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## Investigation of red-cockaded woodpeckers in Virginia: 2012 report

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# **Investigation of Red-cockaded Woodpeckers in Virginia: 2012 report**



**The Center for Conservation Biology  
College of William and Mary  
& Virginia Commonwealth University**

# **Investigation of Red-cockaded Woodpeckers in Virginia: 2012 report**

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Cover Photo: Red-cockaded Woodpecker Cavity. Photo by Bryan D. Watts.



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## **EXECUTIVE SUMMARY**

Two-thousand twelve was a champion year for Red-cockaded Woodpecker recovery at the Piney Grove Preserve with new high marks for breeding pairs, population size and breeding productivity. Ten successful breeding attempts were documented in 2012 reaching an initial recovery goal for the Nature Conservancy property and the highest number of breeding groups since Piney Grove Preserve has been monitored. The Preserve gained one more breeding group this season to reach this new high mark. The additional breeding group was a direct result from the installation of a new artificial recruitment cluster in the summer of 2011. A modern day high of 26 chicks survived to fledge from the 10 successful nests.

A total of 71 Red-cockaded Woodpeckers were identified within Piney Grove preserve in 2012. This included 45 birds that were hatched at Piney Grove from previous years and the 26 fledglings produced during the 2012 breeding season.

Forty-four adult birds were believed to be present within the Piney Grove Preserve going into the breeding season of 2012 (Table 1). This equals the highest spring total set in 2011 that collectively beat the previous high mark in spring of 2010 by 7 birds and almost triple the number counted in 2002 when only 16 birds were present.

Fifty-three birds were detected during the winter survey. This includes 39 adult birds hatched at Piney Grove before 2012 and 14 of the 26 birds fledged during the 2012 breeding season. This is a gain of 6 birds in the winter population from 2011.

The Red-cockaded Woodpecker population continues to set high marks at Piney Grove Preserve as a result of many years of population, habitat, and cavity tree management.

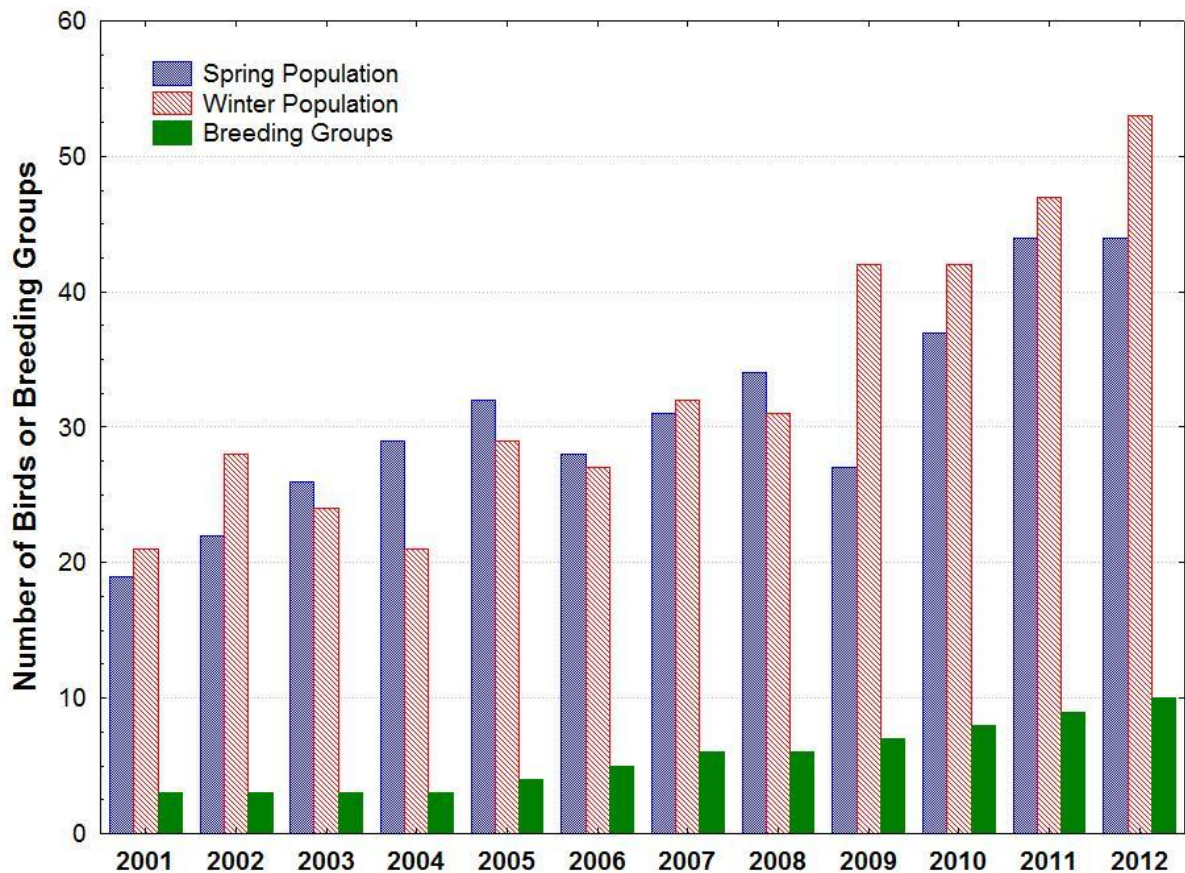
## BACKGROUND

### Context

The Red-cockaded Woodpecker (*Picoides borealis*) is a federally endangered species. Within the past 100 years Red-cockaded Woodpeckers have disappeared completely from the northern portion of their breeding range. Historically, this species was recorded north into New Jersey and Pennsylvania. As recently as the 1930's and 1940's resident birds were known from the open maritime forests of Maryland. Since the recent loss of habitat in Kentucky, Virginia has supported the only population north of the Carolinas. In Virginia, breeding has continued to the present time but the number of both sites and birds has declined dramatically over the past 40 years. As recently as 1977, 23 clans were known scattered across 5 counties. 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. 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 Red-cockaded Woodpecker remains in eminent danger of extinction within Virginia. However, in 1998 a multi-organizational partnership was formed under the primary mission of stabilizing the population and restoring it back to pre-1980 levels. During that year, The Nature Conservancy negotiated a deal with Hancock Timber to purchase 1,100 ha of land supporting the last 3 known Red-cockaded Woodpecker breeding groups. The site has since been expanded and now includes 1,270 ha of pine land. The tract, located in Sussex County is named the Piney Grove Preserve and lies in the heart of the species former Virginia range. The site has become the nucleus for restoration work in Virginia.

Restoration of the Red-cockaded Woodpecker population in Virginia will require a long-term commitment and the use of aggressive techniques that have proven successful further south. Habitat management, population monitoring and management, and translocation of birds into the population have been ongoing since 2000 and have had dramatically positive results. Since 2001, the total population and the number of potential breeding clusters (defined as having 1 adult male and 1 adult female) have doubled (Figure 1). This past season, the Piney Grove Preserve population reached a new high of 10 breeding clusters.



**Figure 1.** Spring and winter population counts and number of breeding groups for Red-cockaded woodpeckers at the Piney Grove Preserve.

## Objectives

The primary objective of this ongoing project is to monitor the population of Red-cockaded Woodpeckers within the Piney Grove Preserve. A secondary objective is to collect information relevant to the continued management of birds and their habitat in Virginia. Specific objectives include

- 1) To determine the number and identification of all birds resident within Piney Grove during the 2012 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.

## **METHODS**

### **Description**

Piney Grove Preserve contains an old-growth loblolly, pond pine, and short-leaf pine 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 Hancock Timber Resource Group in 1993. Under Hancock Timber's management, site quality was improved by removing the dense hardwood understory. The Nature Conservancy purchased the tract from Hancock Timber in 1998. The Nature Conservancy has developed an aggressive management program designed to restore the disturbance regime necessary to return the site to an open pine savannah.

A single clan of Red-cockaded Woodpeckers was discovered within this site in 1985. A second clan was discovered in 1994 and a third in 1995. These 3 clans still remain active. Since 1999, there have been 12 recruitment clusters established by The Nature Conservancy through the installation of artificial cavities.

### **Banding**

Being able to identify individual birds is an essential element of the monitoring program. Banding individuals with unique combinations of color bands allows for their identification and, for this reason, has been one of the project goals.

Adults – Adult birds are captured using a specialized net mounted on a telescopic pole shortly after they roost at dusk. The birds are “roosted” and the net is raised in place and the bird is enticed out into the net. Net poles are only effective on cavities below 50 feet in height. In 1998, Don Schwab banded 10 Red-cockaded Woodpeckers within the Piney Grove complex. In 2000, 7 of these birds were still resident within Piney Grove. During 2000, Bryan Watts banded an additional 4 adult birds, leaving only 2 unbanded birds in the population (1 each in clusters 3 and 5). The 2 remaining unbanded adults within clusters 3 and 5 were lost during 2004 and 2005 respectively. Since this time, nearly all birds within the population have been individually identified by unique, color-band combinations. The only birds that remain unbanded are nestlings that could not be removed from nest cavities and have not been captured after fledging.

