

in the North Carolina Sandhills (73.3%) (Carter et al. 1995). Average clutch size at P3 was below (3.13) (range 2.93-3.33) that observed by Walters et al. (1996) in the CNF (3.30) and CL (3.46) and by Carter et al. (1995) in the North Carolina Sandhills (3.23). The number of fledglings per successful nest averaged 1.68 at P3 (range 1.47-1.81), much below the identical values documented at CNF and CL (1.98) by Walters et al. (1996) and the 2.06 in the Sandhills (Carter et al. 1995). The percentage of banded nestlings fledged from clusters at P3 for years 2000 through 2002 averaged 76.7% (range 72.5-80.5), well below the 83.4% documented in the North Carolina Sandhills (Carter et al. 1995). However, the extremely dense midstory at P3 may have prevented detection of some fledglings, thereby reducing the perceived fledgling success rate and number of fledglings per successful nest.

Interpretation of these data are limited due to only 3 years of data, but may indicate that red-cockaded woodpecker groups in northeastern North Carolina are not as productive as in populations elsewhere in North Carolina. If true, it is uncertain whether or not this observation has adverse implications for red-cockaded woodpeckers in northeastern North Carolina. However, despite these trends and concerns, the red-cockaded woodpecker population at P3 increased between 1995 and 2002.

MANAGEMENT IMPLICATIONS

Red-cockaded woodpeckers are not generally believed to occupy coastal, pocosin, or hardwood dominated habitats. Survey guidelines (Henry 1989) and practices generally exclude these habitat types from cluster surveys. We believe that the definition of potential and suitable red-cockaded woodpecker habitat needs to be expanded in the coastal Carolinas and southeast Virginia. It could be argued that red-cockaded woodpeckers on the Pamlico-Albemarle Peninsula have been forced into atypical habitats because of the clearing of uplands to the west. However, the displacement of red-cockaded woodpeckers into habitats that are normally unsuitable is undocumented in the literature. Further, the population increase documented at P3 argues that the species can survive and perhaps prosper in habitats that appear suboptimal.

Hardwood removal policies within clusters, although applicable and advantageous in upland pine habitat, need to be reconsidered in clusters located in

hardwood-pine or predominantly swamp hardwood stands.

The long-term survivorship of the species in the northeastern coastal plain is questionable due to the population's vulnerability to natural disasters such as southern pine beetle, hurricanes, salt water intrusion, and catastrophic wildfire. Additionally, declining recruitment and decreased genetic diversity characteristic of small, isolated populations may accelerate loss of this species in the Pamlico-Albemarle Peninsula regardless of management regime. Effective management of the large amount of contiguous habitat present in this relatively undisturbed part of eastern North Carolina is pivotal to the survival and continued growth of this Essential Support Population.

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DECLINE AND PROTECTION OF THE VIRGINIA RED-COCKADED WOODPECKER POPULATION

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Abstract: The red-cockaded woodpecker (*Picoides borealis*) population in Virginia suffered a dramatic decline in the latter half of the 20th century. Of 60 active clusters identified after 1975, only 2 potential breeding groups remained by 2002. The bulk of this decline occurred on commercial timberlands. Federal endangered status appears to have provided little protection at least through the mid-1980s. Of 26 clusters that were

determined to be active between 1977 and 1980, 18 were destroyed through timber harvest by 1985, in direct violation of legal protections. Industry activities were reinforced by the reluctance of the legal community to pursue appropriate penalties. A management agreement between the U.S. Fish and Wildlife Service (USFWS) and a corporate landowner in lieu of a civil case was inadequate to protect foraging habitat and resulted in the abandonment of 4 additional active clusters between 1989 and 1996. A survey of lands within the historic range in 1998 revealed that the short-term potential for restoration is limited. However, several patch complexes with the potential to support territories will become available over the next 20 to 30 years if aggressive management is applied. The establishment of Piney Grove Preserve (PGP) by The Nature Conservancy (TNC) through a purchase of all remaining habitat supporting active clusters has already begun to reverse the population decline. The Nature Conservancy, in conjunction with state and federal wildlife agencies, is implementing an aggressive habitat and population management program in concert with a safe harbor program to restore the population. Piney Grove Preserve will serve as the nucleus for restoration of additional sites within the state.

