

Final Environmental Assessment
for
Strategy and Guidelines for the Recovery and
Management of the
Red-cockaded Woodpecker and Its Habitats on National
Wildlife Refuges



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1.0 PURPOSE AND NEED

1.1 Introduction

The Red-cockaded Woodpecker (*Picoides borealis*) (RCW) was listed as endangered by the Fish and Wildlife Service (Service) in 1970, and received Federal protection under the Endangered Species Act of 1973, as amended (ESA). Prior to issuance of the RCW Recovery Plan in 1979 (U.S. Fish and Wildlife Service 1979), the Service had no formal guidance for RCW management on refuges. Management activities included efforts to protect cavity trees and periodic prescribed burns to control hardwood growth within clusters. Mechanical midstory hardwood control efforts were infrequent. In 1979, the Service adopted the Recovery Plan for managing RCWs on refuge lands. In 1985, the RCW Recovery Plan (U.S. Fish and Wildlife Service 1985) was revised and this plan was adopted as a guide for management on refuges.

In 1987, specific guidelines were issued for RCW management on refuge lands (Appendix A). These guidelines reiterated the 1985 RCW Recovery Plan recommendations for cluster site protection and maintenance, and for provision of adequate foraging habitat. In addition, these guidelines established populations goals for RCWs based on density objectives of one group per 200 acres of pine and pine-hardwood types.

The Service proposes to revise the management guidelines released in 1987 with an updated version of the guidelines (Appendix B) that will significantly accelerate the recovery of RCW populations on National Wildlife Refuges (Refuges) in the southeastern United States. The revised guidelines are based upon an enhanced understanding of RCW population ecology resulting from research and the response of RCW populations to innovative management techniques developed in the last 10 years. Implementation of these guidelines will aid in reaching RCW population objectives identified for each refuge. Unless otherwise cited the information and discussion in this document were derived from the Draft Strategy and Guidelines contained in Appendix B which is incorporated into this document by reference.

Refuges, administered through the National Wildlife Refuge System Improvement Act of 1997 (Refuge Act) are managed so as to "ensure that the biological integrity, diversity, and environmental health of the System are maintained." Through implementation of these guidelines the Refuge System plans to become a model of appropriate management of RCW populations for other federal agencies and private land owners and managers.

1.2 Need

RCW populations throughout the southern pine ecosystem have declined drastically since the early 1900's. These population declines are primarily due to habitat loss, the resulting isolation among groups and subpopulations, and changes in habitat quality. To be specific, forests were cleared for farms or harvested to provide lumber for a growing population. It has been estimated that the original 90 million acres of longleaf pine (*Pinus palustris*), a component of the southern

pine ecosystem, has been reduced to less than 4 million acres (Frost 1993). Cutting patterns across the landscape have isolated RCW populations throughout the ecosystem. Not only has there been habitat loss and isolation among populations, but fire control has reduced habitat quality by permitting encroachment of a hardwood midstory. In addition, the limited availability of suitable cavity trees has also precluded population increases. James (1995) estimated a 23% overall decline in the number of known RCW sites during the 1980s. Clearly, the downward trends in the population documented in earlier decades have continued and indicate the need for more intensive recovery efforts.

At the present time, refuge lands support 12 RCW populations, totaling an estimated 237-242 groups. Approximately 141,900 acres of pine and pine hardwood habitat, are currently being managed for RCW's. The proposed guidelines identify a potential increase on refuge land to 644-654 RCW groups (Table 1). The RCW Recovery Plan specifies that 15 viable populations throughout the species range are needed for recovery. Four Refuges (Carolina Sandhills, Okefenokee, Piedmont, and St. Marks) are part of four of the 15 populations needed for long-term viability. There is, therefore, substantial opportunity to improve the population status of the RCW on refuge lands. The proposed guidelines are designed to enhance coordination and promote a more comprehensive implementation of management actions which will accelerate recovery of the RCW.

1.3 Purpose

The Service proposes to implement revised management guidelines that will: (1) significantly accelerate the recovery of RCW populations on refuge lands in the southeastern United States; and, (2) lead to the restoration and enhancement of the southern pine ecosystem and the eventual delisting of the RCW. Since the 1987 RCW guidelines were written, unprecedented scientific and technological advances have been made that will curtail population declines and stabilize or increase RCW populations. These advances provide the basis for the management strategy described in the proposed Guidelines.

1.4 Decision to be Made

The Service must decide whether to implement new RCW management guidelines or if the Service should continue to manage under the 1987 management guidelines and objectives. In addition, the Service must determine if the proposed guidelines are in accordance with Sections 7, 9 and 10 of the ESA and the Refuge Act.

Table 1. Pine and Pine-hardwood Acreage, Number of Active Clusters, and Population Objectives for 13 National Wildlife Refuges.

Pine & Pine-Hardwood Acreage				Number of Active Clusters	
Refuge	Current	Planned	Current RCW Mgt.	Present	Goal
Alligator River*	65000	65000	4770	5-10	10-20
Big Branch Marsh	2500	2500	2500	2	10
Carolina Sandhills	38570	38570	38570	100	192
D'Arbonne	1250	1250	1250	5	5
Felsenthal	8200	8200	8200	20	34
Noxubee	22020	22020	22020	34	88
Okefenokee	29000	29000	27140	30	126
Pee Dee	2720	2720	2720	1	10
Piedmont	26238	19250	19250	32	96
Pocosin Lakes	N/A	N/A	N/A	1	1
Santee	1090	1090	980	0	0
St. Marks	15600	14300	14300	6	71
Upper Ouachita	200	200	200	1	1
TOTAL	212,388	204,100	141,900	237-242	644-654

* Estimates for Alligator River are based on preliminary surveys. Large portions of the refuge have not been surveyed and it is considered likely that significantly more RCWs are present. Additional surveys are planned or are underway. Figures presented here will be revised as data are gathered.

2.0 ALTERNATIVES

2.1 Introduction

Based on the biological requirements of the RCW, RCW recovery plan strategies and objectives, and legal mandates and objectives related to management of refuges, the Service considered four alternatives to address the need discussed in Section 1.0. The alternatives considered were as follows:

Alternative A: No Action-Continue to Manage with 1987 Guidelines. Continue to manage RCW populations and the associated habitat based on Management Guidelines for Red-cockaded Woodpeckers on refuge land (1987). See Appendix A.

Alternative B: Implement Revised Management Guidelines: The Proposed Action. Initiate management of RCW populations and their habitat based on the Strategy and Guidelines for the Recovery and Management of the Red-cockaded Woodpecker and Its Habitats on National Wildlife Refuges (1997). See Appendix B.

Alternative C. Increase Lands Managed for RCWs to Include Pine Hardwood Sites and Additional Refuge Lands. Additional lands at Alligator River, Santee and Piedmont NWRs would be devoted to RCW management. Revised Guidelines would be implemented.

Alternative D. Decrease the Acreage of Lands Managed for RCWs From That Proposed in the Draft Guidelines. Managed acreage and population goals would be reduced by half and resources would be directed to other projects. Revised Guidelines would be implemented.

Public comment on the proposed action will be solicited during public comment period and responses will be evaluated to determine if new or modified alternatives should be evaluated.