Nestlings – For logistical and safety reasons, banding of Red-cockaded Woodpecker nestlings is restricted to an age window of 5-10 days. Because of this restriction, close monitoring of breeding activity is essential to successful banding. During the early portion of the breeding season, both the breeding pair and the nest cavity from each cluster area



were 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. The pole can accommodate cavity heights to 50 ft. For cavities exceeding that height, breeding status was determined by visual monitoring of activity at the cavity. After dates of incubation were determined, an estimated hatching date was calculated. Nest cavities were monitored closely around the time of expected hatching to verify hatch dates. The window for banding was determined from estimated hatching dates.

All nestlings were banded during the recommended age window. Nest trees were climbed with ladders and nestlings were extracted from cavities using a noose apparatus. Nestlings were then lowered to the ground, banded, and returned to the cavity. Each nestling received a unique combination of color bands as described above. Nestlings were weighed at the time of banding using a Pesola spring scale. In the first 2 weeks after fledging, birds were identified and sex was determined by crown plumage.

### **General Observations**

As in previous years, 2 systematic surveys of all birds within Piney Grove were conducted to identify individuals and to determine distribution. Surveys were conducted in the early spring prior to the expected breeding window and in early winter after the expected dispersal period. All clusters were visited before dawn to count the number of individuals emerging from roost cavities and/or joining emerging birds to determine clan size. Birds were followed while foraging so that color band combinations could be read with spotting scopes. Biologists systematically worked through all sites over a period of days until all individuals were identified. Once clutches were laid, observations were made at the nest cavity to identify the breeding male and female for each site.

### **Cavity Monitoring and Management**

RCW cavity trees at Piney Grove are monitored each year to document changes in condition and use by RCW and other animals. Cavity trees are tagged with individual numbers, painted with a double white band, and mapped to facilitate monitoring. Each tree is assigned to a cluster area based on the proximity to an existing cluster and the RCW group that constructs the cavity. The cluster area assignment for a cavity tree does not change according to the RCW clan using the tree but rather is considered “captured” by the clan. To differentiate multiple cavities within a tree, each cavity, starting with the highest above ground, is assigned an alphabetical identifier. When a new cavity is discovered on a cavity tree the letter attributed to other cavities on the tree may change accordingly. Cavity monitoring and management consists of two parts: cavity tree status and cavity competitor inspection and removal. Monitoring and management in 2012 began in April and continued through June.

**Cavity Tree Status** – Cavity trees were visited at least once to evaluate tree condition and cavity characteristics. Changes to cavity status or cavity tree conditions were recorded as

necessary on subsequent visits. Tree conditions that were recorded included: live or dead; standing, broken, or fallen; evidence of beetle or other insect damage; lightning strike; and indications of red-heart disease (*Phellinus pini*).

Characteristics of each cavity were observed with binoculars and recorded to describe the physical condition of the cavity. The characteristics observed included: cavity origin and condition, the entrance and plate size, and the activity status. Activity status was determined by the presence or absence of chipping, fresh or recent sap flow, and dry sap. See Appendix I for 2012 cavity characteristics recorded for each cavity. Characteristics were categorized as follows:

Cavity

Natural – Constructed by an RCW  
Artificial – Cavity is a box installed in the tree

Status:

Unavailable - Cavity is no longer available  
Active: Chipping on resin wells to some degree with fresh or recent sap flow  
Possibly active: Slight but inconclusive evidence of RCW activity  
Inactive: No RCW chipping or sap flow  
Relic: No RCW activity for 4 or more years

Condition:

Complete – Natural cavity that is excavated enough for an RCW to occupy  
Complete (New) – Newly completed since last update  
Advanced Start: >10 centimeter depth but not completed  
Start: 1-10 centimeter depth  
Sub-start: Less than one centimeter depth  
Insert – Artificial cavity

Entrance:

Unavailable - Cavity is no longer available  
Normal - Normal size entrance  
<2X - Enlarged less than twice the normal diameter  
>2X - Enlarged two to four times the normal diameter  
>4X - Enlarged more than four times the normal diameter  
Restrictor plate reducing entrance to normal size  
Healing over

Plate size:

Unavailable - Cavity is no longer available  
>45 cm - Completed: Greater than 45 centimeter diameter plate  
30-45 cm - Completed: 30-45 centimeter diameter plate

15-30 cm - Completed: 15-30 centimeter diameter plate  
0-15 cm – Started but not completely encircling entrance: 0-15 centimeter diameter plate  
Unstarted: No plate

Resin work:

Unavailable - Cavity is no longer available  
Fresh: Some to all resin wells have chipping and bark scaled  
Recent: Few resin wells have little chipping with little to no sap flow  
Old: No recent RCW activity

Cavity competitor inspection and removal – All active, completed inactive cavities, and artificial cavity inserts within 50 ft from the ground were checked on a one-month cycle using a camera and monitor mounted on a telescoping pole. Data on competitors is only presented for April, May, and June 2011. When cavity competitors were located, the tree was climbed to remove the competitor or nest material. Amphibians, wasps and bird nests with a tending adult, fresh eggs, or nestlings were not removed.

## RESULTS

### Population Monitoring

During the calendar year of 2012, 72 Red-cockaded Woodpeckers were identified within Piney Grove preserve (Table 1). This included 46 birds that were hatched at Piney Grove from previous years and 26 fledglings produced during the 2012 breeding season.

In general, the Piney Grove Preserve population is relatively young group with 64.4 % of all adult birds being  $\leq 3$  yrs old (Figure 2). Among the 46 adult birds detected in 2012 include 1 older bird fledged in 2000, 2 fledged in 2004, 1 fledged in 2005, 3 fledged in 2006, 5 fledged in 2007, 3 fledged in 2008, 11 fledged in 2009, 9 fledged in 2010, and 11 fledged in 2011.

There were 17 birds detected in 2011 that were not detected in 2012. This includes the loss of 13 of the 25 fledglings produced in 2011, 2 adult birds present in 2011, and both of the last 2 remaining translocated birds. Each of the translocated birds attempted breeding in 2011 but was not detected during the 2011 winter survey or during any time in 2012.

Forty-four adult birds were believed to be present within the Piney Grove Preserve going into the breeding season of 2012 (Table 1). This equals the highest spring total set in 2011 that collectively beat the previous high mark in spring of 2010 by 7 birds and almost triple the number counted in 2002 when only 16 birds were present.

At the start of the breeding season, group sizes per cluster ranged from 3-6 birds with an average of 4.4 birds ( $\pm 1.24$  SD) birds per group. Three groups only supported 3 birds. This was not surprising for Clusters 6 and 15 because they are relatively new breeding clusters and it can take some time for sizes to increase. However, it was surprising that Cluster 3 only supported 3 birds. Cluster 3 is a natural and long standing cluster that has supported 4-7 birds in previous years. However, 2 birds that occupied Cluster 3 in 2011 have simply dispersed to two other breeding clusters in 2012 (Clusters 1 and 19).

