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VIRGINIA RED-COCKADED WOODPECKER CONSERVATION PLAN

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The Center for Conservation Biology is an organization dedicated to discovering innovative solutions to environmental problems that are both scientifically sound and practical within today's social context. Our philosophy has been to use a general systems approach to locate critical information needs and to plot a deliberate course of action to reach what we believe are essential information endpoints.

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PART I: INTRODUCTION

A. Background – The red-cockaded woodpecker was listed as endangered in 1970 and received protection with the passage of The Endangered Species Act in 1973 (16 U.S.C. 1531 et seq). The primary reason stated for listing was population decline caused by extensive habitat loss throughout the species range. Endemic to the southeastern pine ecosystem, red-cockaded woodpeckers were once a common bird but at the time of listing had declined to less than 10,000 individuals (Jackson 1971). Highly specialized, the species requires old growth, fire maintained pine savannas. Demand for wood products over a period of 4 centuries, clearing for agriculture, and fire suppression had left only small scattered remnants of suitable habitat. Red-cockaded woodpeckers in southeastern Virginia currently represent the northernmost population known. Throughout the latter half of the twentieth century this 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, ultimately reaching a low of 2 breeding pairs by 2002. Through active habitat restoration and intensive population management within the only extant site, the population had recovered to 6 breeding pairs by 2007. However, due to the lack of available old growth pinelands in Virginia and the limited amount of conservation-owned lands within the historic range, restoration will require heroic efforts over a period of decades.

B. Objectives - The overriding objective for red-cockaded woodpeckers in Virginia is to provide for the long-term viability of the species in the state. In Virginia, this includes 1) the stabilization and expansion of the existing remnant population within Piney Grove Preserve and 2) the long-term restoration of the species within additional sites to reduce the risks associated with stochastic events. Accomplishment of these objectives will require a commitment of government agencies and the broader conservation community over many decades.

PART II: GENERAL SPECIES OVERVIEW

A. Species Description – Red-cockaded woodpeckers are small with adults measuring 20-23 cm and weighing 40-55 g (Jackson 1994). Virginia birds tend toward the higher end of this distribution and weigh 46-50g (Watts, unpublished data). This species is distinguished by plumage from all other woodpeckers within its range in having a black and white ladder back and white cheek patches. Both the back and wings show distinctive black and white barring. The breast and belly are white to dull white with black spots along lateral surfaces grading to bars on the flanks. The crown is black and separated from the eye by a white superciliary stripe. The white auricular or "cheek" patch is separated from the white throat by a black malar stripe. The tail is flared with outer white and inner black retrices.

Following the first fall molt, male and female red-cockaded woodpeckers are rarely distinguishable by plumage in the field. Females have a solid black crown and males have a small patch of red feathers near the lateral margin of the crown. However, this patch is typically not displayed such that birds may not be reliably sexed except in the hand. Feathered nestlings and fledglings prior to fall molt may be reliably sexed in the field since females have a solid black crown and males have a large red crown patch. Hatching-year birds are distinguishable from older birds in the field by their duller black plumage and dingy white plumage. Hatching-year and second-year birds are distinguishable in the hand from after-second-year birds by their retained duller remiges.

B. Taxonomy – The red-cockaded woodpecker is currently classified as *Picoides borealis*. The *Picoides* genus is diverse, including nearly three dozen species throughout the world. The red-cockaded is endemic to the southeastern United States and is sympatric with two congeners including the downy (*P. pubescens*) and the hairy woodpecker (*P. villosus*). Proposed separation of the southern Florida population from the remaining populations to the north including Virginia (Wetmore 1941) into separate subspecies has been questioned by

various researchers (e.g. Jackson 1971, Mengel and Jackson 1977, Short 1982). Morphological characters appear to be smoothly clinal with no distinct plumage differences. The smallest birds are in south Florida and the largest are in Kentucky (Jackson 1994). Birds from Virginia are skewed to the larger end of the distribution (Watts, unpublished data).

PART III. NATURAL HISTORY

A. Habitat – The red-cockaded woodpecker is endemic to the southeastern pine ecosystem, where it is a year-round resident. It requires open, park-like stands of pines that are maintained by frequent fire (Jackson 1987), which is an essential element of this system. Fire prevents hardwood encroachment and the ultimate conversion of the forest from pine to hardwood. Throughout their range, red-cockaded woodpeckers have shown a negative response to an advancing midstory (Hooper et al. 1980, Conner and Rudolph 1991, Kalisz and Boettcher 1991). In addition to increasing the danger to high-intensity fires, an advanced midstory is thought to predispose cavity trees to greater predation risk and competition from nest competitors (Walters 1990). Low-intensity ground fires with a return interval of 1-5 yr are typically required to maintain the open understory.

Red-cockaded woodpeckers require old, live pines for excavation of roost and nest cavities (Jackson and Jackson 1986). Cavities can only be excavated into the dead heartwood of the tree, a component that does not reach suitable dimensions until the tree matures. Based on measurements from Francis Marion National Forest, average red-cockaded cavity diameter was 10 cm, suggesting a recommended heartwood diameter of 15 cm to ensure successful excavation (Hooper et al. 1991). As the heartwood to sapwood ratio increases with age, a threshold age is reached such that average tree dimensions will support a cavity. This age is approximately 70 and 90 years for loblolly (*Pinus taeda*) and longleaf pine (*P. palustris*) respectively (Conner and Locke 1982). Red-cockaded woodpeckers selectively choose cavity trees that are infected with red heart

disease, a fungal infection that decays the heartwood facilitating excavation (Steirly 1957, Jackson 1977, Hooper et al. 1991). Red heart is a naturally occurring fungus that typically infects senescent or stressed trees. A third factor leading to the selection of older-age trees is tree height (Jackson and Jackson 1986). Within normal, healthy pine stands, cavity trees tend to be taller than other trees, affording greater flexibility in cavity placement. In loblolly pine stands, tree height allows cavities to be placed above encroaching midstory vegetation. When tree diameter is sufficient and heartwood decay is prevalent throughout much of the bole, cavity height is often correlated with midstory height.

Red-cockaded woodpeckers require open pinelands with little to no hardwood component for foraging. Birds forage in the branches of the crown and on the main stem and exhibit a preference for larger trees (Bradshaw 1990). Smaller trees are also used and low stocking of younger stems are recommended for stand maintenance. Home range size varies across the species range depending on site quality. The average for the southeast region is 85 ha (range = 14.4 – 213.2 ha) including all pine habitats (McFarlane 1995). In Virginia, average home range for 6 breeding groups was 62 ha during the breeding season and 120 ha during the winter season (Bradshaw 1995).