2.2 Alternative A. No Action-Continue to Manage with 1987 Guidelines

Under Alternative A, the Service would manage RCW populations on refuge land based on the 1987 guidelines (Appendix A). Population goals on refuges would continue to be based on 1 group/200 acres of pine habitat. Individual refuges with RCW populations would continue to provide foraging habitat and cluster protection for each group based on the RCW Recovery Plan and Guidelines for Preparation of Biological Assessments and Evaluations for the Red-cockaded Woodpecker, also known as the Blue Book (Henry 1989). Determining the specific silvicultural treatment of pine habitats would generally be left with each refuge. There would be no specific guidelines on the direction of even-aged or uneven-aged pine management with respect to pine types. Regulation of pine regeneration would be based on the Area Control Method. Use of uneven-aged management would not be discouraged but would require each station to provide specific language indicating silvicultural regulation to insure pine stands are reaching old-growth ages and sufficient foraging habitat is being perpetuated through time. In addition, pine rotation

age would be approximately 20 years shorter than that minimally designated in the Proposed Action. Guidance incorporating technical advances for RCW management (e.g., restrictors, artificial cavities, predator exclusion devices, etc.) would not be provided in a set of comprehensive guidelines. Site specific management for the RCW on each refuge would be based on each refuge's forest management plan.

This alternative would result in the least amount of change from the way in which RCW populations on refuges are managed now.

2.3 Alternative B. Implement Revised Management Guidelines: The Proposed Action

The proposed action would result in the implementation of the Draft Guidelines (Appendix B). This implementation would represent a significant update and refinement of the 1987 guidelines. Included are a number of new policies established for various management activities and revisions to several existing policies. The differences between the 1987 Guidelines and the Proposed Guidelines are summarized in Table 2. In implementing the Proposed Guidelines for this particular species the Service remains committed to ecosystem management. The Service will continue to consider the integrity and stability of all plant and animal species as it seeks to recover the RCW on refuge land.

The proposed Guidelines are based on a three phase approach. The first phase will be aimed at stabilizing RCW populations with intensive management. Specific actions would include: correcting hardwood midstory problems in active clusters and recruitment stands; providing a sufficient number of suitable cavities in active clusters through use of restrictors, artificial cavities or both, and reducing demographic isolation between subpopulations through translocation of birds and establishment of artificial clusters. In the long run, the proposed management strategy includes provisions for the use of prescribed fire, particularly in longleaf pine stands during the growing season, lengthening pine rotation ages, and applying non-traditional pine silvicultural techniques. Such a long-term strategy is expected to lead to the recovery of RCW populations while also restoring and enhancing the southern pine ecosystem. Recent studies have shown that such ecosystem restoration will not only benefit RCWs, but high priority neotropical migrant birds, temperate migrants, and resident birds (Hunter et al. 1996).

Concurrent with phase 1, individual refuges will identify specific refuge lands to be managed according to the proposed Guidelines. The area identified will total at least the amount identified in Table 1. The last phase will consist of the actual implementation of management activities as prescribed in the Guidelines, including the use of fire and silvicultural techniques.

The proposed action will be applied to RCW populations on 12 refuges in the southeast with the goal of increasing the number of groups from the current 237-242 to a goal of 644-654. Refuge specific goals for the number of acres of RCW habitat, the number of active clusters, and population goals for each refuge are summarized in Table 1.

Table 2. Highlights of the 1987 and 1997 Guidelines for Management of Red-cockaded Woodpeckers on National Wildlife Refuges.

Management Activity	1987 RCW Guidelines (Alternative A. No Action)	1997 RCW Guidelines (Alternative B. Proposed Action)
Population Objectives and Subpopulation Delineation		
Density Factor	1 Group per 200 acres	1 Group per 200-250 acres
Managed RCW Habitat (Acres)	143,100	143,100
Population Objectives (Total Active Clusters)	683	657-667
Population Delineation	Parcels of land within 18 miles are considered habitat for a single population.	Clusters within 18 miles in non-fragmented foraging habitat or not separated by >than 5 mi. of non-foraging habitat.
Subpopulation Delineation	No information	Criteria for delineating active and inactive clusters into subpopulations
Management Intensity Levels	All populations managed the same regardless of population size	Three management intensity levels based upon population size
Cluster Protection	No specific information.	Prohibits tree removal within clusters unless it protects/improves RCW habitat. Pine thinning in clusters when BA exceeds 90 sq. ft Cavity trees felled when beetle infested. Replace felled trees with artificial cavities.
Silviculture-Related Operations	No information	Policies for log landings, road-building, and road use.
Prescribed Burning	Protect cavity trees by burning in low ambient temperatures, construction of a fire lane around cluster, burn separate from adjoining stand. Rake fuels from base of cavity trees.	Expanded protective measures re: backfiring, wetting fuels, and location of plowlines. Prescribed burning may be applied during the nesting season.
Silvicultural Operations During Breeding Season	No silvicultural operations during the breeding season (4/1 to 7/1)	No silvicultural operations during the breeding season (3/1 to 7/1)

Rights-of-Way	No information	No new rights-of-way should be constructed thru a cluster; maintenance should occur after the breeding season.
Pine Beetle Suppression/Control	Maintain tree spacing at 20-25 ft. to minimize infestation.	No change in tree spacing policy. Reduce infestation risk by thinning when BA >90 sq. ft. Maintain 90 sq. ft. BA. Replace infested cavity trees if needed by installing artificial cavities.
Nesting Habitat Management		
Monumentation	Delineate cluster with a 200 ft boundary around cavity trees.	Same policy regarding 200 ft. boundary. Detailed monumentation procedures provided.
Midstory Control	Hardwood stocking should be less than 20 sq. ft. BA/ acre. All hardwood stems one inch or larger within 50 feet of cavity trees will be removed.	Silvicultural practices conducted outside of the breeding season. Detailed silvicultural procedures and policies. Hardwood stocking and stem removal procedures expanded. Prescribed burns during growing season to control hardwoods.
Cavity Restrictors	No information	Restrictors should be used in all clusters when cavities are limited and applied to artificial cavities. Detailed information on the procedures for using restrictors.
Snag Retention	No information	Due to importance of cavities to other wildlife species, retention of dead hardwood and pine trees within clusters is necessary.
Inactive Clusters	No information	Manage inactive clusters as though they were active by evaluating the suitability of cavities and habitat for potential improvement.
Abandoned Clusters	No information, other than the definition.	Evaluate clusters to determine their potential as recruitment or replacement stands.

Predator/Competitor Control	No information	Procedures for controlling rat snakes and flying squirrels provided. Controls need to be applied on a cluster-by-cluster basis.
Population Management		
Delineation of Recruitment/Replacement Stands	No information	Recruitment stands, at least 10 acres, will be located within 1/4 to 3/4 mile from an existing cluster or recruitment stand. Based on their potential for nesting habitat, establish replacement stands for all active clusters, located no more than 1/4 mile from a cluster.
Artificial Cavities and Starts	No information	Artificial cavities should be used along with restrictors. Detailed procedures for creating artificial cavities through drilling or inserts is provided.
Translocation	Recommends action, but techniques not developed	Procedures for translocating juvenile birds to an established territory of a bird of the opposite sex are provided. Translocation efforts focused on refuges with less than 30 active clusters.
Banding and Marking	No information	Specific procedures are described.
Population Monitoring	All clusters surveyed annually.	Clusters surveyed based on management intensity levels.
Foraging Habitat Management	The amount of foraging habitat determined by acreage	The amount of foraging habitat determined by stand data instead of acreage. Foraging habitat criteria remain the same.
Prescribed Burning	Recommends a minimum of a 3 year burning cycle.	Recommends frequent burns depending on fuel loads, weather, vegetation type. Recommends use of growing season burns when feasible - especially in longleaf-wiregrass and shortleaf-bluestem communities.