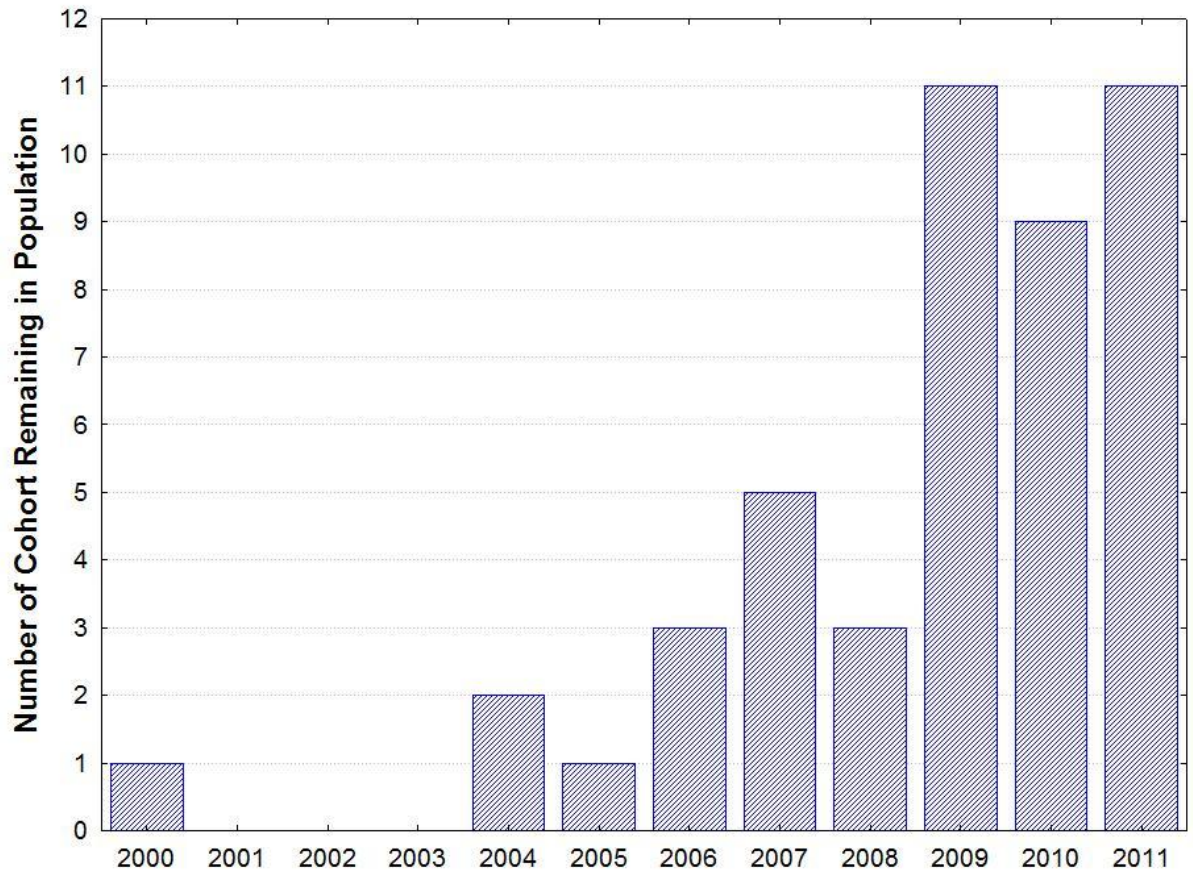


Figure 2. Age structure of the adult (i.e., hatched before 2012) Red-cockaded Woodpecker population at the Piney Grove Preserve. The year identifies age of hatching for every woodpecker currently in the population.

Fifty-three birds were detected during the winter survey. This includes 39 adult birds hatched at Piney Grove before 2012 and 14 of the 26 birds fledged during the 2012 breeding season. There were 5 adult bird detected during the spring survey that were not detected during winter survey. Conversely, there were two birds not detected during the

spring survey that were found in winter. Both of these birds dispersed to new clusters since 2011 so likely were not detected from their transient behavior. The retention rate of fledged birds through winter was relatively lower in 2012 and 2011 (53 and 48%, respectively) compared to previous years when typically 70-75% of the fledged birds are found during the winter survey. This could be a function of the much larger production of fledglings over the past two years.

In the winter assessment, birds were roosting in 11 different cluster areas including C-1, C-3, C-5, C-6, C-7, C-8, C-9 C-10, C-13, C-15, and C-19 (Table 2). As in years past, the birds roosting in C-9 was part of the C-7 clan. No birds roosted in C-12 during 2012 despite roosting activity there in 2011. Group size ranged from 2-7 birds and averaged 5.2 ( $\pm$  1.55 SD) birds per group. Three birds were found moving between two clusters in winter.

### **Breeding Observations**

Successful breeding occurred in 10 Clusters this season. A total of 12 attempts were made during the 2012 season with success at C-1, C-3, C-5, C-6, C-7, C-8, C-10, C-15, and one failed and one successful attempt at both clusters C-13 and C-19. This is the highest number of successfully breeding pairs since Piney Grove has been monitored. This was the first year breeding occurred at C-19. Cluster 19 was created by installation of artificial cavities in the autumn of 2011 so its occupation and successful breeding by birds was fortunate. A combined total of 26 chicks survived to fledge from the 10 successful nests (Table 3).

Cluster 1 – A new breeding male assumed reproductive duties in 2012 (DG/YE/DG, WH/AL). Cluster 1 is this bird's native cluster and it has remained here since fledging in 2005. Over the past few years, this male was a helper bird and was behaviorally dominant over all birds in the groups except for the previous breeding male (AL/OR, DB/DB/WH). The previous breeding male was initially translocated from Carolina Sandhills NWR in 2002, and then moved into Cluster 1 in 2007 where it remained as the breeder from that year until 2011. This male was not detected in winter marking the time for the loss of the last known translocated bird in the Piney Grove population. This was the third consecutive year for the breeding female (YE/YE/DB, AL/DB); a C-8 bird hatched in 2009 and moved to C-1 in 2010. Feeding of young was augmented by at least one helper male (AL/OR, YE/LG/YE) that was originally hatched in C-1 in 2009 and has remained at this cluster since that time. The appearance of 4 eggs was first detected on 24 April in tree #157. This was the first year this tree was used for nesting. Three nestlings were observed in the nest on 8 May and estimated to be 3-4 days old. All three nestlings successfully fledged and were identified as 2 females and 1 male. Only two of the hatch year birds were captured for banding on 16 December (both female) and they were still in C-1 during the winter. The male hatch year bird was not in C-1 but an unbanded bird was detected nearby in C-10.

**Table 1.** Occurrence of individual Red-cockaded Woodpeckers at Piney Grove Preserve 2004-2011 identified by USGS Serial Leg Band and color band combination (X<sub>j</sub> indicates hatch-year bird in that year).

USGS	Left Leg	Right Leg	Sex	2006	2007	2008	2009	2010	2011	2012
1581-66207	WH/LB/WH	WH/AL	F	X						
1581-66214	RE/DB	WH/AL	M	X	X	X	X	X	X	X
1581-66220	WH/LB/WH	PU/AL	U		X	X	X	X	X	
1581-66224	DG/YE/DG	RE2/AL	M	X						
1581-66230	WH/LB/WH	AL/YE	F	X	X					
1581-66231	WH/LB/WH	PK2/AL	M	X	X					
1581-66238	WH/LB/WH	AL/PU	F			X				
1581-66245	DG/YE/DG	AL/LB	M	X						
1581-66251	LB/WH/LB	AL/DB	M	X	X	X	X	X	X	X
1581-66252	LB/WH/LB	AL/LB	F							
1581-66253	DB/RE/DB	AL/WH	F	X	X	X	X	X	X	X
1581-66254	DB/RE/DB	AL/RE	M	X	X	X				
1581-66256	LB/WH/LB	AL/OR	F							
1581-66257	LB/WH/LB	AL/RE	M	X	X	X	X	X	X	X
1581-66258	LB/WH/LB	AL/YE	F	X	X	X	X			
1581-66261	DB/RE/DB	AL/DB	M	X	X	X	X	X		
1581-66263	DB/RE/DB	AL/PU	F	X		X	X	X		
1581-66264	WH/RE/WH	AL/DG	M	X	X	X	X	X		
1581-66265	LB/WH/LB	AL/WH	F	X <sub>j</sub>	X	X	X			
1581-66266	LB/WH/LB	RE/AL	F	X <sub>j</sub>	X	X	X	X	X	X
1581-66267	WH/RE/WH	AL/RE	F	X <sub>j</sub>						
1581-66268	WH/RE/WH	AL/YE	M	X <sub>j</sub>	X	X				
1581-66269	DG/YE/DG	YE/AL	M	X <sub>j</sub>	X					
1581-66270	DG/YE/DG	WH/AL	M	X <sub>j</sub>	X	X	X	X	X	X
1581-66271	DB/RE/DB	YE/AL	F	X <sub>j</sub>	X	X	X	X	X	X
1581-66272	OR/OR/OR	RE/AL	M	X <sub>j</sub>						
1581-66273	WH/RE/WH	AL/WH	M		X <sub>j</sub>	X	X	X	X	X
1581-66274	WH/RE/WH	AL/DB	M		X <sub>j</sub>	X	X	X	X	X
1581-66275	OR/AL	DB/RE/DB	F		X <sub>j</sub>					
1581-66276	DG/YE/DG	OR/AL	F		X <sub>j</sub>	X	X	X	X	X
1581-66277	LB/WH/LB	YE/AL	F		X <sub>j</sub>					
1581-66278	LB/WH/LB	OR/AL	F		X <sub>j</sub>	X	X	X	X	X
1581-66279	YE/DB/YE	AL/RE	F		X <sub>j</sub>	X	X	X		
1581-66280	YE/DB/YE	AL/YE	M		X <sub>j</sub>	X	X	X	X	X