Key words: legal protection, *Picoides borealis*, population decline, red-cockaded woodpecker, restoration, Virginia.

The historic status and distribution of the red-cockaded woodpecker in Virginia is poorly known because no systematic survey of the species was completed prior to dramatic habitat losses. However, the southeastern pine ecosystem within which the species apparently evolved (Jackson 1994) and currently resides is known to have occupied a large area within the coastal portion of the state in early colonial times (Ware et al. 1993). At the time of European settlement, Virginia supported approximately 404,687 ha (1,000,000 ac) of pinelands that contained longleaf pine (*Pinta palustris*) (Frost 1993). The composition, structure, and spatial pattern of these forests on the landscape varied according to the relationships between climate, soil, and fire regime (Frost 1993, Ware et al. 1993). Writings by early colonists describe expansive longleaf savannas that covered thousands of hectares (Powell 1977, Frost and Musselman 1987). It seems reasonable to assume that red-cockaded woodpeckers were prominent components of these communities (Jackson 1988).

As the site of the first successful European settlement in North America, coastal Virginia has been altered by European culture for nearly 4 centuries. Although the early impacts of this culture on the red-cockaded woodpecker population were not documented, they likely parallel the pattern of land use associated with the wood products and agriculture industries. For example, the naval stores industry was initiated at Jamestown in 1608 (Smith 1624). Although the early impact of this industry on pinelands was likely local in scope, growth in the human population and the development of new processing technologies resulted in a rapid exploitation of this resource throughout the 18th and early 19th centuries (Frost 1993). For all practical purposes, all of the longleaf pine stands in Virginia were exhausted before the red-cockaded woodpecker was described to science. A similar pattern of development occurred within the timber industry during the 20th century as advances in transportation, wood processing, and silvicultural practices shifted the emphasis from long-rotation lumber production to maximum-yield fiber production. This transformation occurred over a very short time period and resulted in catastrophic declines in habitat availability for red-cockaded woodpeckers in Virginia.

Red-cockaded woodpeckers in southeastern Virginia currently represent the northernmost population known. Throughout the latter half of the 20th century this remnant population experienced a rapid decline. Since the 1980s the population has been in eminent danger of extirpation due to historical waves of habitat loss and degradation. Our objectives here are (1) to describe the extent and surrounding circumstances of the population decline during the late 20th century, and (2) to describe current actions underway to restore the population.

MODERN POPULATION DECLINE (1950-2000)

Prior to the early 1950s, information on the status and distribution of the red-cockaded woodpecker in Virginia is available only from a limited number of accounts, museum specimens, and area bird lists (e.g. Rives 1890, Bailey 1913). Murray (1952) summarized records before 1950 and referred to the species as rare but widespread across the southeastern portion of the state. His records span 5 decades and identify 6 counties of occurrence. In the early 1950s, state forester C. C. Steirly began to compile mapped locations for the species in

southeastern Virginia. Steirly (1957) provided details on 20 active clusters distributed within 4 counties and gave a broad discussion of their breeding range and ecology during the mid-1900s.

The first attempt to systematically survey for red-cockaded woodpeckers in Virginia was initiated in 1977. M. A. Byrd and colleagues, with funding provided by the Virginia Department of Game and Inland Fisheries (VDGIF), conducted a roadside survey for old-growth pine stands across 5 southeastern counties. This survey resulted in the documentation of 43 clusters

that exhibited recent evidence of red-cockaded woodpecker activity (Miller 1978). Of those clusters, 23 clusters were documented to be occupied and supported a minimum of 47 birds. In subsequent years the survey was expanded to include surrounding areas but very few additional active clusters were documented. Although far from complete, this study provided the only available baseline information against which to compare more recent surveys.