B. Nesting – Red-cockaded woodpeckers live in groups where group members collectively defend the territory, excavate and maintain cavities, and rear young. Groups typically include reproductively mature individuals that forego breeding and “help” with maintenance activities. This cooperative breeding strategy typically evolves in species that occupy stable but saturated habitats and is rare in North America. Group size documented for breeding groups within Piney Grove has varied between 2 and 8 with recently formed groups having few to no helpers and the more established groups typically having 2-3 helpers. Dispersal of fledged young typically occurs in mid-fall with males being more likely to remain on the natal territory to become helpers.

B. 1. Phenology – Historic information concerning the seasonality of breeding for red-cockaded woodpeckers in Virginia is very limited. Clapp (1997) was unable to locate any egg dates for the state. However, he cites observations of birds feeding young on 9 April, 1912 and young in the nest as late as 1 June 1975 and suggests from this information a range of possible egg dates from 9 April to at least 2 May. Miller (1978) lists the date of 5 clutches ranging from 8 to 12 May. Intensive monitoring work conducted within Piney Grove Preserve (2000-2007) has documented 28 breeding attempts (Watts and Bradshaw 2000, 2001, Bradshaw and Watts 2003a, 2003b, 2005, Watts et al. 2006, 2007). The mean laying date is 1 May with a standard deviation of 9 days and a range of 19 April to 23 May. However the median date is 27 April and 50% of the clutches over this time period were laid during the last 2 weeks of April. In general, eggs are laid from late April to early May, nestlings are present from early May through early June, and birds fledge from early to mid June.

B. 2. Reproductive Rates – Until recent monitoring efforts, relatively little has been known about reproductive rates for red-cockaded woodpeckers in Virginia. Miller (1978) reported on the outcome of 4 nesting attempts between 1977 and 1978. The Center for Conservation Biology at William and Mary (CCB) and the Virginia Department of Game and Inland Fisheries (VDGIF) reported on the outcome of 51 nesting attempts (VDGIF Annual Report 1980-1999). As part of the intensive monitoring program on Piney Grove Preserve, CCB (CCB reports 2000-2007) reported on the outcome of 28 nesting attempts. Collectively, these reports document a mean fledging rate of 1.67 young/pair (n=83). Intensive monitoring within Piney Grove Preserve is beginning to provide some additional information related to reproductive rates. From a limited sample, mean clutch size is 2.81 (n=16). Hatching rate is 87.1% (34 of 39 eggs). Of 34 chicks known to have hatched, 24 (70.6%) fledged, suggesting that 61.5% of eggs laid result in birds fledging. From this small sample, it appears that a good portion of the loss is in the form of brood reduction. A considerable amount of work is needed to

further document reproductive rates and mortality patterns so that this may be integrated into a broader population model.

PART IV. RED-COCKADED WOODPECKER POPULATIONS

A. Historic Population - 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 (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 four 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 eighteenth and early nineteenth 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 twentieth 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.

Early accounts of red-cockaded woodpeckers were made from all physiographic provinces of Virginia. Jurisdictions with records include the counties of Giles (Bailey 1913), Albemarle (Rives 1890), Brunswick (Murray 1952), Dinwiddie (Murray 1952), Chesterfield (Murray 1952), Southampton (Steirly 1949), Sussex (Steirly 1950), Prince George (Steirly 1957), Greensville (Steirly 1957), Isle of Wight (Steirly 1957) and the current independent cities of Norfolk (Bailey 1913), Suffolk (Steirly 1957), Virginia Beach (Sykes 1960), and Chesapeake (van Eerden and Bradshaw, unpublished observation).

B. Population Decline - 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. 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 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 documented (Watts and Bradshaw 2005). 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 VDGIF 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 breeding pairs 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.

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 has been converted to pine plantations and will not support the species for the foreseeable future.

PART V. STATUS AND DISTRIBUTION

A. Status – Virginia supported 6 breeding pairs of red-cockaded woodpeckers during the 2007 breeding season. Active management on Piney Grove Preserve has increased the breeding population from a low of 2 pairs in 2002, to 3 pairs in 2003, 4 pairs in 2005, and 5 pairs in 2006. With 9 young fledged in 2007 and 27

birds going into the breeding season, the Virginia population currently contains 36 individuals.

B. Current Distribution – Since the translocation of a bachelor male from Southampton County to Sussex County in 2005 (Watts et al. 2006), all known red-cockaded woodpeckers in Virginia are located within the Piney Grove Preserve in Sussex County. Recent extralimital observations of birds in Lancaster County, Mathews County, and the city of Annandale are believed to represent dispersing birds.

PART VI. CURRENT THREATS TO POPULATION

A. Population Viability Considerations - The entire red-cockaded woodpecker population in Virginia is currently confined to a single location with only 6 breeding groups. This situation makes the population highly vulnerable to extinction due to factors that plague small populations. Among others these include catastrophic events, demographic processes, and the lack of genetic diversity.

A. 1. Catastrophic Events – In the long term there is a significant probability that an event such as a hurricane, ice storm, wildfire, or outbreak of pine bark beetles will impact Piney Grove Preserve over time. The potential impact of hurricanes on red-cockaded woodpecker populations was demonstrated when Hurricane Hugo devastated a large area of Francis Marion National Forest in 1989 (Hooper 1991). In the fall of 2003, Hurricane Isabel caused widespread forest damage throughout coastal North Carolina (Trickel 2003) and Virginia. This hurricane passed within 40 km of Piney Grove Preserve while still retaining hurricane-force winds and dropping more than 6 inches of rain. The storm caused dramatic but isolated tree loss within Piney Grove Preserve, including the loss of 8 cavity trees (Bradshaw and Watts 2003b). Though not as frequent as in more inland or northerly locations, periodic ice storms do occur in coastal Virginia and may

cause severe damage to forest patches. During the winter of 1998, a severe ice storm caused dramatic losses of trees over hundreds of square kilometers in coastal Virginia. In 1999, an extensive and rapid pine bark beetle outbreak in the Daniel Boone National Forest caused the extirpation of the entire Kentucky population of red-cockaded woodpeckers. Since 2000, Piney Grove Preserve has experienced isolated beetle outbreaks that have killed several cavity trees. However, to date, conditions that might lead to a more serious outbreak have not been in place. Because the coastal plain of Virginia experiences periodic natural events with the potential to cause catastrophic forest damage, the population within Piney Grove Preserve will always be vulnerable to such events. Management strategies (e.g., restore populations to additional locations, manage pine stands to reduce local impact of events) should be followed that reduce vulnerability to such events.

