.

Our short term goal is to create a population of 10 potential breeding groups, with a long term goal exceeding 30 groups. Mechanical hardwood removal should be completed in 2003. Intensive cavity management will continue until the population exceeds 10 potential breeding groups. New recruitment clusters will be established at 0.25 mi (400 m) intervals and aggregated

as closely as possible within the habitat (Letcher et al. 1998). Artificial cavity development will shift from inserts to drilled cavities (Copeyon 1990) if suitable trees can be identified. All new artificial insert cavities will have an entrance hole gasket to prevent expansion and reduce kleptoparasitism by red-bellied woodpeckers. As group size increases, internal translocations will be made to establish new pairs. In addition, we will implement any management techniques that develop from research on flying squirrel deterrence or red heart inoculation.

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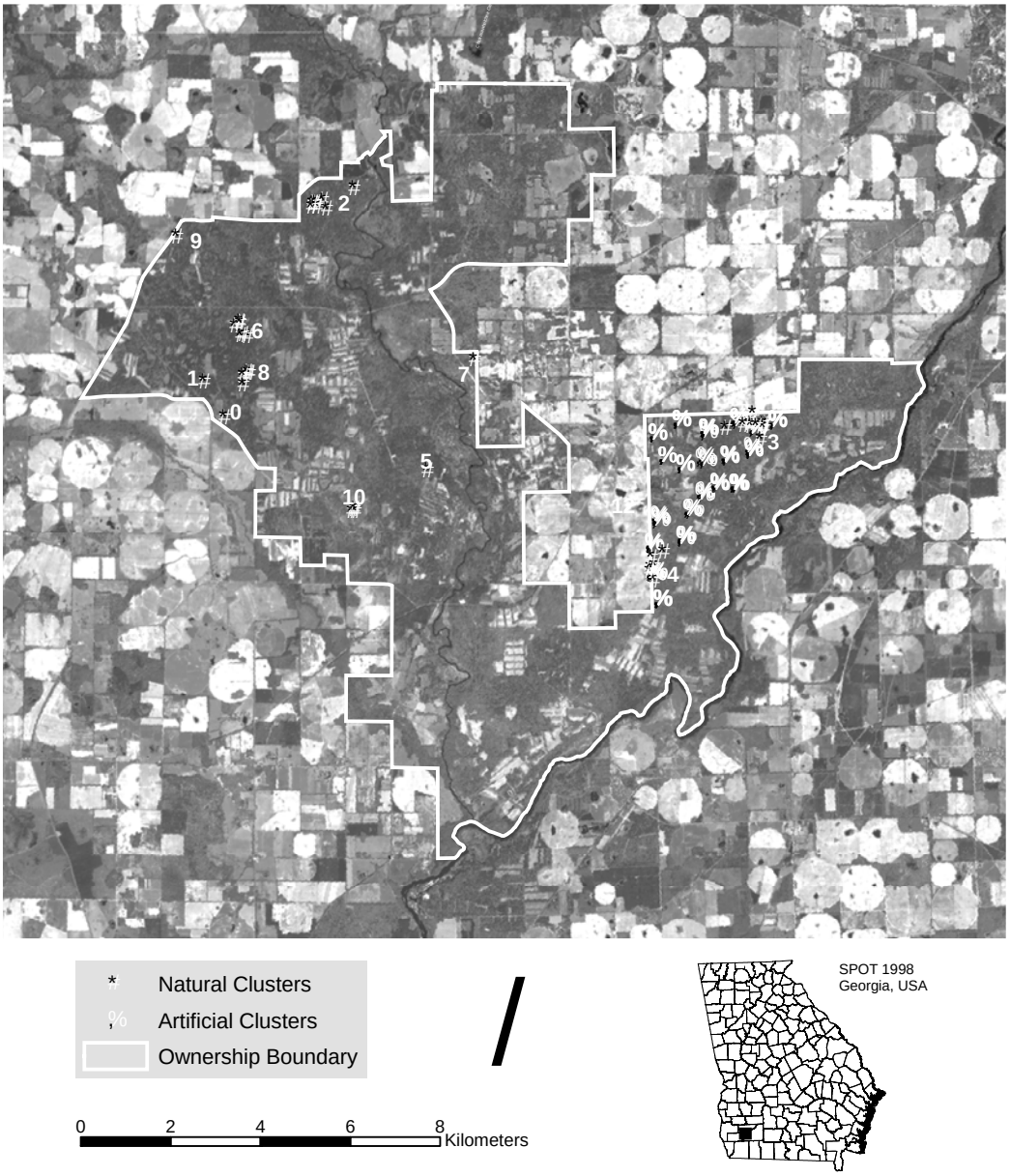

Figure 1: Natural and artificial red-cockaded woodpecker clusters and cavities at Ichauway, Georgia.