Pine Thinning	To create and maintain high quality foraging habitat, maintain well stocked pine stands (60-90 sq. ft BA greater than 30 years old)	Quality foraging habitat will have well stocked pine stands (60-80 sq. ft. BA greater than 30 years old).
Pine Beetle Suppression/Control	Maintain tree spacing to reduce beetle infestation. No other guidance.	Procedures for control of beetle infestations outlined. Dead trees should be retained as snags.
Forest Management		
Pine Rotation Age	longleaf, 120 yrs; loblolly, 80 yrs; shortleaf, 100 yrs; slash and pond, 80 yrs.	Longleaf 120 yrs; loblolly, 100 yrs; shortleaf, 120 yrs; slash and pond, 100 yrs. Rotation ages apply only to foraging habitat.
Regeneration Methods	Only even-aged regeneration discussed.	Natural regeneration of pine species is preferred through even or uneven-aged management. Restoration of off-site pine plantations to native species (long-leaf) is encouraged.
Even-aged Regeneration	Area as opposed to volume control procedure	Area control used to regulate regeneration. Clearcutting and planting only used for off-site pine conversion. Modified shelterwood/seedtree method with retention of residual trees appropriate.
Uneven-aged Regeneration	No information	Group and single tree-selection methods may be appropriate for regenerating longleaf pine.
Clearing RCW Habitat	No information	Removal or clearing of RCW habitat not related to pine regeneration is not permitted
Cooperative Agreements	Identifies the need to establish cooperative agreements with adjacent public and private landowners. Regional office leads the effort with refuge field station support.	Targets adjacent state and federal lands to which cooperative agreements could be established. Refuge field stations are assigned the lead, with support from the RCW coordinator.
Implementation Guidelines	No information	Refuges must develop RCW plans in accordance with NEPA, NWRSA, and ESA.

To make a contribution to the RCW Recovery Plan goal of 15 viable populations, the Service will emphasize, in its management efforts, four populations located at Carolina Sandhills, Okefenokee, Piedmont, and St. Marks refuges. Although the remaining six refuges will not contribute to recovery populations, they will be managed as support populations.

The extent of certain management activities would be based on Management Intensity Levels. Under this alternative the intensity of management activities would be based on the size of the RCW population on a given refuge and the threat of extirpation. Small populations would receive the most intense management, whereas, larger populations would not need to implement the same intensity of management.

Guidance incorporating technical advances for RCW management (e.g., restrictors, artificial cavities, predator/competitor control, translocation) are identified as tools to be used to stabilize and increase RCW populations on refuges. Cluster protection is better defined in the revised Guidelines. Forest management is more structured with a 20 year lengthening of the minimum rotation age for all pine species, except longleaf. Most silvicultural regeneration options are permitted under both even-aged and uneven-aged management. Clearcutting will be limited to conversion of off-site pine. Control of hardwood midstory and restoration of the herbaceous community within pine habitat is promoted through aggressive burning programs and a transition in prescribed fires to the growing season, especially within the longleaf-wire grass (*Aristida stricta*) community.

Cooperative agreements among agencies, and private entities with adjoining RCW populations is encouraged with the lead for implementing the agreements occurring at the refuge level. The Proposed Action would provide a framework from which refuge specific RCW management plans would be written.

2.4 Alternative C. Increase Lands Managed for RCWs to Include Pine Hardwood Sites and Additional Refuge Lands

Under this alternative the Service would increase its management objectives for the RCW on Piedmont, Santee and Alligator River NWRs to include additional pine/hardwood sites and other lands not identified for management of RCWs under the Proposed Guidelines. Management of these sites would be aimed at converting them to pine dominated forest from the existing pine/hardwood forest. The acreage on Alligator River NWR which would be managed for RCWs would be increased from the currently estimated 4,770. The acreage increase is not known at this time since the habitats and populations potentially supporting RCWs have not been inventoried adequately. Surveys are now being conducted or are planned which will provide the necessary information. Once determined the goals for Alligator River will be increased to the maximum extent feasible. On Piedmont NWR RCW managed lands would increase from 19,250 to 26,238. This would result in an increase in 6,988 additional acres being managed for RCW production and an increase in the number of active clusters from 96-131. In addition, reintroduction of RCWs would be initiated on Santee NWR and the 1,090 acres of habitat

available would be managed so as to support five clusters of RCWs. In total, the goal for number of active clusters would correspondingly be increased from 644-654 to an estimated 685-694 clusters for refuge lands in the Southeast. Once surveys are completed on Alligator River NWR this figure is expected to be larger.

The Guidelines would be applied to the additional lands in the same manner as described under Alternative B.

2.5 Alternative D. Decrease the Acreage of Lands Managed for RCWs From That Proposed in the Draft Guidelines

Under this alternative the pine and pine/hardwood acreage and the goals for number of active clusters on refuge lands would be reduced to half the level identified in Alternative B. Current management activities on some refuges would be curtailed resulting in passive management of RCWs and active management of other refuge resources. A portion of the resources, staff and funds, previously earmarked for RCW management would be directed at other refuge programs such as public use, neotropical migratory bird management or other refuge initiatives as developed and approved by individual Refuge Managers. This would result in a reduction of lands devoted to RCW management from approximately 141,900 acres to about 70,000 acres. The goal for the number of active clusters would also be reduced to about 325 for all refuge lands in the Southeast Region. For an assessment of the reduced goals for specific refuges the figures contained in Table 1 would be reduced to one half their value. For example the acreage managed on Felsenthal NWR would be reduced to 4,100 acres and the goal for number of active clusters would be reduced to 17.

The Guidelines described under Alternative B would be applied to the reduced acreage identified for management.

3.0 AFFECTED ENVIRONMENT

3.1. Wildlife

Red-cockaded Woodpecker

The RCW is non-migratory and individual groups maintain territories around their cavity tree cluster. RCWs are cooperative breeders and helper birds aid the mated pair in rearing their offspring. The breeding season is April through July with the clutch size ranging from two to five eggs.

RCWs use longleaf, slash (*Pinus elliottii*), loblolly (*Pinus taeda*), shortleaf (*Pinus echinata*), and Virginia pines (*Pinus virginiana*) as cavity trees. Often cavity trees are infected with red heart fungus. Although red heart fungus is usually not abundant in southern pines until the trees are

80-100 years of age, it may infect pines as young as 40 years of age.

At one time, the RCW was widely distributed throughout the southern pine ecosystem of the southeastern United States. Its range extended from Missouri, Kentucky, and Maryland, southward to Florida, and westward to eastern Texas. Due to losses of foraging and nesting habitat, habitat fragmentation, and declining RCW populations, the RCW was placed on the endangered species list in 1970. Since that time, their habitat has continued to dissipate, with the remaining suitable habitat concentrated on public lands, primarily Federal (military lands, national forest lands, and refuges) and State Lands. Refuges, which currently support 237-242 groups of an estimated of 4,690 groups rangewide. Approximately 143,100 acres of pine hardwood habitat are now being managed for RCWs. Unfortunately, existing and potential habitat on refuges is not large enough in and of itself to support genetically viable populations. For a detailed refuge by refuge listing of acreage and population size see Table 1.

RCW habitat may be differentiated as either nesting or foraging habitat. Nesting habitat normally consists of an open, mature pine stand with very little hardwood present in the midstory. When hardwood midstory reaches cavity level, a high rate of cavity abandonment occurs. Foraging habitat is primarily pine stands with trees 10 inches in diameter and larger at breast height; however, smaller diameter pines are occasionally used.

Among the 12 refuges which support populations of RCWs, the habitat quality is variable. As indicated earlier, a dense hardwood midstory is a major cause of cluster abandonment. The exclusion of fire from the southern pine ecosystem for many years resulted in the development of a midstory in many stands. Most active and some inactive clusters have now had midstory control completed. However, very little of the RCW's remaining habitat has had any midstory treatment.