A. 2. Stochastic Processes - The combined effects of demographic and environmental stochasticity are likely the greatest threats currently faced by the red-cockaded woodpecker population in Virginia. Letcher et al. (1998) used a spatially-explicit population model to show that vulnerability to stochastic processes increases as population size is reduced and as breeding groups are more scattered on the landscape. They suggest that when both factors are combined populations of less than 100 groups are vulnerable to extinction. However, they also demonstrate that when populations with as few as 25 groups are highly clumped, they can be remarkably resilient. Virginia has not supported a known population of 25 breeding groups in nearly 3 decades. It is unlikely that such a population will be supported within a contiguous site for the foreseeable future. However, restoring red-cockaded woodpeckers in locations with the potential to support populations of this size should be a long-term goal in the state.

A. 3. Genetic Diversity – Inbreeding depression is a common problem with small, closed populations and has been demonstrated for red-cockaded woodpeckers

in the Sandhills of North Carolina (Daniels and Walters 2000). Reproductive rates were reduced for inbred pairs and their progeny due to lower hatching rates and first year survival. Using a spatially-explicit simulation model, Daniels et al. (2000) suggest that a population size of 40-100 groups or an immigration rate of 2 individuals per year is needed to protect against inbreeding depression. Since the initiation of a banding program and intensive monitoring at Piney Grove in 2000, inbreeding has been documented. The most dramatic examples of this were a female breeding with a male progeny in cluster 5 in 2005 and a male breeding with the previous year's female progeny in cluster 7 in 2006. Given the small population size and limited opportunities for dispersal, breeding with relatives will be a likely occurrence for the foreseeable future.

Estimates of population size required to protect against genetic drift range from 500 to thousands in closed populations (e.g., Franklin 1980, Lande 1995). Given the long-term outlook for the Virginia population it is clear that translocations from other states are a key management strategy needed to maintain genetic diversity. Translocations need not occur each year. Rather, they can be adjusted based on population monitoring data so as to ensure that a sufficient number of translocated individuals are among the resident birds available to fill breeding vacancies as they arise.

B. Nest Competitors – Red-cockaded woodpeckers are primary cavity producers in an ecosystem where cavities are in short supply. Because of this, there is considerable demand and competition for cavities by secondary cavity users. Since red-cockadeds excavate cavities in live pine trees they require a considerable effort and may take several months or longer to complete. Each member of the group requires its own cavity for roosting and available cavities may be limiting, particularly during the late summer when newly fledged birds are present. Cavity competitors frequently usurp active red-cockaded woodpecker cavities and/or damage the cavity such that it is no longer usable by the woodpeckers. The loss of cavities may be particularly detrimental to breeding groups depending on the timing and specific cavity involved.

Due to the history of hardwood encroachment and the diverse community of associated cavity competitors, the Virginia red-cockaded woodpecker population has had a long history of problems with cavity loss (Bradshaw, personal communication). Even after the intensive management program was established on Piney Grove Preserve, the population has continued to lose cavities to competitors. For example, in 2006 the cavity management program documented 69 instances of cavity users other than red-cockadeds in natural and artificial cavities (Watts et al. 2007). These involved 33% of all intact cavities. It seems likely that population management will continue to require a vigorous program to manage competitors.

PART VII: RED-COCKADED WOODPECKER MANAGEMENT AND RECOVERY

A. Management Responsibility - The Virginia Department of Game and Inland Fisheries (VDGIF) is the primary wildlife and freshwater fish management agency in the Commonwealth, and has legal jurisdiction over state and federally listed endangered and threatened animal species in Virginia, including the red-cockaded woodpecker. The VDGIF, under Section 6 of the Endangered Species Act (ESA), has a Cooperative Agreement with the U.S. Fish and Wildlife Service (USFWS) that designates VDGIF as the lead agency for the conservation of protected animal species in Virginia.

A. 1. Regulations Protecting the Red-cockaded Woodpecker

Federal Laws - There are three federal laws that provide direct protection for red-cockaded woodpeckers including: 1) The Lacey Act, 2) The Migratory Bird Treaty Act, and 3) The Endangered Species Act.

The Lacey Act of 1900 (16 U.S.C. 3371) as amended, regulates the trade of wildlife or their parts or products taken or possessed illegally, across state, foreign, or Indian reservation boundaries where codified regulations exist.

The Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 40 Stat. 755) as amended, prohibits, without specific authorization, the possession, taking, selling, transporting, and importing of international migratory birds (including red-cockaded woodpeckers), their nests, eggs, parts, or products when such items are included in terms of conventions between the USA, Canada, Mexico, and Japan. Take under this statute includes actions to pursue, hunt, take, capture, kill, possess, sell, barter, purchase, ship, export, or import protected species.

The Endangered Species Act of 1973 (16 U.S.C. 1531-1543; 87 Stat. 884) as amended, provides for the conservation of “endangered” and “threatened” species of fish, wildlife, and plants by federal action. It prohibits the unauthorized “taking”, possession, sale, transport, import, export, delivery, or receiving of any threatened or endangered species. The Act defines an endangered species as a species that is in danger of extinction throughout all or a significant portion of its range. The Act contains provisions for listing, protection and recovery. To affect recovery, the Act provides for the development and implementation of recovery plans for listed species. According to the Act, a recovery plan is a plan for the conservation and survival of the species.

Virginia Laws - There are three pieces of Virginia legislation that are pertinent to red-cockaded woodpecker management in the state, including 1) Article 6 of the Code of Virginia pertaining to Virginia’s Endangered Species, 2) Federal Endangered Species Act Cooperative Agreement, and 3) sections of the Virginia Code pertaining to Protection of Wildlife Species.