During the 20-year period between 1980 and 2000, the decline of the Virginia population is well

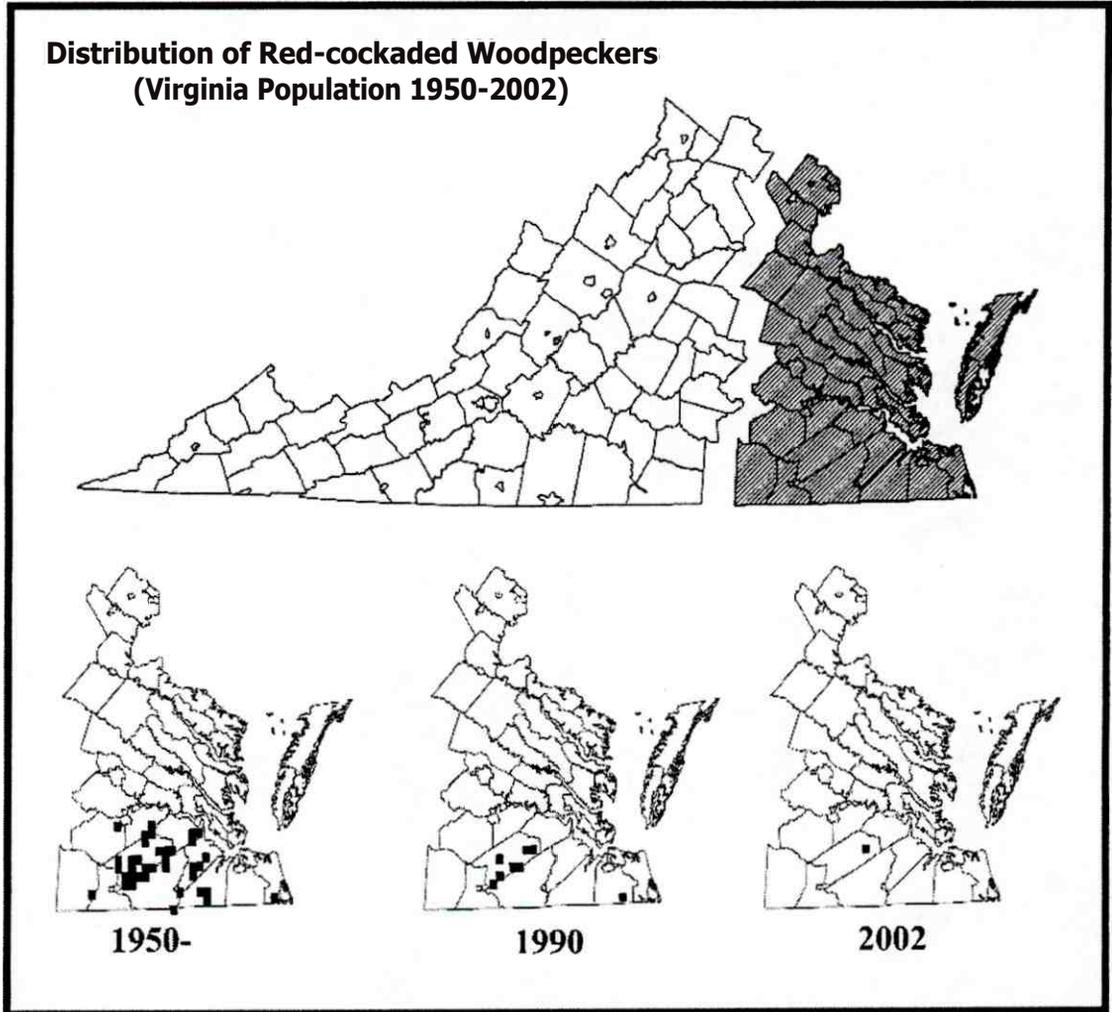


Figure 1. Decline in the known population of red-cockaded woodpeckers in Virginia during the latter half of the twentieth century. Black boxes indicate quarter quadrangles that were known to support active clusters during each time period.

documented (Figure 1). In 1980, all clusters determined to be active in 1977 were surveyed in preparation for an investigation of habitat use (Bradshaw 1990). Of the 23 original clusters, only 9 were still forested. In the 4 years from 1977 to 1980, more than half of the known state population had been lost. An annual monitoring program was initiated by VDGEF in the early 1980s. This program documented reproductive rates and use of known clusters. By 1990, only 5 of the original 23 clusters detected in 1977 were still active. By 2000, this number had declined to only 2 clusters. During the breeding season of 2002, Virginia supported only 2 potential breeding groups and 2 clusters with solitary males. The 2 clusters containing solitary males were not included in the 1977 survey but were discovered in the intervening years.