USGS	Left Leg	Right Leg	Sex	2006	2007	2008	2009	2010	2011	2012
1581-66281	OR/OR/OR	YE/AL	F		Xj	X	X			
1581-66282	YE/DG/YE	DB/AL	F			Xj	X	X		
1581-66283	WH/AL	YE/DG/YE	F			Xj	X	X		
1581-66284	DB/RE/DB	WH/AL	F			Xj	X	X		
1581-66285	DB/RE/DB	DB/AL	M			Xj	X	X	X	X
1581-66286	DB/RE/DB	RE/AL	F			Xj				
1581-66287	LB/WH/LB	AL/PU	F			Xj	X	X	X	
1581-66288	LB/WH/LB	AL/DG	M			Xj	X	X	X	X
1581-66289	YE/DB/YE	AL/WH	U			Xj				
1581-66290	YE/DB/YE	AL/PU	M			Xj	X	X	X	X
1581-66291	WH/WH/WH	RE/AL	F			Xj	X	X	X	X
1581-66292	YE/DB/YE	AL/DG	F				Xj		X	
1581-66293	YE/DB/YE	AL/LB	F				Xj	X	X	X
1581-66294	YE/YE/DB	AL/DB	F				Xj	X	X	X
1581-66295	YE/DB/YE	RE/AL	U				Xj			
1581-66296	DG/AL	YE/YE/DG	M				Xj	X	X	X
1581-66297	AL/RE	YE/DG/YE	F				Xj	X	X	X
1581-66298	AL/DB	YE/DG/YE	F				Xj	X	X	X
1581-66299	AL/YE	DB/RE/DB	F				Xj	X	X	X
1581-66300	AL/RE	LB/WH/LB	M				Xj	X	X	X
1541-29901	AL/DB	LB/WH/LB	M				Xj			
1541-29902	AL/DB	WH/RE/WH	F				Xj	X	X	X
1541-29903	AL/YE	WH/RE/WH	M				Xj	X		
1541-29904	AL/LB	WH/RE/WH	F				Xj		X	
1541-29906	AL/DG	DB/RE/DB	M				Xj	X	X	X
821-70901	OR/OR/OR	AL/DG	M				Xj	X	X	X
1541-29907	OR/OR/OR	AL/WH	F				Xj	X		
821-70910	AL/YE	YE/LG/YE	F					Xj	X	X
821-70911	AL/WH	YE/LG/YE	M					Xj		
821-70912	AL/OR	YE/LG/YE	M					Xj	X	X
821-70940	AL/WH	DB/RE/DB	M					Xj	X	X
unbanded			M					Xj	X	
unbanded			F					Xj	X	X
821-70913	AL/YE	LB/WH/LB	M					Xj	X	
821-70914	AL/LB	LB/WH/LB	M					Xj	X	X
821-70915	AL/LG	LB/WH/LB	F					Xj		
821-70916	AL/OR	LB/WH/LB	F					Xj		
821 70908	AL/OR	WH/RE/WH	M					Xj	X	
821 70909	AL/LG	WH/RE/WH	U					Xj		
unbanded			F					Xj		

USGS	Left Leg	Right Leg	Sex	2006	2007	2008	2009	2010	2011	2012
821-70904	AL/LB	YE/DB/YE	M					Xj	X	X
821-70905	AL/OR	YE/DB/YE	U					Xj		
821-70907	AL/LG	YE/DB/YE	F					Xj	X	X
821-70906	AL/RE	YE/DB/YE	M					Xj	X	X
821-70902	OR/OR/OR	AL/YE	M					Xj	X	X
821-70903	OR/OR/OR	AL/LB	M					Xj	X	
821 70917	YE/OR/YE	AL/DB	M					Xj	X	
821-70922	LG/YE/LG	AL/LB	F						X	
821-70923	LG/YE/LG	AL/WH	M						Xj	X
821-70924	LG/YE/LG	AL/DB	F						Xj	X
821-70925	LG/YE/LG	AL/OR	F						Xj	
821-70931	WH/LB/WH	WH/AL	F						Xj	
821-70932	WH/LB/WH	OR/AL	F						Xj	
821-70933	WH/LB/WH	PU/AL	F						Xj	X
821-70937	PU/YE/PU	AL/WH	M						Xj	
821-70938	PU/YE/PU	AL/OR	M						Xj	
821-70939	PU/YE/PU	AL/LG	M						Xj	
821-70918	YE/DB/YE	YE/AL	M						Xj	X
821-70919	YE/DB/YE	LB/AL	M						Xj	X
821-70920	YE/DB/YE	OR/AL	M						Xj	
821-70921	YE/DB/YE	RE/AL	F						Xj	X
821-70926	OR/OR/OR	AL/PU	F						Xj	
821-70927	OR/OR/OR	AL/DB	M						Xj	X
821-70930	OR/OR/OR	AL/LG	F						Xj	X
821-70928	YE/OR/YE	AL/OR	M						Xj	
821-70929	YE/OR/YE	AL/WH	M						Xj	X
821-70934	OR/DB/OR	AL/YE	F						Xj	
821-70935	OR/DB/OR	AL/DB	F						Xj	
821-70936	OR/DB/OR	AL/LG	M						Xj	X
unbanded			M						Xj	
unbanded			M						Xj	
821-70941	AL/OR	DB/RE/DB	F						Xj	X
821-70963	AL/YE	LG/YE/LG	F							Xj
821-70964	AL/WH	LG/YE/LG	F							Xj
unbanded			F							Xj
unbanded			M							Xj
unbanded			M							Xj
unbanded			F							Xj
821-70948	AL/OR	WH/LB/WH	M							Xj
821-70949	AL/LG	WH/LB/WH	M							Xj



USGS	Left Leg	Right Leg	Sex	2006	2007	2008	2009	2010	2011	2012
821-70950	AL/YE	WH/LB/WH	F							Xj
821-70945	PU/YE/PU	AL/YE	F							Xj
821-70946	PU/YE/PU	AL/LB	M							Xj
821-70947	PU/YE/PU	AL/MB	M							Xj
821-70954	WH/PU/WH	AL/YE	F							Xj
821-70955	WH/PU/WH	AL/LG	M							Xj
821-70956	WH/PU/WH	AL/MB	F							Xj
821-70957	YE/MB/YE	AL/LG	F							Xj
821-70958	AL/WH	YE/MB/YE	M							Xj
821-70959	AL/PU	YE/MB/YE	F							Xj
821-70942	AL/WH	OR/OR/OR	M							Xj
821-70943	AL/MB	OR/OR/OR	M							Xj
821-70944	AL/YE	OR/OR/OR	F							Xj
821-70952	YE/OR/YE	AL/YE	F							Xj
821-70953	YE/OR/YE	AL/LG	F							Xj
821-70951	OR/MB/OR	AL/OR	F							Xj
821-70960	LG/DB/LG	AL/LG	F							Xj
821-70961	LG/DB/LG	AL/YE	F							Xj
Translocated and Foreign Birds										
801-40249	BK/YE/DB	RE/AL	F	X	X	Xj				
1751-83142	AL/OR	DB/DB/WH	M	X	X	Xj	X	X	X	
951-26448	AL/YE	DG/DG/MV	M	X	X					
1751-83183	AL/OR	YE/YE/WH	M	X	X					
951-26305	AL/YE	YE/YE/WH	M	X	X	Xj	X	X	X	
1951-05086	AL/MV	MV/MV/WH	F	X	X	Xj	X			
941-92233	AL / ST	WH/WH/LG	F	X	X	Xj				
1841-53714	RE/YE/RE	AL/OR	F	X	X	Xj				

Cluster 3 – The breeding male (RE/DB, WH/AL) remained the same since 2007. This was the sixth consecutive year this male held breeding status. This is the oldest bird in the Piney Grove population and was originally banded in C-3 in 2000 as a nestling. The breeding female (LB/WH/LB, RE/AL) has remained the same since 2008. This is the fifth consecutive year this female has assumed breeding duties. The birds nested in a new tree (#179) for the third consecutive year. This cavity is too high to be examined by peeper scope and two awkward to be climbed for banding of nestlings. Incubation behavior was first observed on 8 May and food delivery 23 May. Feeding of young was aided by a fourth-year male (DB/RE/DB, AL/DB) that was originally hatched in C-3. Fledglings were identified as 2 males

and 1 female on 27 June. Since all birds were not banded it is difficult to determine their individual whereabouts. During the winter, only 3 birds were detected without bands in the population; 2 in C-1, 1 in C-10, and 1 in C-19. The C-19 bird is presumed to be an adult bird observed in spring and winter. So it is unknown whether or not the C-3 fledglings still remain in the Piney Grove populations.

Cluster 5 – The breeding male was replaced this season after a 5-year run by the prior male. The 2012 breeding male (LB/WH/LB, AL/RE) was a helper the previous season and was hatched at this cluster in 2005. This was the third consecutive year the same breeding female (AL/DB, YE/DG/YE) has remained the same. Two males were detected helping with feeding of young (LB/WH/LB, AL/DG) (AL/RE, LB/WH/LB) (birds hatched at C-5 in 2007 and 2009, respectively). Two eggs were first discovered in tree #17 on 30 April and an additional egg was subsequently discovered on 4 May. This was the first year the pair nested in this tree after a two-year stint in tree #23. On 19 May, 3 nestlings were banded at 11 days age. All 3 nestlings successfully fledged and were identified as 2 males and 1 female. Only 1 of the males was detected during winter surveys and was still present in C-5.