Article 6 Endangered Species (§29.1-563 - §29.1-570) – These sections of the Code of Virginia provide that VDGIF is the state regulatory authority over

federally or state listed endangered or threatened fish and wildlife in the Commonwealth, defining fish or wildlife as ". . . any member of the animal kingdom, vertebrate or invertebrate, except for the class Insecta, and includes any part, products, egg, or the dead body or parts thereof". They prohibit the taking, transportation, possession, sale, or offer for sale within the Commonwealth of any fish or wildlife listed as a federally endangered or threatened species. The taking, exportation, transportation or possession of any fish or wildlife, however, may be permitted by the Board of Game and Inland Fisheries for zoological, educational or scientific purposes and for captive propagation for preservation purposes. The Act further authorizes the Board to adopt the federal list of endangered and threatened species, to declare by regulation that species not listed by the federal government are endangered or threatened in Virginia, and to prohibit by regulation the taking, transportation, processing, sale, or offer for sale of those species. Implementing regulations passed pursuant to this authority (4 VAC 15-20-130 through 140) further define "take" and other terms similarly to the federal Endangered Species Act.

Federal Endangered Species Act Cooperative Agreement – Federally listed endangered or threatened species also are placed under VDGIF jurisdiction via a cooperative agreement signed in 1976 with the USFWS pursuant to Section 6 of the ESA. This Cooperative Agreement recognizes VDGIF as the Virginia agency with regulatory and management authority over federally listed or threatened animals excluding insects, and provides for federal and state cooperation regarding the protection and management of those species.

State Protection of Wildlife Species – In addition to the above, the Code of Virginia (§29.1-521) and VDGIF regulations (4 VAC 15-30-10) provide legal protection to all native birds and to their nests, eggs, and young.

B. Past Management Efforts - Historically, habitat within the Virginia range of red-cockaded woodpeckers was managed for wood products and agriculture with

no consideration of the species. As a forester within the region, Steirly observed first hand the harvesting of many active clusters. Although he reports on occasion that cavity trees were left as seed trees, there was no consideration of foraging habitat to support breeding groups. Formal survey efforts for the species did not begin until the mid-1970s (Miller 1978) but management efforts would take many more years to initiate due to the fact that all known breeding groups were on private lands. Aside from some limited removal of cavity competitors, direct management activities did not begin until the mid-1980s when the boundaries of critical habitat for all active groups were delineated. Cavity trees were marked for the first time using national protocols in 1988. Cavity restrictors designed to reduce the impact of cavity competitors were used for the first time in the state in 1989. In 1993 a new era in management was initiated when Hancock Timber Group (HTG) purchased all of the pinelands with active groups and committed to managing critical habitat for those groups. HTG began the process of removing hardwoods and returning the habitat back to pine savanna. The Nature Conservancy (TNC) purchased the core of lands of what is now Piney Grove Preserve from HTG in 1998 specifically for the restoration of the pine ecosystem. TNC has aggressively managed the habitat through hardwood removal and controlled burn programs and has successfully returned the site to pine savanna. Since 2000, the breeding population has also been aggressively managed using all recommended techniques including intensive population monitoring, cavity management, the establishment of recruitment clusters, and translocations from a donor population.

In order to address private landowner concerns regarding red-cockaded woodpeckers, meetings were held with state, federal and academic partners in 1996. Out of these discussions came the vision to establish a Safe Harbor program for red-cockaded woodpeckers in Virginia, modeled after successful programs in the Carolinas (Costa and Kennedy 1997, Lohr 2000). The program exempts private landowners managing their property for the benefit of the species from additional responsibilities under the federal Endangered Species Act in the event that new red-cockaded woodpecker groups are formed. After

three years of negotiations, led by the Environmental Defense Fund, 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 Piney Grove. The 'enhancement of survival' permit issued to TNC to secure landowner agreements is issued by USFWS on a 33 yr renewable term basis.

In 2001, International Paper Corporation (IP) became the first to enroll in the Virginia Safe Harbor program, enrolling 116 ha of pinelands adjacent to the preserve. TNC 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 rights. In addition to its role as a diplomacy tool, the Safe Harbor program is intended to enroll several thousand acres of additional land to increase the effective size of Piney Grove Preserve.

C. Current Management Activities in Virginia

C. 1. U.S. Fish and Wildlife Service (USFWS) – USFWS has provided funding for red-cockaded woodpecker research and management in Virginia since the 1980s. USFWS coordinates with TNC, CCB and VDGIF on red-cockaded woodpecker translocations to Piney Grove.

C. 2. Virginia Department of Game and Inland Fisheries (VDGIF) – VDGIF has provided funding for red-cockaded woodpecker research and management in Virginia since the 1980s. VDGIF continues to provide financial assistance, as well as equipment and logistical support, for red-cockaded woodpecker monitoring at Piney Grove Preserve. VDGIF coordinates with TNC, CCB and USFWS on red-cockaded woodpecker translocations to Piney Grove.

C. 3. The Nature Conservancy (TNC) – TNC has owned and managed the 2,695 acre Piney Grove Preserve in Sussex County since 1998. This former timber company site harbors the only currently documented red-cockaded woodpecker

population in Virginia. TNC also oversees Virginia's Red-Cockaded Woodpecker Safe Harbor program.

C. 4. The Center for Conservation Biology at William and Mary (CCB) – CCB and its predecessors have been directly involved with red-cockaded woodpecker management and research in Virginia since the mid-1970s. This includes rounds of population and habitat surveys, population and reproductive monitoring, habitat research, and hands-on population management. Working with other partners, CCB is responsible for population, reproductive, and cavity tree monitoring, translocations and advising within Piney Grove Preserve. This includes all hands-on work with the birds.

C. 5. Virginia Department of Conservation and Recreation, Division of Natural Heritage (DCR-NH) – DCR-NH personnel work with TNC crews to conduct annual prescribed burns at Piney Grove Preserve.

D. Conservation Planning

D. 1. Federal Management/Recovery Objectives - The USFWS developed a Recovery Plan for the Red-cockaded Woodpecker in 1979, revising the Plan in 1985 and again in 2003 (USFWS 2003). The latest revision updates objectives to be met in order to delist the species by the year 2075. Expressed as the number of potential breeding groups (PBG), the objectives are tied to individual sites that currently support red-cockaded woodpeckers. Sites are grouped within recovery units that were delineated according to ecoregions. Individual recovery units are comprised of populations, which are in turn made up of aggregations of sites. Populations are defined according to their capacity to harbor minimum numbers of PBGs at the time of delisting. Populations are classified as primary core (≥350 PBGs), secondary core (≥250 PBGs), and support populations. Of the latter, essential support populations represent unique or important habitat types that cannot support a larger, core population. Significant and important

support populations are also identified, but are not included in the recovery criteria.