CAUSES OF POPULATION DECLINE

The timber industry operating in Virginia was directly responsible for the dramatic decline in red-cockaded woodpeckers during the latter half of the 1900s. All of the red-cockaded woodpecker clusters discovered in Virginia during this time period were located on private lands. Of 8 clusters described by Steirly (1957) in the early 1950s as having existing groups, 5 were harvested while under his observation. Of 60 clusters documented after the mid-1970s, all but 8 were harvested by the year 2000 (Watts and Bradshaw 2000). The vast majority of these clusters have been converted to pine plantations and will not support the species for the foreseeable future.

Elevation of the species to endangered status under the Endangered Species Act of 1973, as amended (ESA), appears to have provided no detectable increase in protection, at least through the mid-1980s. Of 26 clusters that were determined to be active between 1977 and 1980, 18 were harvested by 1985 in direct violation of legal protections. On 1 occasion in 1980, researchers arrived to survey a known cluster only to observe birds flying stump to stump just after the site had been harvested (D. Bradshaw, College of William and Mary, personal observation). However, no legal action was taken by either state or federal regulatory agencies. Several researchers believe that the lack of prosecution in this case led to the rapid loss of numerous clusters that were unknown to the management community. On at least 2 subsequent occasions, logging trucks were observed carrying trees with identifiable red-cockaded

woodpecker cavities (M. Byrd, College of William and Mary, personal communication).

The only legal case prepared by the federal government on behalf of red-cockaded woodpeckers in Virginia involved the harvest of cavity trees in the late 1980s. A criminal case was prepared by the solicitor's office of the Department of Interior citing violations of the ESA and the Migratory Bird Treaty Act. The Department of Justice, however, chose not to pursue the case and criminal charges were never filed. In lieu of a civil case, the USFWS and the corporation entered into a management agreement for the remaining properties known to support active clusters (LePore 1988). Both state and federal biologists were opposed to the terms of the agreement, which protected cavity trees but allowed for the harvest of surrounding habitat required for foraging. Management of the lands under the agreement led to the abandonment of 4 of the 5 clusters involved between 1989 and 1996.

Until recent years, there have been no legal or economic incentives for corporate landowners to change management practices for the benefit of red-cockaded woodpeckers. For most of the active clusters that were not harvested before 1985 and that were not covered under the management agreements, landowners agreed not to harvest stands until a period of 5 years had passed since the last woodpecker was observed. Nearly all of these clusters were left idle until hardwood intrusion rendered them unusable by woodpeckers and they were abandoned. The 5-year period has elapsed on the majority of these clusters and most were harvested by the year 2000.

POTENTIAL FOR RESTORATION

In anticipation of developing a restoration plan for the red-cockaded woodpecker in Virginia, VDGIF initiated and funded a systematic survey of potential active clusters within the historic range in 1996 (Bradshaw 1999). This survey used a combination of aerial photography and ground visits to identify patch complexes that could potentially support red-cockaded woodpeckers now, and 20 to 30 years into the future. Within 8,725 km² of land, the survey identified only 4 patch complexes that supported enough old-growth pine for clusters in association with an ample foraging base. Two of these clusters supported active clusters suggesting that the potential for establishing additional territories is currently limited. However, several sites were identified with the potential to support clusters in the next 20 to 30

years if managed appropriately. One of these occurs within the Great Dismal Swamp National Wildlife Refuge (GDSNWR).

PINEY GROVE PRESERVE: A NUCLEUS FOR RECOVERY

In 1993, a new approach to timber management opened the first door to red-cockaded woodpecker recovery in Virginia. Hancock Timber Resource Group (HTRG) purchased all of the pinelands that were known to contain red-cockaded woodpeckers in the state. This included 5 clusters. Through its management subsidiary, Resource Management Services, Inc., the company contracted with local experts to monitor the population and initiated a hardwood removal operation within all of the active clusters. HTRG initially was able to bear the cost of site improvements as a component of its environmentally conscious pension plan portfolios. However, due to its fiduciary responsibilities and the timber base present, HTRG determined that over time it would be difficult to sustain the cost of long-term red-cockaded woodpecker habitat maintenance.