Cluster 6 – This was only the second year that birds in this cluster attempted breeding and followed the first successful campaign from 2011. This site had been occupied in most years by at least one bird since 2008 and sometimes by 2 or 3 birds just prior to the breeding season but breeding was never detected. The breeding male (AL/DG, DB/RE/DB) remained the same from last year. This bird was hatched in C-3 in 2008 and has occupied C-6 since 2009. As in 2011, two females shared in breeding duties so it is difficult to ascertain which one was the genetic parent of the young birds. One female (AL//DB, WH/RE/WH) was hatched in C-7 and first detected roosting in C-6 in the winter of 2010. The other female (DB/RE/DB, AL/WH) was hatched in C-3 in 2004 and roosted there for all years after until moving to C-6 when it was first detected roosting there in the spring of 2011. Breeding at this site was first determined on 30 April when 3 eggs were discovered in tree #116. Three nestlings were banded as 8 day old chicks on 19 May. All 3 nestlings successfully fledged and were identified as 2 males and 1 female on 5 June. One male and 1 female were detected in C-6 in winter and the last fledgling was not discovered.

Cluster 7 – A new breeding male (OR/OR/OR, AL/DG) assumed reproductive duties in 2012. The 2011 breeding male (AL/YE, YE/YE/WH) disappeared during the nesting period and subsequently a 1 egg nest failed. The disappearance of the 2011 male also marked the penultimate translocated bird to be lost from the population. He was the first and only breeding male in this cluster from 2005-2011. The new 2012 breeding male hatched from C-10 in 2009 and moved into this cluster in the late summer of 2011. The breeding female (DB/RE/DB, YE/AL) remained the same for the third consecutive year. This female was hatched at C-3 in 2006 but was first detected using C-7 in 2007. A new tree was chosen for nesting (Tree # 108) after the failed nesting tree in 2011 snapped above cavity and died. Three eggs were detected on 8 May and 3 nestlings were banded as 11 day old chicks on 25 May. All 3 nestlings successfully fledged and were identified as 2 females and 1 male. Only the male was detected during the winter and was observed still occupying C-7.

Cluster 8 – The breeding pair remained the same for the fifth consecutive year. The breeding male (LB/WH/LB, AL/DB) was originally banded in C-5 in 2004 and the breeding female (LB/WH/LB, OR/AL) was originally banded at C-5 in 2007. The pair nested in a new tree that had recently been excavated after a 2 year stint in tree #179. Four eggs were initially detected on 24 April when a bird was flushed from the nest. However, a second visit on 8 May discovered 7 eggs with a bird incubating. On 19 May 4 eggs hatched while 3 remained unhatched. One of the nestlings was observed to be much larger than the other 3 hatchlings. Only 3 of these 4 nestlings had survived when they were banded on 25 May. Three birds successfully fledged and were identified as 2 females and 1 male on 23 June. The two female birds were observed again in C-8 during winter but the male fledgling was not detected during the winter survey.

Cluster 10 – This was the second consecutive year for the breeding male and the fourth consecutive year for the breeding female (DG/YE/DG, OR/AL) at this cluster. The pair nested for the second consecutive year in tree #157. Four eggs were discovered in the nest on 24 April. Only 3 of these eggs hatched on 30 May when the young were found to be 0-1 day old. Three nestlings were banded as 8 day old chicks on 8 May. A female helper (AL/LG, YE/DB/YE) and a male helper (OR/OR/OR, AL/YE) were observed helping with the feeding of nestlings. All three birds successfully fledged and were identified as 2 males and 1 female. All three fledglings were discovered during the winter survey with the two males remaining at C-10 and the female being detected at both C-10 and nearby C-7.

Cluster 13 – This was third consecutive year breeding has been successful in this cluster. The breeding pair remained the same since 2010 with male (WH/RE/WH, AL/DB) being a C-7 hatched bird from 2007 that began using C-13 in 2008. The breeding female (WH/WH/WH, RE/AL) was hatched at C-10 in 2008 and was first observed roosting at C-13 in the winter of 2009. The pair nested in tree #119 for the second consecutive year. Two eggs were first discovered on 24 April. However, by 30 April the nest was empty from an apparent failure. The pair recycled in the same tree with 3 new eggs being detected on 8 May. The female was found to be brooding 2 chicks on 19 May and both were banded on 25 May as 8 day old nestlings. Both of the banded birds successfully fledged and were identified as 2 females on 20 June. Both fledglings were observed again in C-13 during the winter survey.

Cluster 15 – This was the second year that a pair successfully bred in this cluster and likewise only the second year birds in this cluster acted independent of nearby C-8. This cluster was a recent budding of birds from C-8. Budding is typically defined as the splitting of two clans into separate breeding clusters where no additional space is used. Birds have occupied C-15 since 2008 but have previously not been more than an extension of C-8. However, a new breeding pair occupied C-15 with the old pair from 2011 moving to C-19. This cluster had a complete turnover in individuals all 2012 occupants being newly arrived birds. The breeding male (YE/DB/YE, AL/YE) was hatched in C-8 in 2007. This male roosted in C-15 in 2008 but hasn't been detected there again until 2012. The breeding female

(WH/LB/WH, PU/AL) was hatched in C-5 in 2011. Three eggs were first detected on 8 May. A follow up visit on 14 May revealed one 3 day old chick and two unhatched eggs in the nest. Only 1 nestling was banded on 22 May and estimated to be 8 days old. The unhatched eggs were missing on this visit. The banded chick successfully fledged and was identified as a female. This bird was observed again in C-15 during the winter survey.

**Cluster 19** – This was the first year birds attempted breeding in this cluster and were successful with 2 fledged young. Cluster 19 was created as a new recruitment cluster with the aid of artificial nest cavities in the late summer of 2011. By that winter, C-19 was occupied by 2 birds fledged that summer from the nearby C-15. However, by the spring of 2012, 6 birds had moved into C-19. This includes the C-15 breeding pair of 2011 and a collection of other Piney Grove birds. Competition for cavities in this cluster appeared high during spring with repeated observations of antagonistic attempts of birds trying to remove other roosted birds from their cavities. The breeding male (YE/DB/YE, AL, PU) originated from C-8 as a 2008 cohort. This bird bred at C-15 in 2011. The breeding female was unbanded, so its origin is uncertain. However, it is believed to be a 2010 hatch year bird from C-3 that bred in C15 in 2011 and moved with its mated male to C-19 this year. Two eggs were observed on 8 May but these eggs had vanished on 14 May. The pair re-nested and 2 hatched young, estimated to be 0-1 day old, were discovered 5 June. A helper (AL/YE, DB/DB) was observed brooding the nestlings on this day. Two birds were banded as 9-10 day old chicks on 15 June and subsequently fledged while being identified as 2 females. Only 1 of these 2 fledglings was found in C-19 during the winter survey.

## Translocations

No translocations of birds into Piney Grove have been conducted since 2005. The last 2 remaining translocated birds disappeared from Piney Grove in 2011.

**Table 2.** Foraging group clusters for Red-cockaded Woodpeckers detected within Piney Grove Preserve during the 2012 winter survey. Clans at C-3, C-7, and C-8 are joined by one or more birds roosting from C4, C-9, and C-15, respectively.

Roost Cluster	Left Leg	Right Leg	Sex
1	DG/YE/DG	WH/AL	M
1	DG/AL	YE/YE/DG	M
1	AL/YE	YE/LG/YE	F
1	AL/OR	YE/LG/YE	M
1	LG/YE/LG	AL/WH	M
1	AL/YE	LG/YE/LG	F
1	AL/WH	LG/YE/LG	F

<b>Roost Cluster</b>	<b>Left Leg</b>	<b>Right Leg</b>	<b>Sex</b>
<b>3</b>	RE/DB	WH/AL	M
<b>3</b>	LB/WH/LB	RE/AL	F
<b>3</b>	DB/RE/DB	DB/AL	M
<b>3</b>	AL/RE	YE/DB/YE	M
<b>3</b>	AL/OR	DB/RE/DB	F
<b>5</b>	LB/WH/LB	AL/RE	M
<b>5</b>	LB/WH/LB	AL/DG	M
<b>5</b>	AL/DB	YE/DG/YE	F
<b>5</b>	AL/RE	LB/WH/LB	M
<b>5</b>	OR/OR/OR	AL/LG	F
<b>5</b>	AL/LG	WH/LB/WH	M
<b>6</b>	DB/RE/DB	AL/WH	F
<b>6</b>	AL/DB	WH/RE/WH	F
<b>6</b>	AL/DG	DB/RE/DB	M
<b>6</b>	PU/YE/PU	AL/YE	F
<b>6</b>	PU/YE/PU	AL/MB	M
<b>7/9</b>	DB/RE/DB	YE/AL	F
<b>7</b>	AL/WH	DB/RE/DB	M
<b>7</b>	LG/YE/LG	AL/DB	F
<b>7</b>	WH/PU/WH	AL/LG	M
<b>8</b>	LB/WH/LB	AL/DB	M
<b>8</b>	YE/DB/YE	AL/LB	F
<b>8</b>	YE/DB/YE	YE/AL	M
<b>8</b>	YE/DB/YE	RE/AL	F
<b>8</b>	YE/MB/YE	AL/LG	F
<b>8</b>	AL/PU	YE/MB/YE	F
<b>10</b>	WH/RE/WH	AL/WH	M
<b>10</b>	DG/YE/DG	OR/AL	F
<b>10</b>	AL/LG	YE/DB/YE	F
<b>10</b>	OR/OR/OR	AL/DB	M
<b>10</b>	Unbanded		F
<b>10</b>	AL/WH	OR/OR/OR	M
<b>10</b>	AL/MB	OR/OR/OR	M