The presence of adequate potential cavity trees, in the form of relicts, will be a critical factor contributing to the abundance and stability of populations on refuges. Because of past timber cutting practices prior to refuge acquisition, a small percentage of the pine and pine/hardwood stands on refuges are old enough to provide potential cavity trees.

Other Wildlife

The 12 refuges occupied by RCW are also habitat to numerous other terrestrial wildlife. Common game species are: white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), and gray (*Sciurus carolinensis*) and fox squirrels (*Sciurus niger*). Also occupying forested lands are a variety of non-game species such as resident and migratory birds, mammals, reptiles, and amphibians.

The Coastal Plain herpetofauna which inhabits many of the habitats also used by woodpeckers is of note. Of the 290 species of reptiles and amphibians native to the southeast an estimated 170 species reside in longleaf pine forest communities. Many species are dependent upon the small freshwater wetlands found in pine forests and have restricted distributions. As of 1995 as many

as 159 species were in a special conservation status having been designated as endangered, threatened or of special concern at the state or federal level. Examples of particularly unique or endangered species include the flatwoods salamander (*Ambystoma cingulatum*), striped newt (*Notophthalmus perstriatus*), Carolina and dusky gopher frogs (*Rana capito capito* and *R.c. capito*), eastern indigo snake (*Drymarchon corais couperi*) and gopher tortoise (*Gopherus polyphemus*) (Dodd, 1995). The unique ecological role played by the gopher tortoise is of note. Gopher tortoises excavate burrows in sandy areas which are used by 13 other animal species that are currently listed or are candidates for listing. None of these 13 species are known to have increasing populations. Gopher tortoises themselves are listed as threatened in part of their range and are candidates for listing in the remainder of their range.

Wildlife managers over the past 25-30 years have stressed maximizing species diversity by creating "edges" and structural diversity. This has been accomplished via forest management techniques such as thinning, clear-cutting small areas, and prescribed burning. In the early 1970's, interest developed in the conservation of non-game species (e.g., neotropical migratory birds), some of which are experiencing population declines. More recently, considerable research has emerged defining the suitability of various seral stages (i.e., grass/forb, shrub/seedling, sapling/poletimber, and sawtimber) for resident and migratory bird species, in each forest type. With the greater understanding of bird-habitat relationships and the adoption of an ecosystem management approach which seeks to conserve the ecosystem as a whole, wildlife managers are now beginning to recognize that maximizing species diversity is not necessarily a good conservation strategy on a landscape basis. Increase in edges may result in species diversity locally, but it may adversely affect both habitat suitability for some species and regional diversity.

3.2 The Longleaf Pine Ecosystem

As indicated earlier, of the original 90 million-acres of longleaf pine habitat, less than 4 million acres remain. In the southeastern United States, virtually all ecosystems have been influenced by humankind. The existing biological diversity has resulted from modification of historical fire regimes, forest type conversions, and fragmented habitat conditions. These modifications were primarily caused by settlement patterns and past land use. The distribution and abundance of pine communities is vastly different from that which occurred historically. There are lesser amounts of longleaf and shortleaf pine, and there may be increased amounts of loblolly and slash pine.

Altering natural disturbance regimes (primarily fire) can have a dramatic effect on ecosystem function and species associations. In the Southeast, recurring fires have been a long-standing evolutionary agent of habitat change to which native species adapted. The total extent of fire in the southeastern U.S. has decreased almost 95 percent in the past 50 years. This decrease has adversely impacted the fire-dependent southern pine ecosystems. In areas where emphasis has been on dormant season burning, flatwoods habitats have deteriorated, with the resulting proliferation of evergreen (volatile) species such as gallberry (*Ilex glabra*), titi (*Cliftonia monophylla*), wax myrtle (*Myrica cerifera*), and saw palmetto (*Serenoa repens*). In loblolly and

shortleaf pine habitats, fire suppression and dormant season burning have altered natural plant communities resulting in a midstory and overstory with a greater hardwood component and a decrease in plant diversity (Dodd 1995).

3.3 Vegetation

The majority of the RCW habitat occurs in two broad vegetation regions:

1. Southern mixed and sand pine scrub forest, commonly known as the longleaf and longleaf-slash pine forests (LLSL).
2. Oak hickory pine forests, commonly known as the loblolly-shortleaf pine-hardwood forest (LBSH)

The thirteen refuges in the Southeast Region contain about 213,000 acres of pine and pine-hardwood forest. LLSL forests, which occupy the lower and middle Coastal Plain, border the Atlantic and Gulf Coasts from North Carolina to east Texas. These forests consist of predominantly longleaf and slash pines, with lesser amounts of loblolly, shortleaf and Virginia pine. Other common tree species include: turkey oak (*Quercus laevis*), bluejack oak (*Q. incana*), myrtle oak (*Q. myrtifolia*), live oak (*Q. virginiana*), holly (*Ilex opaca*), titi, cabbage palm (*Sabal palmetto*), and Southern magnolia (*Magnolia grandiflora*). Where fire has been excluded, a heavy understory of volatile evergreen hardwood species (i.e., saw palmetto, gallberry or titi) commonly occurs. Common shrubs and vines include rosemary (*Ceratiola ericoides*), yaupon (*Ilex vomitoria*), runner oak (*Q. pumila*), sand post oak (*Q. margaretta*), way myrtle, gallberry, and greenbriers (*Smilax sp.*).

Within longleaf pine forests, two associations of herbaceous vegetation occur: bluestem grasses (i.e. little bluestem, broomsedge bluestem) (*Andropogon sp.*) in the western Gulf Coastal Plain, and wiregrasses (*Aristida sp.*) in the eastern Gulf Coastal Plain. Forests that receive frequent prescribed burns consist of herbaceous understories dominated by grasses.

LBSH forests, interspersed throughout the upper, middle, and lower Coastal Plains, contain mixtures of predominantly pine and pine/hardwoods (especially oak) which have evolved with periodic fires. Loblolly, shortleaf, and to a much lesser extent Virginia pine, predominate. Hardwoods are co-dominant with pine by and large and significant hardwood mid and understories occur except where burning occurs.

The most common hardwood species are: hickory (*Carya sp.*), along with dogwood (*Cornus florida*), persimmon (*Diospyrus virginiana*), sweetgum (*Liquidambar styraciflua*), elm (*Ulmus sp.*), red cedar (*Juniperus virginiana*), yellow poplar (*Liriodendron tulipifera*), black tupelo (*Nyssa aquatica*, *Nyssa sylvatica*), and red maple (*Acer rubrum*). Common herbaceous species in open areas include various bluestem species, crabgrass, panicums, and paspalums. Beneath denser canopies, spike grasses predominate.

The longleaf pine forest once occupied more than 90 million acres throughout the south. Today, less than 4 million acres remain. The longleaf belt covered more than an estimated 100,000 square miles, from southern Virginia to central Florida with extensions to east Texas and into the Appalachian foothills of Alabama and Georgia. Longleaf pine was the predominant tree, forming an extensive and continuous forest. Loblolly, slash, and shortleaf pines also extended over parts of the area.

Longleaf pine develops in close association with periodic surface fires. In the past, frequent fires resulted in open, park like stands of longleaf with a ground cover dominated by grasses. With a reduction of fire occurrence, hardwoods and other pines encroach on the longleaf forest. Within the range of slash pine, this species becomes increasingly important leading to the longleaf-slash pine forests. Elsewhere, loblolly and shortleaf pines as well as hardwoods gradually replaced longleaf, which eventually results in a loblolly pine-hardwood type or occasionally a loblolly pine-shortleaf pine type.