In 1998, following VDGIF's comprehensive habitat survey, INC negotiated a deal with HTRG to purchase 1,100 ha of land supporting the last 3 known red-cockaded woodpecker potential breeding groups. The tract, located in Sussex County approximately 96 km west of Norfolk, is named the Piney Grove Preserve (PGP) and lies in the heart of the species former range in Virginia. At the time of purchase there were only 2 other active clusters known in the state, both with solitary birds. Piney Grove Preserve comprises approximately 1,100 ha of mixed age-class pine timber, predominantly loblolly pine (*Pinus taeda*).

The Virginia Department of Game and Inland Fisheries, USFWS, and TNC recognized that local acceptance of red-cockaded woodpecker recovery efforts would be essential to long-term success at PGP. Seeking solutions to address private landowner concerns, and how to expand red-cockaded woodpecker conservation to other private lands, meetings were held with state, federal, and academic partners in 1996, prior to acquisition. Out of these discussions came the vision to establish a safe harbor program for red-cockaded woodpeckers in Virginia, modeled after successful programs established by the USFWS in the Carolinas (Costa and Kennedy 1997, Lohr 2000). After 3 years of negotiations, led by Environmental Defense, VDGIF, and USFWS, a safe harbor program was established

with TNC designated as the permit holder and program administrator. The permit area extends to a 62.5-km radius around PGP and the permit issued to TNC to secure landowner agreements is issued on a 33-year renewable term basis.

In 2001, International Paper Corporation became the first to enroll in the Virginia safe harbor program, enrolling 116 ha of pinelands adjacent to the preserve. The Nature Conservancy has also enrolled its land base in the program. Safe harbor outreach to local landowners led by TNC has increased awareness of red-cockaded woodpecker recovery efforts and recognition for the importance of private property for this species. In addition to its role as a diplomacy tool, the safe harbor program is intended to enroll several thousand hectares of additional land to increase the effective area of potential red-cockaded woodpecker habitat in Virginia.

Conventional management techniques are being used at PGP to restore and maintain red-cockaded woodpecker habitat including fire and timber management, artificial cavity provisioning, and cavity restrictor installations. The preserve is 1 of 4 regularly burned mature pine areas in southeastern Virginia and is being used by state agencies, consultants, and TNC as a demonstration site for landowner outreach. In 2002, TNC entered into an agreement with a forestry consulting firm to develop and implement a timber management plan for the preserve.

Translocation of birds from donor populations and establishment of recruitment clusters via artificial cavity provisioning have been identified as essential strategies to overcome demographic stresses and nesting habitat limitations. The Nature Conservancy has entered into an agreement with Carolina Sandhills National Wildlife Refuge in McBee, South Carolina to translocate birds to PGP, in coordination with VDGIF and USFWS. Three red-cockaded woodpeckers were moved in fall 2001. Eight more individuals were translocated in fall 2002. Three additional birds were translocated from private land in Gates County, North Carolina, in the spring of 2002 as part of a USFWS section 10 habitat conservation plan.

As of summer 2002, translocation efforts have established 2 new active clusters, for a total of 5 active clusters on the preserve. Only 2 clusters contain potential breeding groups at this time. By 2004, TNC hopes to have, via recruitment clusters and translocations, 10 active clusters with 6 potential breeding groups.

Red-cockaded woodpecker recovery partners in Virginia clearly recognize that PGP is a short-term solution for the species. The Center for Conservation Biology at the College of William and Mary, in association with VDGIF, is leading an effort to develop a statewide recovery plan to address broader species conservation goals. Other lands with long-term potential to support red-cockaded woodpeckers, including the GDSNWR, are under consideration for an aggressive management program. Habitat availability on private lands will continue to be crucial to the species recovery however, and safe harbor will be relied upon to engage more private landowners in the recovery process. The next few years will be critical to the long-term recovery of the Virginia population.

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RED-COCKADED WOODPECKER STATUS AND MANAGEMENT: WEST GULF COASTAL PLAIN AND INTERIOR HIGHLANDS

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Abstract: Red-cockaded woodpecker populations declined precipitously following European settlement and expansion and cutting of the original pine forests across the southeastern United States. By 1990 most residual populations lacked demographic viability, existed in degraded habitat, and were isolated from other populations. The primary causes of this situation were harvest of the original pine forests of the south-