<b>Roost Cluster</b>	<b>Left Leg</b>	<b>Right Leg</b>	<b>Sex</b>
<b>13</b>	WH/WH/WH	RE/AL	F
<b>13</b>	YE/OR/YE	AL/WH	M
<b>13</b>	YE/OR/YE	AL/YE	F
<b>13</b>	YE/OR/YE	AL/LG	F
<b>15</b>	WH/LB/WH	PU/AL	F
<b>15</b>	OR/MB/OR	AL/OR	F
<b>19</b>	YE/DB/YE	AL/PU	M
<b>19</b>	AL/RE	YE/DG/YE	F
<b>19</b>	AL/YE	DB/RE/DB	F
<b>19</b>	AL/LB	YE/DB/YE	M
<b>19</b>	OR/DB/OR	AL/LG	M
<b>19</b>	LG/DB/LG	AL/LG	F
<b>19</b>	Unbanded		F
<b>10&amp;7</b>	AL/YE	OR/OR/OR	F
<b>8&amp;15</b>	YE/DB/YE	AL/YE	M

### **Cavity Tree Status**

By the end of June 2012, Piney Grove contained 177 cavities in 161 live trees including 50 start cavities, 61 completed natural cavities, and 66 artificial inserts. A total of fifteen new cavities or new cavity starts were added to the number of known cavities. Five trees were found containing two newly completed natural cavities and six cavity starts. Four starts were discovered in previously tagged cavity trees. Three artificial insert cavities were installed to create a new cluster area, cluster 19. Three trees died by July 2012 resulting in a loss of three cavities or starts.

Sixty five (51 percent) of the 127 available natural cavities or inserts had fresh or recent chipping and sap flow from resin wells in spring 2012. Of the 66 inserts in live trees, 29 (44%) had fresh or recent resin work. Of the 61 natural cavities, 36 (59%) had fresh or recent resin work.

**Table 3.** Red-cockaded Woodpecker nestlings recorded during banding and fledgling at the Piney Grove Preserve in 2012.

Cluster	USGS	Left Leg	Right Leg	Sex	Band Date	Band Age
1	821-70963	AL/YE	LG/YE/LG	F	12/6/2012	as hatch year
1	821-70964	AL/WH	LG/YE/LG	F	12/6/2012	as hatch year
1	not banded	-		F	-	-
3	not banded	-		M	-	-
3	not banded	-		M	-	-
3	not banded	-		F	-	-
5	821-70948	AL/OR	WH/LB/WH	M	5/25/2012	11
5	821-70949	AL/LG	WH/LB/WH	M	5/25/2012	11
5	821-70950	AL/YE	WH/LB/WH	F	5/25/2012	11
6	821-70945	PU/YE/PU	AL/YE	F	5/19/2012	8
6	821-70946	PU/YE/PU	AL/LB	M	5/19/2012	8
6	821-70947	PU/YE/PU	AL/MB	M	5/19/2012	8
7	821-70954	WH/PU/WH	AL/YE	F	5/15/2012	11
7	821-70955	WH/PU/WH	AL/LG	M	5/15/2012	11
7	821-70956	WH/PU/WH	AL/MB	F	5/15/2012	11
8	821-70957	YE/MB/YE	AL/LG	F	5/25/2012	8
8	821-70958	AL/WH	YE/MB/YE	M	5/25/2012	11
8	821-70959	AL/PU	YE/MB/YE	F	5/25/2012	10
10	821-70942	AL/WH	OR/OR/OR	M	5/8/2012	8
10	821-70943	AL/MB	OR/OR/OR	M	5/8/2012	8
10	821-70944	AL/YE	OR/OR/OR	F	5/8/2012	8
13	821-70952	YE/OR/YE	AL/YE	F	5/25/2012	8
13	821-70953	YE/OR/YE	AL/LG	F	5/25/2012	8
15	821-70951	OR/MB/OR	AL/OR	F	5/22/2012	8
19	821-70960	LG/DB/LG	AL/LG	F	6/22/2012	9
19	821-70961	LG/DB/LG	AL/YE	F	6/22/2012	9

### Cavity competitor inspection and removal

There were 21 instances of cavity competitors and 11 instances of nest material in RCW cavities during April, May and June 2012. Multiple cavity competitor species occurring simultaneously in a cavity were counted as separate instances. Multiple individuals of one species found together in a cavity were counted as one instance. Southern flying squirrels accounted for 10 of the 32 occurrences. A total of 26 flying squirrels were encountered on 10 instances from eight of the 127 available cavities. Several of the flying squirrels encountered were likely to be individuals that had escaped during previous removal attempts. For example, there were three instances totaling 13 squirrels encountered in tree 156 in cluster area 10. One of seven flying squirrels escaped on the first encounter, all three

flying squirrels (one of which may have been the individual that escaped the first instance) escaped on the second encounter and one of three (likely the same three from the second encounter) escaped on the third encounter. Because the squirrels that are captured are removed from the population, there were at least nine individuals (8 removed and one escaped).

Other cavity competitors encountered included birds, snakes, and bats. Eight bird nests, with eggs or nestlings (not including RCW nests) were found in cavities. The birds identified at 6 of the 8 nests were the tufted titmouse (*Baeolophus bicolor*), and the white-breasted nuthatch (*Sitta carolinensis*) with 3 for each species. These same species are suspected for the two bird nests that were unidentified. Black rat snakes (*Elaphe obseleta*) were found on two instances in insert cavities. One cavity, an inactive cavity with an enlarged entrance and a restrictor plate, contained three or more unidentified bats.

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**Appendix 1: Status of Red-cockaded Woodpecker cavity trees at the Piney Grove Preserve through June 30, 2012.**

CLUSTER	Tree	Cavity	Species	Condition	Cavity	2012 Status	2012 Condition	2012 Entrance	2012 Plate	2012 Resin Work
1	31		Lob	Dead	Nat	U	Complete	U	U	U
1	32		Lob	Live	Nat	Active	Complete (New)	Normal	>15 cm	Fresh
1	34		Lob	Live	Nat	Active	Complete	Normal	15-30 cm	Fresh
1	35		Lob	Live	Nat	Active	Start (Ad)	Normal	Unst	Recent
1	36		Lob	Live	Art	Relic	Insert	Normal	>15 cm	Old/None
1	37		Lob	Live	Nat	Inactive	Start (Ad)	Normal	Unst	Old/None
1	38		SL	Dead	Nat	U	Complete	U	U	U
1	39	a	Lob	Live	Nat	Active	Start	Normal	Unst	Fresh
1	39	b	Lob	Live	Nat	Inactive	Complete	<2X	> 45 cm	Old/None
1	40		Lob	Dead	Nat	U	Complete	U	U	U
1	41		Lob	Dead	Nat	U	Complete	U	U	U
1	42		Lob	Live	Nat	Relic	Start	Healing	U	U
1	43		Lob	Live	Nat	Relic	Complete	>2X	Unst	Old/None
1	44	a	Lob	Live	Nat	Relic	Complete	Normal	Unst	Old/None
1	44	b	Lob	Live	Nat	Relic	Complete	>4X	15-30 cm	Old/None
1	45	a	Lob	Dead	Nat	U	Complete	U	U	U
1	45	b	Lob	Dead	Nat	U	Complete	U	U	U
1	46		Lob	Live	Nat	Relic	Complete	>2X	Unst	Old/None
1	47		Lob	Dead	Nat	Relic	Start (Ad)	Restrictor	Unst	Old/None
1	48		Lob	Live	Nat	Active	Complete	Normal	> 45 cm	Recent
1	49		Lob	Live	Nat	Relic	Complete	>4X	15-30 cm	Old/None
1	50		SL	Dead	Art	U	Insert	U	U	U
1	51		Lob	Dead	Art	U	Insert	U	U	U
1	52		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
1	53		Lob	Live	Nat	Active	Complete	Normal	30-45 cm	Fresh
1	54		Lob	Live	Nat	Active	Complete	Normal	15-30 cm	Fresh
1	55		Lob	Live	Nat	Active	Complete	<2X	Unst	Fresh
1	57		Lob	Live	Nat	Active	Complete	Normal	30-45 cm	Fresh
1	58	a	Lob	Live	Nat	Active	Start	Normal	Unst	Fresh
1	58	b	Lob	Live	Nat	Inactive	Complete	<2X	15-30 cm	Old/None
1	59	a	Lob	Live	Nat	Active	Start	Normal	Unst	Fresh