3.4 Recreation

In general, portions of forest lands and waters within a refuge are open to the public for wildlife-dependent recreational uses such as hunting, fishing, wildlife observation, photography, environmental education, and interpretation. Such areas are usually accessed on foot on designated trails, or by vehicle on paved or unpaved roads. Some unpaved roads are only open during designated hunting seasons. To minimize noise effects and other environmental impacts, all-terrain vehicles and similar activities are generally prohibited on refuges or restricted to designated roads or areas.

Hunting occurs during the fall for most species such as deer and squirrel and in the spring for turkey. Hunting is restricted to designated areas on the refuge to maximize safety, minimize conflicts with other types of recreational use and to attain wildlife management objectives.

Some areas may be permanently closed or temporarily closed to public use at certain times of the year in order to: (1) protect sensitive wildlife or their habitat, (2) allow for management activities such as prescribed burns, timber sales, or other forestry operations, and/or (3) reduce the likelihood of injury to refuge visitors.

At the present time, there are no restrictions on the kinds of public use in forested lands occupied by RCW that are specifically related to the presence of RCWs. Hunting is permitted during State regulated seasons and wildlife observation and photography may be permitted at all times of the year.

Maintenance of designated trails, unpaved roads, and paved roads generally occurs during the summer.

4.0 ENVIRONMENTAL CONSEQUENCES

This section includes an analysis of the environmental consequences of implementing each of the Alternatives described in Section II. The alternatives evaluated are as follows:

Alternative A. No Action-Continue to Manage with 1987 Guidelines

Alternative B. Implement Revised Management Guidelines: The Proposed Action

Alternative C. Increase Lands Managed for RCWs to Include Hardwood Sites and Additional Refuge Lands

Alternative D. Decrease the Acreage of Lands Managed for RCWs From That Proposed in the Draft Guidelines

It should be noted that the under Alternative A management of the RCW on refuges would be accomplished as it is now with the principal guidance being derived from the 1987 Guidelines. Under Alternatives B, C, and D management of the RCW would be guided by the Revised 1998 Guidelines with the intensity of management effort increased under Alternative C and decreased under Alternative D.

4.1 Alternative A. No Action-Continue to Manage with 1987 Guidelines

4.1.1 Wildlife

Red-cockaded Woodpecker

Under this alternative the Service would continue to manage the RCW under the existing guidelines. A summary of the major components of the 1987 Guidelines are listed in Table 1. Approximately 143,100 acres of habitat would be managed for RCWs.

Overall impacts to the RCW are expected to be beneficial. However the 1987 Guidelines do not include specific guidance on the use of management actions and techniques which have been developed since 1987 and have proven effective in aiding the recovery of the species. Although these methods have been implemented on selected areas coordinated and consistent implementation has not been achieved due to the lack of an approved set of guidelines. For example, the 1987 Guidelines contain no specific guidance on the following:

- delineation of subpopulations;
- varying management intensity based on threat to a specific population, e.g., management intensity level designation;

- methods to be used to protect clusters while conducting prescribed fire and silvicultural operations;
- nesting habitat management methods, e.g., cavity restrictor use, snag retention, predator and competitor control, artificial cavities, translocation, banding and marking, delineation of recruitment stands, and
- forest management actions such as clearing of RCW habitat or uneven-aged management regeneration.

Management of the RCW population in the absence of the above specific guidance would result in less coordinated recovery efforts and the failure to consistently use the best available management technique in a manner resulting in the least impact to the birds. For example, the lack of designation of recruitment stands could result in the integrity of existing clusters under even-aged forest management degrading without planning for the dispersal of birds into new habitat. This could lead to a reduction in the number of groups in a population due to cluster abandonment as these stands degrade and become unsuitable. This would be more evident within loblolly and shortleaf stands with expected longevity of <150 years. By not establishing recruitment stands and provisioning these sites with artificial cavities, the rate of population expansion is expected to be minimal because RCW population growth has been associated with cavity limitation. In addition, this alternative does not discuss measures for control of RCW predation or competition. The lack of measures to control these species (e.g., flying squirrels, snakes, red-bellied woodpeckers) will indirectly affect reproduction and survivorship. Snakes climbing nest cavities may circumvent the resin barrier and eat the eggs, young, or adult in the nest. Flying squirrels may cause nest abandonment by displacing incubating or brooding adults resulting in the loss of a brood. In small populations, this brood loss is expected to be critical to stability and expansion of the population. Without cavity restrictors placed on some enlarged cavities to insure each RCW has a suitable cavity, survivorship to individuals is expected to be reduced.

The use of artificial cavities in the No Action alternative is not discussed. Some refuges are now installing artificial cavities and it is assumed that some additional refuges will slowly integrate their use for RCW management.

Rotation ages have an indirect effect on the number of potential cavity trees. Rotation ages established for the Alternative A are approximately the average age at which cavity construction has been observed within the respective pine species. The possible rotation of stands at these ages would reduce the overall number of potential cavity trees. In addition, the development of red heart disease which facilitates cavity construction is only likely to be present in trees reaching these or older rotation ages. Therefore, regeneration of pines based on these rotation ages would minimize nesting habitat.

Guidance on regeneration methods under the No Action Alternative are restricted to even-aged silviculture. Pine regeneration through even-aged regeneration would involve mostly seedtree/shelterwood cuts. This would create stands unsuitable as foraging habitat until the regeneration reaches 30 years of age. The No Action alternative would not require the retention of the seedtrees and the size of the cut would be regulated solely by the area control method. Fragmentation of the forest through large regeneration cuts and loss of seedtrees is expected.

It is worth noting that many of the methods and practices included in the revised Guidelines have been in use in selected areas on some refuges. However use has not been consistently applied and continued use of the 1987 Guidelines would result in a less coordinated and comprehensive implementation of the Service's recovery effort.

Other Wildlife

Under the no action alternative the impact on other wildlife species of continuing management under the 1987 Guidelines is difficult to assess. The 1987 Guidelines lack specific guidance on the timing of prescribed burns to avoid the breeding season of other wildlife species, prohibiting establishment of new rights-of-way, retention of snags, and clearing of RCW habitat. In addition, the recommended pine rotation ages are 20 years lower under the 1987 Guidelines for loblolly, shortleaf, slash and pond pine. Lack of clarity and consistency in guidelines for RCW management could result in some adverse impacts to other wildlife species although the impact is difficult to quantify since there would be greater latitude to select management actions and it is not known what specific management activities might be conducted at individual refuges. Such activities are typically assessed at each refuge through forest management planning, comprehensive conservation planning or some other form of assessment.

4.1.2 The Longleaf Pine Ecosystem

Impacts on the longleaf ecosystem are expected to be minimal. Current management efforts on most refuges have been directed at recovery and enhancement of longleaf stands. The lack of specific guidance directing refuges to implement, where feasible, growing season burns may result in some adverse ecological impact to plants species typical of this type of fire dependent habitat. Conversely, avoidance of burns during the growing season may benefit other species of wildlife which may be breeding at the time of the burn and be affected directly or indirectly by loss of habitat, e.g., nesting birds, amphibians.

4.1.3 Vegetation

Under the no action alternative hardwood midstory at cluster sites would be eliminated or reduced to <20 sq. ft/acre. Pine regeneration would be driven primarily by even-aged regeneration and no size limit on cuts are specified. Although refuge's generally restrict cuts to <40 acres, larger cuts could occur provided they do not exceed limits imposed on regeneration by the Area Control Method. Pine regeneration would generally occur at an age much sooner than the stand would naturally degrade. The availability of snags overall would be reduced

because of earlier harvest of mature trees. Under even-aged management, seed trees would likely be harvested following establishment of adequate regeneration. In time this will lead to small clear-cut-like stands scattered throughout the forest.