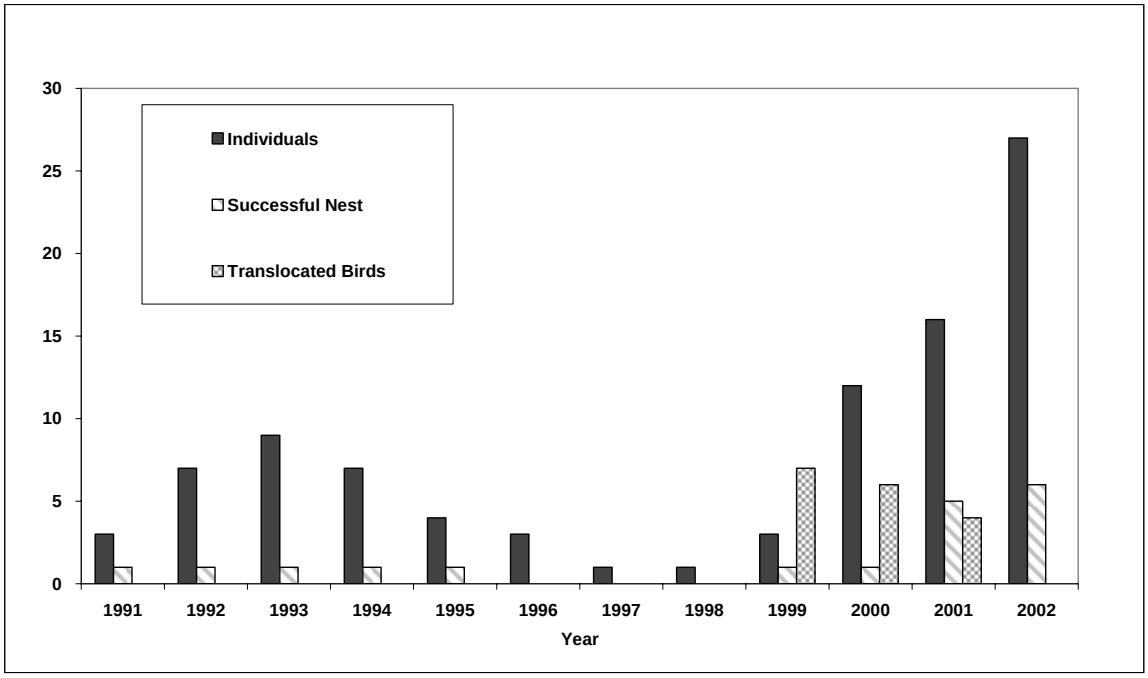

Figure 2: Number of red-cockaded woodpeckers, successful nest and translocated subadults from 1991 to 2002 at Ichauway, Georgia.

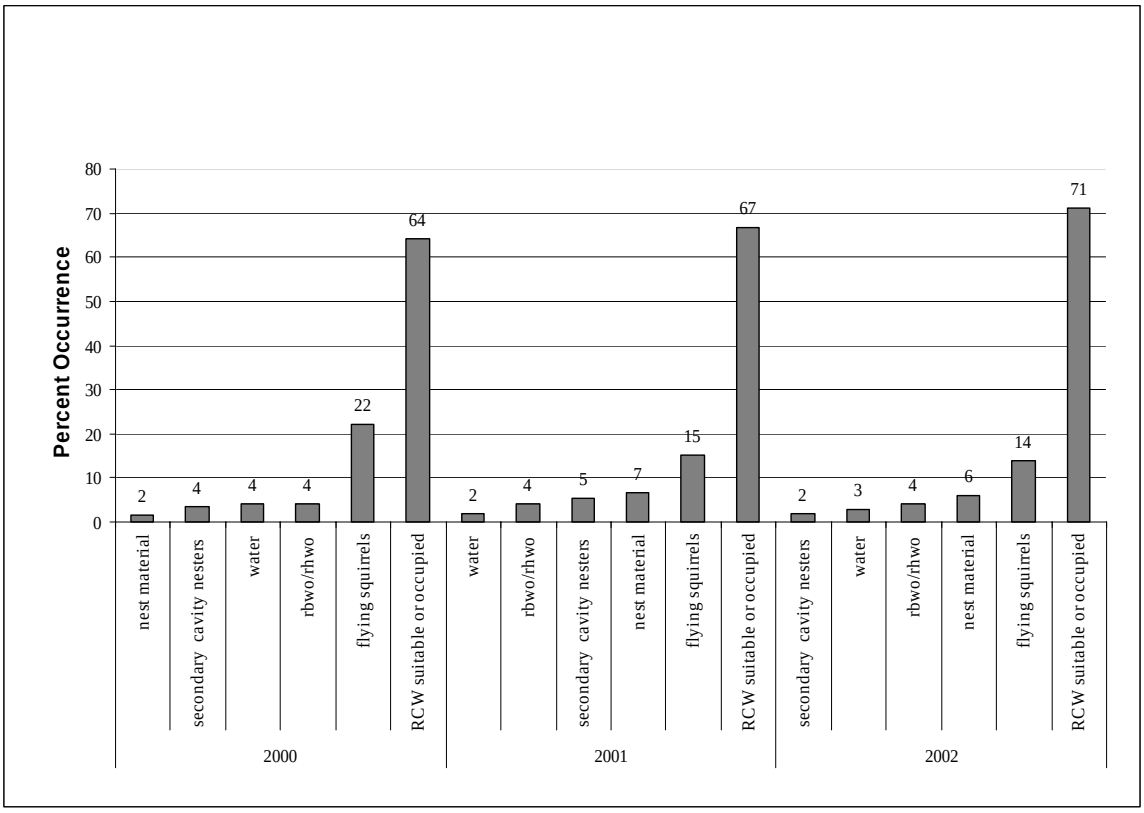

Figure 3: Percent occurrence of kleptoparasites and status of red-cockaded woodpecker cavities for 2000, 2001, and 2002 at Ichauway, Georgia.