1	59	b	Lob	Live	Nat	Inactive	Start	Normal	Unst	Old/None
1	102		Lob	Dead	Nat	U	Complete	U	U	U
1	117	a	Lob	Live	Nat	Active	Start (Ad)	Normal	Unst	Fresh
1	117	b	Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
1	164		Lob	Dead	Nat	U	Complete	U	U	U
1	NT		SL	Live	Nat	Active	Complete (New)	Normal	Unst	Fresh
2	60		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
2	61		Lob	Dead	Art	U	Insert	U	U	U
2	62		Lob	Dead	Art	U	Insert	U	U	U
2	63		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
3	1		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
3	2		Lob	Live	Art	Relic	Insert	Restrictor	>15 cm	Old/None
3	3	a	Lob	Dead	Nat	Relic	Complete	Restrictor	> 45 cm	Old/None
3	3	b	Lob	Dead	Nat	Inactive	Start	Normal	Unst	Old/None
3	4	a	Lob	Live	Nat	U	Complete	U	U	U
3	4	b	Lob	Live	Nat	Inactive	Complete	Restrictor	30-45 cm	Old/None
3	5		Lob	Live	Nat	Relic	Start	Normal	Unst	Old/None
3	6		Lob	Live	Nat	Active	Complete	Normal	Unst	Recent
3	7	a	Lob	Live	Nat	Active	Start	Normal	Unst	Recent
3	7	b	Lob	Live	Nat	Active	Start (Ad)	Normal	Unst	Recent
3	8		Lob	Live	Nat	Active	Complete	Normal	> 45 cm	Fresh
3	9	a	Lob	Live	Nat	Inactive	Start	Normal	Unst	Old/None
3	9	b	Lob	Live	Nat	Active	Complete	Normal	30-45 cm	Fresh
3	9	c	Lob	Live	Nat	Relic	Start	Normal	Unst	Old/None
3	71		Lob	Dead	Nat	U	Complete	U	U	U
3	72		Lob	Live	Nat	Relic	Complete	>4X	>15 cm	Old/None
3	74		Lob	Dead	Nat	U	Complete	U	U	U
3	75		Lob	Live	Nat	Relic	Complete	>2X	Unst	Old/None
3	76		Lob	Live	Art	Relic	Insert	Normal	>15 cm	Old/None
3	77		Lob	Dead	Nat	U	Complete	U	U	U
3	79	a	Lob	Live	Nat	Relic	Complete	>2X	30-45 cm	Old/None
3	79	b	Lob	Live	Nat	Active	Start (Ad)	Normal	Unst	Recent
3	79	c	Lob	Live	Nat	Active	Start (Ad)	Restrictor	Unst	Recent
3	80		Lob	Live	Nat	Active	Start (Ad)	Normal	Unst	Fresh
3	177		Lob	Live	Art	Relic	Insert	Normal	>15 cm	Old/None
3	178		Lob	Live	Nat	Active	Complete (New)	Normal	Unst	Fresh
3	179		Lob	Live	Nat	Active	Complete	Normal	15-30 cm	Fresh

3	18 0		Lob	Live	Nat	Active	Complete	<2X	>15 cm	Fresh
3	NT		Lob	Live	Nat	Active	Start	Normal	Unst	Fresh
4	81		Lob	Dead	Art	U	Insert	U	U	U
4	82		Lob	Live	Art	Active	Insert	Normal	>15 cm	Fresh
4	83		Lob	Dead	Art	U	Insert	U	U	U
4	84		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
4	18 6		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
5	14		Lob	Live	Nat	Active	Complete	<2X	Unst	Fresh
5	15		Lob	Live	Nat	Active	Complete	Normal	>15 cm	Fresh
5	16		Lob	Live	Nat	Active	Complete (New)	Normal	>15 cm	Fresh
5	17		Lob	Live	Nat	Active	Complete (New)	Normal	Unst	Fresh
5	18	a	Lob	Live	Nat	Active	Start	Normal	Unst	Fresh
5	18	b	Lob	Live	Nat	Active	Start	Normal	Unst	Fresh
5	19	a	Lob	Live	Nat	Active	Start	Normal	Unst	Recent
5	19	b	Lob	Live	Nat	Active	Complete	Normal	15-30 cm	Fresh
5	19	c	Lob	Live	Nat	Active	Start	Normal	Unst	Recent
5	20		Lob	Dead	Nat	U	Complete	U	U	U
5	21		Lob	Dead	Nat	U	Complete	U	U	U
5	22		Lob	Live	Nat	Relic	Complete	Restrictor	> 45 cm	Old/None
5	23	a	Lob	Dead	Nat	U	Complete	U	U	U
5	23	b	Lob	Dead	Nat	U	Complete	U	U	U
5	24		Lob	Live	Nat	Active	Complete	Restrictor	> 45 cm	Fresh
5	25		Lob	Live	Nat	Active	Complete	<2X	> 45 cm	Recent
5	26		Lob	Live	Nat	Active	Complete	Restrictor	> 45 cm	Recent
5	27		Lob	Live	Nat	Inactive	Complete	Restrictor	30-45 cm	Old/None
5	28		Lob	Live	Nat	Relic	Complete	Restrictor	>15 cm	Old/None
5	29		Lob	Dead	Nat	U	Complete	U	U	U
5	30		Lob	Live	Nat	Active	Start (Ad)	Normal	Unst	Recent
5	92		Lob	Live	Nat	Relic	Start	Healing	U	U
5	93		Lob	Dead	Nat	U	Complete	U	U	U
5	94		Lob	Live	Nat	Relic	Complete	Restrictor	Unst	Old/None
5	95		Lob	Live	Nat	Relic	Complete	Restrictor	15-30 cm	Old/None
5	96		Lob	Dead	Nat	U	Complete	U	U	U
5	97		Lob	Dead	Nat	U	Complete	U	U	U
5	98		Lob	Dead	Nat	U	Complete	U	U	U
5	99		Lob	Dead	Nat	U	Complete	U	U	U
5	12 7		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
5	13 8		Lob	Dead	Art	U	Insert	U	U	U

5	19 1		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
5	NT 1		Lob	Live	Nat	Active	Complete (New)	Normal	Unst	Fresh
5	NT 3		Lob	Live	Nat	Active	Complete (New)	Normal	Unst	Fresh
6	10		Lob	Live	Art	Inactive	Insert	Normal	>15 cm	Old/None
6	11		Lob	Dead	Art	U	Insert	U	U	U
6	12		Lob	Dead	Art	U	Insert	U	U	U
6	13		Lob	Dead	Art	U	Insert	U	U	U
6	33	a	Lob	Live	Nat	Active	Start (Ad)	Normal	Unst	Fresh
6	33	b	Lob	Live	Nat	Active	Start	Normal	Unst	Fresh
6	11 6		Lob	Live	Art	Active	Insert	Normal	>15 cm	Fresh
6	13 5	a	Lob	Live	Nat	Active	Complete	<2X	Unst	Fresh
6	13 5	b	Lob	Live	Nat	Active	Start	Normal	Unst	Fresh
6	13 5	c	Lob	Live	Art	Active	Insert	Normal	Unst	Fresh
6	13 6	a	Lob	Live	Nat	Inactive	Start	Healing	U	U
6	13 6	b	Lob	Live	Nat	Active	Start (Ad)	Normal	Unst	Recent
6	13 7		Lob	Live	Art	Active	Insert	Normal	Unst	Fresh
6	13 9		Lob	Live	Art	Active	Insert	Normal	>15 cm	Fresh
7	10 5		Lob	Live	Art	Active	Insert	Normal	15-30 cm	Fresh
7	10 6	a	Lob	Live	Nat	Inactive	Complete	>4X	30-45 cm	Old/None
7	10 6	b	Lob	Live	Nat	Inactive	Start	Normal	Unst	Old/None
7	10 7		Lob	Live	Nat	Active	Complete	Restrictor	30-45 cm	Fresh
7	10 8		Lob	Live	Nat	Active	Complete	Normal	30-45 cm	Fresh
7	10 9	a	Lob	Live	Nat	Active	Start	Normal	Unst	Fresh
7	10 9	b	Lob	Live	Nat	Active	Start (Ad)	Normal	Unst	Fresh
7	11 0		Lob	Live	Art	Active	Insert	Normal	>15 cm	Recent
7	11 1		Lob	Live	Art	Inactive	Insert	Normal	>15 cm	Old/None
7	11 2		Lob	Dead	Art	U	Insert	U	U	U
7	11 3		Lob	Dead	Art	U	Insert	U	U	U
7	11 4		Lob	Dead	Art	U	Insert	U	U	U
7	11		Lob	Live	Nat	Inactive	Complete	>2X	30-45	Old/None