Under current management prescribed burning could occur during the growing or nongrowing season. Due to safety and feasibility factors it is likely that there would be more nongrowing season burns and less reduction in the amount of hardwood species.

Thinning operations under this alternatives would result in the development of well stocked stands. The No Action alternative has no provision for retention of relict or suppressed trees which would likely be removed.

4.1.4 Recreation

Current RCW management activities are not likely to significantly affect recreational opportunities. Some refuges have clusters or recruitment stands associated with recreational areas (i.e., trails, picnic areas, interpretive centers) and management practices aimed at eliminating impacts have already been implemented successfully. In general the access to clusters on refuges by the general public is minimally restricted except for those areas already closed for other administrative purposes.

Although not explicitly stated in the current guidelines, development of new recreational opportunities within clusters or recruitment stands is prohibited. In particular, disturbance during the nesting season is discouraged or prohibited to protect nesting RCW. Since specific restrictions on recreational opportunities in or around active clusters are not included in the current guidelines, it is at least possible that abandonment of certain nests might inadvertently occur.

Overall, RCW management activities contained in the 1987 Guidelines will have minimal impact on refuge recreational opportunities. Prescribed burning and timber harvest may cause a shift or closure to public access for specific locations during management (e.g., closure of picnic area or trail) but not for extended periods. In situations involving recreational hunting (e.g., turkey hunting in spring), certain roads and forest compartments may be closed to access during a prescribed burn. This closure is expected to last for one or two days.

4.2 Alternative B. Implement Revised Management Guidelines: The Proposed Action

4.2.1 Wildlife

Red-cockaded Woodpecker

Under this alternative RCWs on refuge lands would be managed in accordance with the revised 1998 Guidelines. The direction provided to achieve refuge specific RCW population goals

differs significantly from that contained in the existing 1987 Guidelines. A detailed summary of the differences between the 2 alternatives is provided in Table 2. Major differences in the guidelines are explained in more detail below.

Population Goals - Under the 1998 Guidelines there is lower total population goal. This is a reflection of refinements in understanding of RCW distribution and status on refuge lands and a readjustment in the approach to management of RCW habitat. Previously, the Guidelines provided for management which could result in conversion of hardwood stands to pine stands. Due to impacts on other resources and in keeping with an ecosystem approach to recovery of this species the Service plans to manage pine sites and allow sites which are predominantly hardwood to remain so. This change in management approach has reduced the potential overall population goal slightly.

Management Intensity Levels (MIL) - MIL designation will provide a means for determining emphasis for specific management activities based on the current status of RCW populations. It will therefore help to assure that management intensity will approximate the threat to recovery for smaller RCW populations.

Prescribed Burning - The potential for impacts to RCW cavity trees is greater in the Proposed Action since there will likely be some increase in growing season burns. The 1998 Guidelines contain extensive preventive measures to assure that nest trees will not be burned. The control of hardwood midstory through prescribed growing season burning will be more effective in reducing the abandonment of cavities of RCW resulting from hardwood encroachment. Prescribed burning of clusters and associated foraging habitat will improve the overall quality of the habitat for RCW. Reduction of hardwood midstory within older age stands will provide suitable nesting habitat for the formation of new RCW groups.

Midstory Control - The reduction or elimination of hardwood midstory to prevent specific cavity or cluster abandonment by RCW is desirable. In addition, reduction of hardwood midstory in foraging habitat may improve foraging habitat quality. The Proposed Action would insure that a greater reduction of small hardwood stems (<10 in DBH) are removed from clusters thereby potentially reducing cavity competition. Reduction of hardwood midstory to <20 sq. ft./acre would continue under the No Action alternative but could result in dense stands of small diameter trees creating a substantial visual barrier between cavity trees. In addition, the increased hardwood stem densities will lessen the effect of prescribed burning because of an expected reduction in the herbaceous groundcover.

Indirectly, the use of heavy machinery within clusters could cause root damage to cavity or potential cavity trees resulting in trees susceptible to mortality or southern pine beetle attacks. However, the improvement of clusters from mechanical midstory control is expected to have a minimal vegetative effect.

Establishment of Recruitment/Replacement Stands - The designation or lack of designation of stands to replace or establish nesting (cluster) habitat will have no direct on RCW in both alternatives.

Under Alternative B, designation of replacement stands would insure that, as occupied nesting habitat degrades, suitable, younger nesting habitat near the cluster will be available for the group to move into. Provisioning of cavities within these stands will make it very attractive to the birds and stabilize population levels. The establishment of recruitment stands with provisioned artificial cavities will expedite RCW group formation and future growth of populations.

Predator/Competitor Control Including Cavity Restrictors - Cavity restrictors may directly effect RCW. Proper placement of restrictors will effectively prevent usurpation of RCW by other woodpecker species. Improperly installed restrictors can cause a bird to be caught by a leg or wing or prevent entering/exiting of a cavity resulting in injury or death to a bird trapped by the restrictor or in the cavity.

The 1998 Guidelines insure that some degree of control of competition and predation is attained based on the current RCW population. The consistent application of cavity restrictors provide a means of increasing survivorship of RCW that are displaced because of enlarged cavities or from usurpation by red-bellied woodpeckers. Without these measures individuals would be forced to free-roost and be vulnerable to predation or extreme weather conditions. The use of squirrel excluder devices (SQED) has been shown to reduce the incidence of flying squirrel occupation of RCW cavity trees fitted with them. Use of SQEDs should increase survivorship by allowing RCW to occupy cavities that would otherwise be utilized by flying squirrels.

Artificial Cavities and Starts - Artificial cavities are expected to result in the stabilization of groups with limited cavities and reduction of cavity competition with other woodpeckers and flying squirrels. The placement of artificial cavities and starts within suitable nesting habitat (recruitment stands) is anticipated to accelerate population expansion. Under the Proposed Action, the requirement to utilize this technology in conjunction with other management techniques will aid population stability and expansion. Under the No Action alternative the comprehensive use of this technology would be delayed due to a lack of clear guidance.

Forest Management - Forest management including establishing pine rotation age, thinning, regeneration, off-site pine restoration, and southern pine beetle control are necessary to provide sustainable RCW foraging and nesting habitat.

Under this alternative the minimum rotation ages for loblolly, shortleaf, slash, and pond pine will be lengthened by 20 years. This will provide a greater number of trees of sufficient age for the development of red-heart disease enhancing natural cavity development. Stand structure is still likely to be maintained at these ages. On poor quality sites, shortleaf and loblolly pine stands may degrade more quickly. The increased minimum rotation ages will provide for a longer opportunity for natural cluster establishment, and reduce overall fragmentation of the forest.

Thinning operations are designed to promote the health of individual stands and reduce southern pine beetle attacks. A reduction in the number of trees as foraging substrate will result from thinning operations under both alternatives. However, no priority for retention of specific trees is designated in the No Action alternative. Recommendations for the retention of relict and potential cavity trees are provided for in Alternative B. In addition, retention of the residual seed-trees following regeneration cuts through subsequent thinning operations will provide for potential cavity trees sooner than the stand as a whole would otherwise provide if seed-trees were removed after establishment of pine regeneration.