Piney Grove is one of five sites within the Northeast North Carolina/Southeast Virginia Essential Support Population of the Mid-Atlantic Coastal Plain Recovery Unit. This population was estimated to support 35 active clusters in the year 2000, with 3 of these found at Piney Grove. The objective for the population is of at least 100 PBGs, with 10 of these at Piney Grove by the year 2025.

D. 2. Virginia Management/Recovery Objectives - Within the federal Recovery Plan, support populations are primarily defined according to their potential contribution to core populations. They are viewed as important reservoirs of genetic resources and as important sources of immigrants to increase genetic variation in core populations. They may additionally act as buffers against stochastic loss of core populations. The Recovery Plan also recognizes support populations for their intrinsic ecological, cultural and historical value.

Piney Grove Preserve plays a relatively minor role within the context of the Recovery Plan. Population targets for the site account for only 0.12% of the range-wide PBG objective and 10% of the PBG objective for the Northeast North Carolina/Southeast Virginia Essential Support Population. In addition, its function as a reservoir of genetic resources associated with its northern location has been affected by the translocation of 24 South Carolina birds over the years. As these southern birds are among the active breeders at the site, the Virginia genetic reservoir has been diluted.

The value of the Piney Grove population can better be expressed in terms of the significance of its geographic location and of its local importance. The site harbors the northernmost remnant of the red-cockaded woodpecker population across its historic range. As such it is of importance within both an historical and ecological context. Furthermore, Pine Grove represents the last stronghold within the state of a species that is believed to have been historically much more numerous and more widely distributed within southeastern Virginia. The loss of

red-cockaded woodpeckers would represent the loss of an important component of Virginia's avian heritage.

The current management objectives for red-cockaded woodpeckers in Virginia are focused on the Piney Grove site as the core of the Virginia population. They call for the maintenance and continued expansion of the number of breeding groups to a maximum of 12-13 within the current core area, exceeding the minimum objective set in the Recovery Plan. Expansion of this area in the long-term would allow for the creation of additional groups. It is recognized that the siting of the entire Virginia population of red-cockaded woodpeckers at one location makes it vulnerable to stochastic events such as storms, fires and hurricanes. Plans are underway to expand the range of red-cockaded woodpeckers in Virginia through their translocation to additional sites. The Great Dismal Swamp National Wildlife Refuge is completing the planning phase of an on-site reintroduction of the bird. The goals are to create 10 breeding groups within the next 10 years, and another potential 10 groups further out in time.

Collectively, the objective for the Virginia population is of growth from the current 7 active groups at Piney Grove to a minimum of 22 active groups at Piney Grove and Dismal Swamp over the next 10 years. This objective is based on the anticipated carrying capacity of both sites. The establishment of broader population targets is precluded by uncertainty over the long-term potential for expansion of the red-cockaded woodpecker population beyond these two locations. Because of this uncertainty, recovery goals for the species in Virginia can not be defined in terms of numerical objectives at the present time. Rather, they are best framed within the context of achieving the long-term viability of the species within the state. Expansion of the red-cockaded woodpecker population to additional sites could further decrease the impacts of stochastic events and contribute to the reestablishment of the species in other areas of its historic range within Virginia. Expansion to alternate locations is currently limited by the availability of suitable habitat. Expansion is recommended and is achievable, but will take the vision and resolve of partners willing to commit to the management

of habitat that may not be suitable for red-cockaded woodpecker use for several decades. In addition to exceeding the objectives set by the federal Recovery Plan, achieving this expansion will ultimately help to secure the long-term viability of the species in Virginia.

D. 3. Virginia Management/Recovery Approach **-** Management of the Virginia red-cockaded woodpecker population with the objective of providing for the long-term viability of the species in the state should take two complementary approaches. The first is that of strategic site-based management, which is currently occurring at Piney Grove and is planned for the Great Dismal Swamp National Wildlife Refuge. This approach can be expanded to accommodate habitat management and red-cockaded woodpecker reintroductions at additional sites. Standardized management guidelines have been developed nationally for red-cockaded woodpecker habitat and cavities and these should be followed as closely as possible. This information can be found in section 8 of the federal Recovery Plan. The second approach focuses on a strategy for dealing with red-cockaded woodpeckers that may be found in areas of the Virginia Coastal Plain outside of Piney Grove.

Strategic Site-based Management

Phase I. Piney Grove Preserve - Piney Grove Preserve contains an old-growth loblolly and shortleaf pine (*Pinus echinata*) community in Sussex County, Virginia. The site supports a complex of moderate age pine stands interspersed with pockets of older trees ranging from 80 to 140 years. Historically, the site was managed for saw timber on a relatively long rotation by Gray Lumber Company. The site was purchased by HTG in 1993 and by TNC in 1998. TNC purchased an additional 1,160 acres from HTG in 2000, expanding the site to 2,695 acres. In 2006, TNC acquired the Big Woods tract from IP. The 4,905 acre tract abuts the southern boundary of Piney Grove. The vast majority of its

upland areas consist of young loblolly (< 25 years) managed as pine plantation, with approximately 300 acres consisting of trees up to 50 years old.

Under HTG's original management, site quality was improved by removing the dense hardwood understory. Since 1998, TNC has aggressively managed the site for red-cockaded woodpeckers and other pine savanna species through prescribed burning and mechanical thinning. To date, such efforts have restored approximately 1,500 acres of habitat to conditions suitable for nesting and foraging by red-cockaded woodpeckers. An additional 286 acres of IP land adjacent to Piney Grove has been managed for red-cockaded woodpeckers by TNC since its enrollment in TNC's Safe Harbor Program in 2001.

In addition to restoring habitat, TNC has created recruitment cavity tree clusters at Piney Grove through the installation of artificial cavities since 1999. These clusters currently number 11, and there are a total of 14 independent cluster sites with either natural or artificial cavities.