	5								cm	
7	19 0		Lob	Dead	Nat	U	Start	U	U	U
7	19 2	a	Lob	Dead	Nat	U	Start	U	U	U
7	19 2	b	Lob	Dead	Nat	U	Complete	U	U	U
7	19 4	a	Lob	Dead	Nat	Inactive	Sub-start	Normal	U	U
7	19 4	b	Lob	Dead	Nat	Inactive	Complete	Normal	U	U
7	19 5		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
7	NT		Lob	Live	Nat	Active	Start (Ad)	Normal	Unst	Fresh
8	12 9		Lob	Live	Nat	Active	Complete	Normal	>15 cm	Fresh
8	15 5		Lob	Live	Nat	Active	Complete	Normal	>15 cm	Fresh
8	17 0		Lob	Live	Art	Inactive	Insert	Normal	15-30 cm	Old/None
8	17 1		Lob	Live	Art	Active	Insert	Normal	Unst	Recent
8	17 2		Lob	Live	Art	Active	Insert	Normal	>15 cm	Fresh
8	17 3		Lob	Live	Art	Active	Insert	Normal	>15 cm	Fresh
8	17 4	a	Lob	Live	Nat	Inactive	Complete	Restrictor	Unst	Old/None
8	17 4	b	Lob	Live	Nat	Inactive	Start	<2X	Unst	Old/None
8	17 4	c	Lob	Live	Nat	Inactive	Complete	<2X	Unst	Old/None
8	17 5		Lob	Live	Nat	Active	Complete	Normal	>15 cm	Fresh
8	17 6	a	Lob	Live	Nat	Inactive	Start (Ad)	>2X	Unst	Old/None
8	17 6	b	Lob	Live	Nat	Relic	Complete	>4X	Unst	Old/None
8	17 6	c	Lob	Live	Nat	Relic	Start	<2X	Unst	Old/None
8	17 6	d	Lob	Live	Nat	Relic	Complete	>2X	Unst	Old/None
8	17 6	e	Lob	Live	Nat	Relic	Start	Normal	Unst	Old/None
8	17 6	f	Lob	Live	Nat	Relic	Start	Normal	Unst	Old/None
8	NT 1		Lob	Live	Nat	Active	Complete	Normal	>15 cm	Fresh
8	NT 2		Lob	Live	Nat	Active	Start	Normal	Unst	Recent
8	NT 3		Lob	Live	Nat	Active	Start	Normal	Unst	Recent
8	NT 4		Lob	Live	Nat	Active	Complete (New)	Normal	Unst	Fresh

9	85		Lob	Live	Art	Active	Insert	Normal	Unst	Fresh
9	86		Lob	Live	Art	Active	Insert	Normal	30-45 cm	Fresh
9	87		Lob	Live	Art	Active	Insert	Normal	Unst	Recent
9	88		Lob	Live	Art	Active	Insert	Normal	>15 cm	Fresh
10	64		Lob	Live	Art	Active	Insert	Normal	30-45 cm	Fresh
10	65		Lob	Live	Art	Active	Insert	Normal	30-45 cm	Fresh
10	66		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
10	67		Lob	Live	Nat	Relic	Complete	>4X	Unst	Old/None
10	68		Lob	Live	Nat	Active	Complete	<2X	Unst	Fresh
10	150		Lob	Live	Art	Active	Insert	Normal	>15 cm	Fresh
10	151		Lob	Dead	Art	U	Insert	U	U	U
10	152		Lob	Dead	Art	U	Insert	U	U	U
10	153		Lob	Dead	Art	U	Insert	U	U	U
10	154		Lob	Live	Nat	Active	Complete	Normal	15-30 cm	Fresh
10	156		Lob	Live	Nat	Active	Complete	<2X	15-30 cm	Recent
10	157		Unknown	Live	Nat	Active	Complete	Normal	15-30 cm	Fresh
10	NT1		Lob	Live	Nat	Active	Start	Normal	Unst	Fresh
10	NT2	a	Lob	Live	Nat	Active	Start	Normal	Unst	Fresh
10	NT2	b	Lob	Live	Nat	Active	Start	Normal	Unst	Fresh
10	NT3	a	Lob	Live	Nat	Active	Start	Normal	Unst	Fresh
10	NT3	b	Lob	Live	Nat	Active	Sub-start	Normal	Unst	Fresh
10	NT4	a	Lob	Live	Nat	Inactive	Start	Normal	Unst	Old/None
10	NT4	b	Lob	Live	Nat	Active	Sub-start	Normal	Unst	Fresh
11	140		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
11	141		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
11	142		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
11	143		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
12	130		Lob	Dead	Art	U	Insert	U	U	U
1	13		Lob	Live	Art	Active	Insert	Normal	Unst	Recent

2	1									
1	13		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
2	2		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
1	13		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
2	3		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
1	18		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
2	9		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
1	11		Lob	Dead	Art	Relic	Insert	Normal	U	U
3	8		Lob	Dead	Art	Relic	Insert	Normal	U	U
1	11		Lob	Live	Art	Active	Insert	Normal	>15 cm	Fresh
3	9		Lob	Live	Art	Active	Insert	Normal	>15 cm	Fresh
1	12		Lob	Live	Art	Active	Insert	Normal	>15 cm	Fresh
3	0		Lob	Live	Art	Active	Insert	Normal	>15 cm	Fresh
1	12		Lob	Live	Art	Active	Insert	Normal	Unst	Fresh
3	1		Lob	Live	Art	Active	Insert	Normal	Unst	Fresh
1	12		Lob	Live	Art	Active	Insert	Normal	Unst	Fresh
3	2		Lob	Live	Art	Active	Insert	Normal	Unst	Fresh
1	12		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
3	3		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
1	12		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
3	4		Lob	Live	Art	Relic	Insert	Normal	Unst	Old/None
1	12		Lob	Dead	Art	Relic	Insert	Normal	U	U
3	6		Lob	Dead	Art	Relic	Insert	Normal	U	U
1	14		Lob	Live	Nat	Active	Start (Ad)	Normal	Unst	Fresh
3	4		Lob	Live	Nat	Active	Start (Ad)	Normal	Unst	Fresh
1	14		Unkn own	Live	Nat	Active	Start (Ad)	Normal	Unst	Fresh
3	5		Unkn own	Live	Nat	Active	Start (Ad)	Normal	Unst	Fresh
1	88		Lob	Live	Nat	Inactive	Start (Ad)	Normal	Unst	Old/None
4			Lob	Live	Nat	Inactive	Start (Ad)	Normal	Unst	Old/None
1	89		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
4			Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
1	90		Lob	Dead	Art	Inactive	Insert	Normal	Unst	Old/None
4			Lob	Dead	Art	Inactive	Insert	Normal	Unst	Old/None
1	91		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
4			Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
1	10		Lob	Live	Nat	Inactive	Start (Ad)	<2X	Unst	Old/None
4	0		Lob	Live	Nat	Inactive	Start (Ad)	<2X	Unst	Old/None
1	10		Lob	Live	Nat	Inactive	Complete	>2X	Unst	Old/None
4	1		Lob	Live	Nat	Inactive	Complete	>2X	Unst	Old/None
1	16		Lob	Live	Art	Active	Insert	Normal	Unst	Recent
5	0		Lob	Live	Art	Active	Insert	Normal	Unst	Recent
1	16		Lob	Live	Art	Active	Insert	Normal	Unst	Fresh
5	1		Lob	Live	Art	Active	Insert	Normal	Unst	Fresh
1	16		Lob	Live	Art	Active	Insert	Normal	15-30 cm	Fresh
5	2		Lob	Live	Art	Active	Insert	Normal	15-30 cm	Fresh
1	16		Lob	Live	Art	Active	Insert	Normal	30-45 cm	Fresh
5	3		Lob	Live	Art	Active	Insert	Normal	30-45 cm	Fresh
1	16		Lob	Dead	Nat	U	Start	U	U	U
6	5		Lob	Dead	Nat	U	Start	U	U	U
1	16		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
6	6		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
1	16		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
6	7		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
1	14		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None

7	6									
1	14		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
7	7									
1	18		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
8	1									
1	18		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
8	2									
1	18		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
8	3									
1	18		Lob	Live	Art	Inactive	Insert	Normal	Unst	Old/None
8	4									
1	20		Lob	Live	Art	Active	Insert	Normal	Unst	Fresh
9	1									
1	20		Lob	Live	Art	Active	Insert	Normal	Unst	Fresh
9	2									
1	20		Lob	Live	Art	Active	Insert	Normal	Unst	Fresh
9	3									

**Abbreviations**

Lob = Loblolly

SL = Shortleaf

Art = Artificial

U = Unavailable

Unt = Not Started