Regeneration of pine through silvicultural activities will insure the perpetuation of foraging and nesting habitat for RCW. Regenerating pine involves either even-aged or uneven-aged methods both of which affect the distribution of potential cavity trees and foraging habitat. The Proposed Action would retain seedtrees indefinitely and restrict cuts to <25 acres thereby providing some foraging substrate and lessening forest fragmentation at the landscape level. In addition, this two-aged selection method would provide potential cavities within the regenerating stand sooner than would be expected if the stand was clearcut.

Uneven-aged silviculture is an option only for the Proposed Action. Both single tree and group selection could be practiced. Since most seedling stage, yellow pine species are intolerant of fire uneven-aged silviculture is easiest and most efficient to use with longleaf pine. Opinions differ with respect to the adequacy of uneven-aged silviculture to perpetuate RCW habitat. However, both single tree and group selection methods are expected to provide potential cavity trees across the entire stand indefinitely. Over an entire rotational cycle, stands would collectively become a balanced distribution of all age classes distributed either singularly or in small clumps throughout the forest. The development of regeneration is dependant upon frequent repeated entries into the stand to reduce the basal area and stimulate the growth of the regeneration. Within the cluster, regeneration may need to be controlled because of obstruction of cavity trees. To insure a balanced uneven-aged distribution, area control at the stand level for groups selection is necessary. If single tree selection is used, appropriate regulatory mechanisms would be imposed.

Off-site pine conversion would indirectly affect RCWs through removal of present or potential foraging habitat and would be similar for both alternatives. The rate of conversion will be dictated by the foraging guidelines if the conversion would adversely affect the amount of foraging substrate. The clearcutting of off-site pine and planting of native pine to the site will prevent the habitat from being used by RCW until the stand reaches approximately 30 years of age. The density of RCW groups present or the potential carrying capacity within a forest compartment should not be affected by off-site pine conversion.

Southern pine beetle (SPB) control is necessary to insure that stands providing nesting or foraging habitat to RCW groups are not destroyed. The indirect effects of SPB control for both Alternatives A and B will be the loss of some foraging habitat or potential cavity trees within clusters. In certain circumstances, cavity trees may need to be felled if the SPB infestation is anticipated to infest more of the cluster. This could force RCW to free-roost and be susceptible

to predators. However, installation of artificial cavities will off-set the loss of cavities. Large SPB outbreaks can lead to significant loss of trees and jeopardize foraging habitat. Although the removal of the infested trees and a buffer to prevent further spread may result in the foraging habitat being reduced to levels below the guidelines, lack of control is expected to cause more habitat loss. Retention of dead trees killed by SPB will provide substantial short-term RCW foraging substrate for invertebrates.

Translocation - The movement of RCW to facilitate establishment of breeding pairs is an important aspect of RCW management.

The No Action alternative does not contain specific guidance on translocation since that technology had not been sufficiently developed at the time the 1987 Guidelines were developed. Now that this information is available it is assumed that this activity would occur to some degree under both alternatives.

The direct effect to individual RCWs through translocation may be adverse. The "success" of translocation activities is measured in terms of knowing if the bird establishes a roost site, if it pairs, and subsequently if breeding has taken place. A successful breeding rate for translocated birds lower than 50% has still been deemed acceptable; translocations have resulted in the growth of RCW populations. However, translocation undoubtedly places stress on the birds, and the disposition of many of the released birds is uncertain.

Indirectly, the translocation of RCW within a population is expected to be positive resulting in increased numbers of breeding groups. Refuges donating RCW for translocation purposes are expected to minimally affect their population because many hatching-year birds are known to die in the first year and these translocated birds are assumed to represent compensatory mortality from the donor population. Provided excessive number of birds are not annually removed from a population, the indirect effect is expected to be minimal.

Cooperative Agreements - No direct effect to RCW is expected through establishment of cooperative agreements between agencies with adjoining RCW populations.

The No Action alternative would rely on the Regional Office to develop or stimulate memorandum of agreements (MOA). The establishment of cooperative agreements for RCW management with the lead by the regional level is anticipated to be slower and result in few MOAs being established. The indirect effect would be a reduced cooperative effort between agencies working on the same RCW population. Although RCW populations will not be expected to increase, the sharing of expertise between resource personnel (e.g., prescribed burning, translocation, artificial cavity) is expected to be enhanced under the Proposed Action and could aid recovery of the RCW population.

Other Wildlife

The direct affect on wildlife species will be minimal. Silvicultural activities may cause loss of some eggs or nestlings of nesting birds depending on the time of year the activity is conducted and the type of harvest methods that are used. The loss of nests will occur through thinning operations and regeneration cuts. In addition, prescribed burning for midstory control could kill eggs or nestlings depending on the timing of the burn. The Proposed Action alternative will have a greater effect on nesting birds should a transition to growing season burns occur within the longleaf community especially. Nonmobile species such as reptiles and nonflying insects may be killed if unable to find shelter from prescribed burning.

Both alternatives will result in a slow transition of the avian community within the pine and pine/hardwood habitat to species favoring relatively midstory free stands with mature overstory of pine and understory dominated by annual grasses, and other herbaceous plants. This will include species like Bachman's Sparrow, and Northern Bobwhite.. Conversely, species like the red-eyed vireo, hooded warbler, and other species of birds would be displaced as pine stands are cleared of hardwood midstory and understory. The Proposed Action is expected to accelerate this transition.

Indirect effects to other wildlife species includes a reduction in the availability of some mast. However, overstory mast producing species, unless removed for hardwood control within clusters, are expected to be minimally affected. Future mast producing species will be eliminated or reduced through midstory control and prescribed burning operations. The Proposed Action would be expected to affect the vegetation and associated species more significantly because of a gradual shift towards growing season burns.

In addition, the availability of nesting and foraging habitat to certain species of birds will be reduced in the future as hardwood control and prescribed burning operations progress.

The elimination of wildlife species is not likely under either alternative. Species within pine/hardwood stands being modified towards pine are expected to shift to adjoining stands.

4.2.2 The Longleaf Pine Ecosystem

Numerous species occur within longleaf pine habitat occupied by RCWs. Habitat management for the RCW including silvicultural practices, prescribed burning, and pine restoration could effect certain species under both alternatives.

Prescribed burning and silvicultural operations may directly affect plant species. Some plants may be killed or the tops of them destroyed especially during prescribed burning. Logging equipment or other heavy equipment for doing midstory control or placing fire-control lines may crush and kill plants. Sensitive species could be most vulnerable to these operation because of

their limited distribution and the uncertainty of their presence on site. Threatened or endangered plant species with known distribution and specific site locations would be protected during RCW habitat management activities.

Prescribed burning is expected to effect most vertebrate and invertebrate species minimally. Species like Bachman's sparrow could be disturbed during growing season burns under the Proposed Alternative. Nonmobile species (e.g. lizards, insects) may be killed during prescribed fire or silvicultural activities under both alternatives. Gopher tortoises may be vulnerable during growing season burns if caught away from burrows. Overall impacts on a population basis are expected to be minimal.

Indirectly, regeneration, thinning, hardwood midstory control, and/or prescribed burning of pine and pine/hardwood stands will lead to establishment of preferred RCW habitat. Species associated with open park-like pine stands should be expected to increase such as Bachman's sparrow and other neotropical migrants of this plant community. The vertebrates and plants associated with longleaf wiregrass community will benefit as offsite pine is converted back to longleaf pine. Gopher tortoise numbers should benefit from increased acreage of longleaf pine. Conversely, certain neotropical migrants occupying stands with hardwood midstory will be displaced as the stands are managed for RCW habitat. Both alternatives are expected to have similar effects.