A single group of red-cockaded woodpeckers was known from the site in 1985. A second clan was discovered in 1994 and a third in 1995. These 3 clans still remain active. The red-cockaded woodpecker population at the site has been augmented since 2002 through translocations from donor populations. Translocations have been executed by TNC and CCB in coordination with VDGIF and USFWS. Translocations have included 3 birds from private land in Gates County, NC in 2002 under a USFWS section 10 Habitat Conservation Plan, and a total of 24 birds from Carolina Sandhills National Wildlife Refuge in South Carolina in 2001, 2002, 2003, and 2005. One lone bachelor male was translocated to Piney Grove under a Habitat Conservation Plan from a privately owned site on rte 612 in Southampton County in 2005. These efforts, along with cavity competitor control and natural recruitment within the population, have increased the number of active groups from 3 in 2004 to 7 in 2007 (including one non-breeding group). These results are well ahead of the federal Recovery Plan's timetable for Piney Grove, which calls for 5 active clusters by 2010 and 6 by 2015.

The red-cockaded woodpecker population at Piney Grove is actively monitored by CCB since 2000 through the banding of birds and pre- and post-breeding censuses in the spring and fall. CCB also conducts a inventories of cavity trees and cavities, and collects data on physical indicators of cavity stage, status, and activity. See Part VIII (Monitoring and Research) for more information.

Future management at Piney Grove is directed at increasing the acreage of mature, open pine savanna and at maintaining and increasing the number of active red-cockaded woodpecker groups. Planned habitat and red-cockaded woodpecker restoration objectives are outlined below according to the time horizon in which they will take place.

Short-term Goals (first 5 years) - habitat management through prescribed burning will continue with the objective of improving an additional 200-400 acres in the next 5 years. Burning will take place at the rate of 3 burns per 5 years, with no more than 2 years between burns. To date, burns have been carried out on blocks ranging in size from less than 50 acres to over 200 acres. This habitat restoration phase will transition to a maintenance phase, with burns occurring every 2-3 years on blocks of up to 300 acres in working toward a 1,500 acre/year burn goal. During this period, the number of recruitment clusters will be expanded to 17 by provisioning suitable trees with artificial cavity inserts (minimum of 4 suitable cavities per cluster). Translocations of red-cockaded woodpeckers from the Carolina Sandhills National Wildlife Refuge will likely continue, with periodic assessments of the status of the population relative to population objectives guiding those activities (see long-term goals). Red-cockaded woodpecker and cavity population monitoring are both integral components of conservation efforts and will continue as part of the long-term strategy at Piney Grove.

Approximately 500 acres of TNC's Big Woods purchase will be retained by TNC and managed as above for red-cockaded woodpeckers. Ownership of the remaining Big Woods tract will be transferred to VDOF to become a working

state forest. A number of acres will be enrolled in the Safe Harbor program and managed with the goal of supporting red-cockaded woodpecker groups through coordination with TNC. Longleaf pine restoration to benefit red-cockaded woodpeckers may also take place in the long-term in appropriate areas of the Big Woods. Longleaf pine management opportunities at Piney Grove are limited to patches of relatively small acreage.

Long-term Goals (>5 years) – The long-term population objective for Piney Grove Preserve, based on its estimated carrying capacity, is of 12-13 groups of red-cockaded woodpeckers. Habitat maintenance, artificial cavity management and cavity competitor control will continue to be implemented in order to meet this objective. In addition, the quantity and distribution of mature pines suitable for red-cockaded woodpecker nesting will need to be monitored to address the potential impacts of tree senescence as the forest at Piney Grove ages. Loblolly pine mortality as a result of senescence occurs on average at 130 years. Red-cockaded woodpecker groups in senescing stands should be provided with nearby or adjacent pine stands of sufficient age, diameter-at-breast-height (dbh) and basal area to permit cavity excavation.

Phase II. Great Dismal Swamp National Wildlife Refuge - The Great Dismal Swamp National Wildlife Refuge occupies over 111,000 acres in the cities of Chesapeake and Suffolk in southeastern Virginia and in Camden, Gates and Pasquotank Counties in North Carolina. The Refuge falls within the known historical range of the red-cockaded woodpecker in Virginia, and supported red-cockaded woodpeckers as breeders through 1961 and as residents through 1974. The Refuge has engaged in planning for reintroduction of the red-cockaded woodpecker over the past several years. In 2004 it completed an Environmental Assessment for red-cockaded woodpecker habitat enhancement and reintroduction. It also identified red-cockaded woodpecker reintroduction as a goal in its Final Comprehensive Conservation Plan (2006). Reintroduction of the species will be preceded by the restoration of habitat necessary to meet

minimum red-cockaded woodpecker nesting and foraging requirements as established in the federal Recovery Plan. The geographic area of focus is southeast of Lake Drummond, a 3,100 acre natural lake located on the south-central portion of the Refuge, where red-cockaded woodpeckers were historically found. This area is referred to as 'the Blocks'. Habitat restoration and red-cockaded woodpecker reintroduction objectives are organized below by the time horizon necessary to achieve them. They are defined by acreage of habitat to be managed for red-cockaded woodpeckers and by the number of breeding groups to be supported.

Short-term Goals (first 5 years) – Within the first 5 years, restoration of existing habitat will focus on 500 acres of pond pine (*Pinus serotina*) woodland within the Blocks. The site includes large-diameter pond pines that meet cavity tree criteria and younger pine that are suitable for red-cockaded woodpecker foraging. The site currently suffers from extensive hardwood encroachment, and aggressive removal of the hardwood understory in combination with prescribed burning will be necessary to create the open conditions favored by the bird. Recruitment cavity tree clusters will be created by provisioning suitable trees with artificial cavity inserts to achieve an objective of a minimum of 4 suitable cavities per cluster. Red-cockaded woodpeckers will be translocated from Carolina Sandhills National Wildlife Refuge with a goal of establishing and maintaining up to 3 PBGs by the end of the year 2012. Seasonal cavity inventories and red-cockaded woodpecker population monitoring will be established following translocation of the birds. A long-term monitoring protocol to assess pond pine recruitment and establishment will also be implemented.

Mid-term Goals (first 10 years) – 1,500 acres of pond pine within the Blocks are targeted for restoration in addition to the 500 acres noted above within the first 10 years. Restoration will take the form of active habitat management to remove the hardwood understory, as well as allowing for maturation of the pines. This will bring the total to 2,000 acres designated to support red-cockaded

woodpecker groups. Cavity tree cluster creation, woodpecker translocation and cavity tree and woodpecker monitoring will contribute to the objective of supporting a total of 10 PBGs by the year 2017. The Virginia Safe Harbor Program will be promoted in order to engage abutting private landowners in the recovery effort.

Long-term Goals (beyond 10 years) – the primary goal of the Refuge in this second phase of the reintroduction effort will be to maintain the long-term viability of the established red-cockaded woodpecker PBGs through habitat management, cavity provisioning, and monitoring of the population. A potential secondary objective will be expansion of the Refuge's red-cockaded woodpecker population to a maximum of an additional 10 groups. Although this effort is contingent on the successes of the first 10 years, it would also necessitate expansion of the refuge by 2,000 acres in order to support additional birds.

Phase III. Other Sites - The focus of red-cockaded woodpecker management in Virginia in the next 5-10 years is population maintenance and expansion at Piney Grove Preserve and restoration of a red-cockaded woodpecker population at Great Dismal Swamp National Wildlife Refuge. The number of active groups that are planned for these sites more than double the federal Recovery Plan targets for southeast Virginia. Despite this, expansion of the Virginia red-cockaded woodpecker population to additional sites is desirable in order to 1) mitigate for the vulnerability to stochastic events of populations at Piney Grove and Dismal Swamp; 2) expand the size of the Virginia population, expressed as the number of active groups, beyond the carrying capacity of Piney Grove and Dismal Swamp; 3) provide dispersal and breeding opportunities for Virginia birds from Piney Grove and Dismal Swamp, as well as for birds from nearby NC sites; and 4) re-establish red-cockaded woodpeckers in other areas of its historic Virginia breeding range. The greatest limiting factor to red-cockaded woodpecker management and recovery in Virginia is the lack of sufficient acreage of suitable breeding and foraging habitat as a function of tree age. A habitat assessment of

southeastern Virginia (Bradshaw 1999) concluded that the eastern half of Sussex County, centered on the Route 604 area including Piney Grove and Big Woods, was the only truly biologically and geographically significant habitat area left in the state for red-cockaded woodpeckers. This was one of a handful of sites that were deemed feasible places to introduce birds, including the tidewater pocosins along the North Landing River, and to a lesser extent the Northwest River. However, their potential is likely limited to each supporting one group of birds.

If taking a long-term view toward restoration of the species in Virginia, however, the potential for red-cockaded woodpecker reintroductions is much greater. Pine maturation and habitat management at sites that are not currently suitable for red-cockaded woodpeckers can create habitat in sufficient quantity for red-cockaded woodpecker reintroductions in the next 20+ years. Bradshaw (1999) identified the greatest percentage of such sites as occurring in an area bounded by Chuckatuck to the east, Zuni to the west, Piney Grove/Big Woods to the northwest and Surry to the north. Although ownership of these sites is not specified, they likely do not include smaller landholdings belonging to private, non-corporate landowners. The harvesting of many of the mature pines associated with potential red-cockaded woodpecker habitat in the mid-1990s for fear of losing trees to beetle infestations has left the majority of these smaller landholdings with low red-cockaded woodpecker habitat restoration potential for the next 60+ years. Restoration efforts are instead best directed at larger, contiguous areas under the ownership of federal and state agencies, non-governmental organizations, and corporations. These efforts will be limited by the willingness and capacity of landowners to secure and commit the resources necessary for long-term management of the species on their properties. Such efforts are best managed through a partnered approach to site evaluation and long range planning.

The recent successes at Piney Grove and planned reintroductions at Dismal Swamp have fanned a resurgence in interest in red-cockaded woodpecker restoration. Given the potential that exists for a broader-scale recovery of the red-cockaded woodpecker in the state, and its associated

benefits, future planning efforts should include the identification of interested landowners and cooperators.

Additional Management Actions

Red-cockaded Woodpecker Surveys - Methodical surveys of red-cockaded woodpeckers in southeastern Virginia were conducted by CCB and its predecessors in the late 1970s and 1990s. The latter surveys were conducted at sites selected through an assessment of potential nesting and foraging habitat (Bradshaw 1999). The assessment was based on interpretation of aerial photographs covering an area of 8,725 square kilometers in southeastern Virginia, and led to surveys of 120 sites covering almost 3,000 hectares. No red-cockaded woodpeckers were found, and it is extremely unlikely that red-cockaded woodpecker groups have since occupied those sites. In addition, many of the sites have likely been timbered since the surveys were conducted. Although the habitat assessment covered the majority of the known historic range of red-cockaded woodpeckers in Virginia, it did exclude certain areas that may still hold some potential of harboring birds. Examples include the National Park Service property north of Newport News, areas of south central Virginia, and the band of pond pine pocosin along the North Landing and Northwest Rivers. Although the latter were surveyed via fixed-wing aircraft in the late 1990s, it would be worthwhile resurveying them by helicopter. Surveys of all of these sites are recommended, as they represent the last remaining pieces of southeast Virginia's potential red-cockaded woodpecker habitat picture that have yet to be investigated.

Investigation of Red-cockaded Woodpecker Reports - Despite the comprehensive scope of the 1990s CCB surveys, the possibility exists that red-cockaded woodpeckers persist within the broad survey area outside of Piney Grove. The ability of birds to make use of degraded, fringe habitats has been documented in Virginia in the past few decades. Some birds may therefore have

been missed in the surveys, which were targeted toward habitat categorized as potentially suitable for red-cockaded woodpeckers and excluded less suitable sites. In addition, red-cockaded woodpeckers in Virginia continue to be occasionally reported outside of Piney Grove. While the majority of these sightings are unconfirmed, others are supported by corroborating documentation (e.g. photographs, detailed descriptions) or are made by experienced, reliable observers. Among the latter are recent reports of individual, unbanded birds in Lancaster County in 1998 and Mathews County in January 2006 and of one banded bird in Annandale in July 2007. Some of the reports are of birds found well outside of their known historical range in Virginia, and most are not associated with suitable habitat. In all cases the sightings are not associated with cavities or with excavation activity and the birds are present for a relatively short period, ranging from one day to a winter season. The observed birds are thought to be dispersing, although their populations of origin are unknown.

Confirmed or believable sightings should be investigated by CCB/VDGIF as circumstances allow. Individual reports should be entered into a centralized document or database in order to compile a history of these reports and to make the information available as needed to partners participating in red-cockaded woodpecker conservation in Virginia. The circumstances of the situation in which a bird is found will dictate potential avenues of action in regard to the bird. If new breeding areas are identified, then management tools should be considered when appropriate. These can include Habitat Conservation Plans, land purchases, enrollment in Safe Harbor, and conservation easements.