Prescribed burning especially during the growing season will affect plant composition and structure. The topkill of 95% of the understory hardwoods is expected through prescribed burns. A shift towards growing season burning within longleaf pine systems should stimulate fire-dependant plants to increase. A greater establishment and distribution of wire-grass and elimination of fire-intolerant hardwood species within stands is anticipated under the Proposed Action.

RCW management activities will undoubtedly affect biodiversity both positively and negatively. However, the approach recognizes the complexity of pine ecosystems and the natural disturbances that maintained these systems.

4.2.3 Vegetation

Reduced hardwood midstory is expected within RCW foraging habitat under both alternatives. The Proposed Action will reduce most woody vegetation in the understory more extensively than the No Action alternative because of the emphasis placed on growing season burns.

The Proposed Action will use all silvicultural options for pine regeneration including even-aged and uneven-aged methods but will employ minimum pine rotation ages 20 years older than the No Action alternative. The development of red-heart disease within older trees facilitates cavity construction. Reduced fragmentation of the forest at the landscape level is expected through size restrictions on regeneration cuts of <25 acres and offsite pine conversion of 40 acres. The retention of seed-trees following establishment of pine regeneration will reduce seedling

densities around individual seed-trees. This will be most evident within longleaf stands with clumped distribution of residual trees. Fragmentation of the overstory will be lessened to a degree by the retention of approximately 10-20 sq. ft. pine basal area.

Prescribed burning operations under both alternatives will topkill most young woody vegetation on a 3-4 year cycle. However, the Proposed Action's emphasis on growing season burns will eliminate certain hardwood vegetation and promote other appropriate plant species of the longleaf-wiregrass community or loblolly-shortleaf system.

4.2.4 Recreation

The proposed action would result in closures or relocation of recreational activities to prevent disturbance during the nesting season. However, if a particular RCW group has been shown to be tolerant of such activities during the breeding season, the activity will be permitted with conditions to restrict immediate access around a nest or cluster if deemed necessary.

No threats to public health and safety are anticipated to result from implementation of these Guidelines.

No impacts on archeological or historical resources are anticipated to occur under this alternative. Step down management plans will review actions specifically proposed for a given unit through additional NEPA review to further assure that no impacts will occur.

4.3 Alternative C. Increase Lands Managed for RCWs to Include Pine Hardwood Sites and Additional Refuge Lands

Under this alternative approximately 8,078 additional acres of land would be managed specifically for the RCW on Santee and Piedmont NWRs. Additional lands would be managed for RCWs upon the completion of population and habitat surveys. The Guidelines described under Alternative B would be implemented on these lands as well as on the lands already identified for management. For this reason many of the same impacts described under Alternative B would result.

4.3.1 Wildlife

Red-cockaded Woodpecker

The RCW would benefit from increased management intensity either through conversion of pine/hardwood forest sites to pine forest (Piedmont NWR) or more intensive reintroduction efforts on sites which have historically supported small populations of RCWs (Santee NWR). It is estimated that 45-49 additional clusters of RCWs could be established under this alternative. Additional inventory and study would have to be accomplished on Alligator River NWR before population objectives for the RCW could be identified and specific management activities could be identified and implemented.

All other impacts on the RCW are the same as described under Alternative B.

Other Wildlife

Impacts on other wildlife species are similar to those described under Alternative B. The principal difference being that the areas added for intensive management could result in the forced conversion of pine/hardwood sites to pine forest and a subsequent loss of those habitats. For example, approximately 7,000 acres of hardwood sites on Piedmont NWR could be converted under this alternative. Conversion of naturally occurring pine/hardwood stands along drainages at Piedmont NWR would increase habitat for the RCW but would result in displacement of neotropical migratory birds dependent on pine/hardwood forest.

4.3.2 The Longleaf Pine Ecosystem

Impacts on the longleaf pine ecosystem would be the same as described under Alternative B. Additional lands converted to pine forest could support some longleaf pine but such areas are not considered typical of the longleaf pine ecosystem due to differences in soil type and hydrography.

4.3.3 Vegetation

Impacts on vegetation would be the same as described under Alternative B with the exception of pine/hardwood sites which would be converted to pine. Conversion of such sites would probably require clearcutting, planting of pine seedlings, and intensive hardwood control until the pine forest was established.

4.3.4 Recreation

Impacts on recreational use are essentially the same as described under Alternative B. Some additional temporary displacement of recreational uses could occur on sites being converted to pine forest but the loss of use would be restricted to the time of forest clearing activities. Piedmont NWR would be most impacted since as much as 7,000 acres could be converted to pine forest.

4.4 Alternative D. Decrease the Acreage of Lands Managed for RCWs From That Proposed in the Draft Guidelines

Under this alternative the revised 1998 Guidelines would be implemented on a reduced acreage. If this alternative was implemented additional study would be required to identify the sites which would no longer be managed for RCWs. Identification would occur through a public process such as revision of individual refuge management plans. For lands which would continue to be managed for RCW recovery, impacts would be the same as described under Alternative B.

4.4.1 Wildlife

Red-cockaded Woodpecker

Under Alternative D the area which would be identified for management of the recovery of the RCW would be decreased substantially. The revised guidelines would still be implemented but the area which would be specifically managed for RCWs would be reduced substantially. Approximately 70,000 acres would be managed for RCWs with a total population goal of 325. Relative to the other alternatives this alternative would have the least beneficial affect on the recovery of the RCW. Substantially less attention would be directed towards recovery of the species on refuges than is presently occurring.

Other Wildlife

Some wildlife may benefit from a decrease in the management intensity on NWRs since habitat and management resources that would have been used for the RCW would be available for other species such as amphibians and reptiles, or neotropical migratory birds. Specific projects are not known at this time but would be developed at each refuge based on the prevailing ecological and management needs for the lands in question.

4.4.2 The Longleaf Pine Ecosystem

Impacts would be the same as described under Alternative B for the reduced acreage managed for the RCW. Although the other forest lands would not be managed for RCWs impacts on longleaf would probably be largely beneficial since the forest management objectives on most refuges tend towards recovery or maintenance of longleaf stands.

4.4.3 Vegetation

Impacts would be the same as described under Alternative B for the reduced acreage managed for the RCW. Vegetation on the approximately 70,000 acres which would not be specifically managed for the RCW would be managed to promote the naturally occurring stand types or for specific wildlife management purposes as described in individual forest management plans. If this alternative is implemented it would be necessary to revisit existing forest management plans and evaluate the extent of changes for individual refuges to determine the extent of impact on vegetation.

4.4.4 Recreation

Impacts on recreational activities would be the same as described under Alternative B for the acreage which would still be managed for RCWs. Depending on the type of management implemented in place of RCW management it might be necessary to assess impacts on recreational uses. Management would be similar in nature to that presently occurring, e.g., habitat restoration, wildlife surveys, and minimal impact on recreational uses is anticipated.

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6.0 LITERATURE CITED AND CONSULTED

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7.0 APPENDIXES

Appendix A. Management Guidelines for Red-cockaded Woodpeckers on National Wildlife Refuges. U. S. Fish and Wildlife Service. Southeast Region, Atlanta, GA. 11pp.

Appendix B. Strategy and Guidelines for the Recovery and Management of the Red-cockaded Woodpecker and It's Habitats on National Wildlife Refuges. U.S. Fish and Wildlife Service. U.S. Fish and Wildlife Service. Southeast Region, Atlanta, GA. 42pp.

Appendix C. Summary of Public Comment Received for the Proposal to Implement a Revised Strategy and Guidelines for the Recovery of the Red-cockaded Woodpecker and It's Habitat on National Wildlife Refuges. U.S. Fish and Wildlife Service. Southeast Region, Atlanta, GA.