PART VIII: MONITORING AND RESEARCH

A. Monitoring - Monitoring of the Piney Grove RCW and cavity population is conducted by CCB on an annual basis. The monitoring is aligned with efforts that take place at other RCW populations, and is focused on the collection of data that is necessary in order to properly manage the population. Monitoring objectives include: 1) to determine the number and identification of all birds

resident within Piney Grove during each calendar year; 2) to monitor breeding activity in order to document productivity and allow for the unique banding of all individuals within the population; 3) to monitor and manage nest trees and cavity condition. Additional information on monitoring protocols can be found in Appendix 2 of the federal Recovery Plan.

A. 1. Population Monitoring - Two systematic surveys of all birds within Piney Grove are conducted annually to identify individuals and to determine their distribution. Surveys are conducted in the early spring prior to the expected breeding window and in the late fall after the expected dispersal period. Group size is determined by visiting all clusters before dawn to count the number of individuals emerging from roost cavities and/or joining emerging birds. Birds are followed while they forage so that color band combinations can be read with spotting scopes. Biologists systematically work through all sites over a period of days until all individuals are identified. Once clutches are laid, observations are made at the nest cavity to identify the breeding male and female at each cavity tree cluster.

A. 2. Reproductive Monitoring - Reproductive monitoring at each cluster area yields information on breeding activity, clutch size, and hatching and fledgling rates. During the early portion of the breeding season, both the breeding pair and the nest cavity from each cluster area are monitored closely to determine clutch initiation dates. Where cavity height permits, breeding status is determined via the use of a miniature video camera mounted on an extendable pole (peeper scope). The pole can accommodate cavity heights to 50 ft. For cavities exceeding that height, breeding status is determined by visual monitoring of activity at the cavity. After dates of incubation are determined, an estimated hatching date is calculated. Nest cavities are monitored closely around the time of expected hatching to verify hatch dates. The age of nestlings at the time of banding (see 'Banding' section below) is used to estimate fledgling dates

(fledging occurs at 26 to 29 days of age). In the first 2 weeks after fledging, birds are identified and sex determined by crown plumage.

A. 3. Banding

Adults – Banding of adults at Piney Grove took place in 1998 and 2000 after TNC acquired the property. Since that time, adult banding has not been necessary, as all birds produced on-site are banded at the nestling stage and all translocated birds are already banded. Adult birds were captured using a specialized net mounted on a telescopic pole shortly after they roosted at dusk. The birds were "roosted", the net was raised in place and the bird was enticed out into the net. Net poles are only effective for cavities below 50 feet in height.

Nestlings – All nestlings are banded between the ages of 5 to 10 days old. Banding nestlings older than 10 days in age is prohibited because of greatly increased risk of injury and mortality. Banding nestlings younger than 5 days old is not possible because they can not accommodate three color-bands on one leg. Because of these restrictions, close monitoring of breeding activity is essential to successful banding. The window for banding is determined from estimated hatching dates (see 'Reproductive Monitoring' section above). All nestlings are banded during the recommended age window. Nest trees are climbed using Swedish ladders and nestlings are extracted from cavities using a noose apparatus. Nestlings are then lowered to the ground, banded, and returned to the cavity. Each nestling receives a unique combination of three color bands (size XB) on one leg, and a U.S. Geological Survey aluminum band (size 1A) and a color band on the other. Nestlings are aged at the time of banding using descriptive characteristics determined by Ligon (1970), and are weighed using a Pesola spring scale.

A. 4. Cavity Monitoring and Management - In addition to providing data on the number, distribution and condition of cavities available to red-cockaded woodpeckers, cavity monitoring allows for an assessment of whether

management actions are necessary for particular cavities. This can include the removal of nest competitors and the use of excluders to address cavity enlargement. The status of all cavities is evaluated once every one to two months throughout the year. Relic cavities are omitted from this cycle and are only visited in April and September. Each cavity tree is visited and data collected on tree characteristics and on the condition of each cavity supported. Tree condition classes include: live or dead, standing, broken or fallen, beetles, lightning strike, and red heart disease. Cavity data collected include: cavity stage, cavity height and orientation of cavity entrance, entrance enlargement, cavity activity, plate size, chipping on resin wells, and amount and status of sap flow. The condition of each cavity's entrance and plate are used to assess cavity status.

Visits to completed cavities also serve to locate and remove cavity competitors throughout the year. All active and inactive cavities below 50 feet are inspected using a peeper scope. Once competitors are located, trees are climbed and materials are removed. Trees are not climbed to remove snakes, amphibians, or wasps. Nesting birds that are tending eggs or nestlings are not removed. Removal of competing birds is coordinated with VDGIF.

Searches for new cavities focus on areas surrounding existing clusters and are conducted throughout the year.

B. Research – Research needs at Piney Grove focus on those issues which affect the long-term viability of its red-cockaded woodpecker population. At present, these relate to turnover in the cavity population and to the influence of vital rates on the population dynamics of the woodpeckers.

<u>B. 1. Investigate Cavity Turnover Patterns and Their Causes</u> - Critical to red-cockaded woodpecker management is the management of cavity trees and cavities, which are a limiting resource and are tied to the number of birds that a given area can support. Monitoring at Piney Grove has documented that some cavities are used for short periods of time relative to their potential and then

abandoned. New cavities tend not to be excavated in existing cavity trees at Piney Grove. This has led to concerns about the sustainability of present rates of cavity turnover, given the finite supply of trees suitable for cavity excavation. In addition to ongoing cavity monitoring, cavity turnover patterns and their causes should be investigated to 1) estimate the impact that present cavity turnover rates will have on the spatial distribution and supply of trees suitable for future cavity excavation; and 2) develop management scenarios to ensure an adequate supply of cavity trees in the long-term.

B. 2. Investigate Mortality and Reproductive Rates - Vital rates are among the important factors driving the population dynamics of red-cockaded woodpeckers in Virginia. Information on reproductive rates for the period preceding monitoring on Piney Grove is relatively scarce because of limited access to private lands that harbored red-cockaded woodpeckers. A mean fledging rate of 1.67 young/pair has been calculated based on a relatively small sample size (n=83), and is lower by 0.2 than the national average. Very little information is available on mortality rates. Information on mortality and reproductive rates should continue to be collected through ongoing monitoring at Piney Grove. These data should be integrated into a broader population analysis to assess their impacts on long-term population viability. Factors affecting mortality and reproduction should also be examined in relation to the potential for management to address them.

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