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

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Abstract: Red-cockaded woodpecker populations declined precipitously following European settlement and expansion and cutting of the original pine forests across the southeastern United States. By 1990 most residual populations lacked demographic viability, existed in degraded habitat, and were isolated from other populations. The primary causes of this situation were harvest of the original pine forests of the southeastern United States, conversion of forested lands to other uses, short-rotation silvicultural practices, and alteration of the fire regime in the regenerated forests. As social and legal mandates changed, management of red-cockaded woodpeckers became a higher priority. Intensive management for red-cockaded woodpeckers is currently practiced on most public and a few private lands that still support populations. Recent population trends and the current status of red-cockaded woodpeckers in Oklahoma, Arkansas, Texas, and Louisiana reflect historical factors and the efficacy of recent management.

Key words: Interior Highlands, *Picoides borealis*, red-cockaded woodpecker, status, West Gulf Coastal Plain.

Populations of the red-cockaded woodpecker have been declining precipitously in recent decades (Jackson 1971, 1978a; Costa and Escano 1989, James 1995). The primary causes of population decline are loss of forested habitat, incompatible silvicultural practices (primarily short-rotation silviculture), alteration of the fire regime, and increasingly serious demographic problems as populations are severely reduced (Jackson 1971, Conner and Rudolph 1989, James 1995, Conner et al. 2001a). The most recent range-wide assessments of the red-cockaded woodpecker population were by James (1995) who reported numbers for 1990, and Costa and Walker (1995) who reported numbers for 1993/1994. James (1995) reported a total of 4,029 active clusters, of which 876 were on the West Gulf Coastal Plain (including the Florida Parishes of Louisiana) and in the Interior Highlands. For the same region, Costa and Walker (1995) reported 976 active clusters, with a range-wide total of 4,694. These totals represent a precipitous decline since the early 1980s, when an estimated 1,474 active clusters existed on the West Gulf Coastal Plain and in the Interior Highlands.

Much has changed since 1990 that has affected red-cockaded woodpecker populations. The scientific and technical knowledge necessary to effectively manage red-cockaded woodpecker populations has continued to improve due to the efforts of many individuals involved in both research and management (U. S. Fish and Wildlife Service 2003, Conner et al. 2001a). It is now possible to articulate a management strategy that identifies the relatively few management objectives that are both necessary and sufficient to recover red-cockaded woodpecker populations (Conner et al. 2001a, Rudolph et al. 2004b, see also U. S. Fish and Wildlife Service 2003).

Social and legal mandates have also continued to change with the result that management of red-cockaded woodpecker populations, especially those on public lands, has intensified. A lawsuit filed against the U. S. Forest Service in Texas in the U. S. Fifth Circuit (Sierra Club et al. v. Lyng et al.) was decided in June 1988 in favor of the plaintiffs. This lawsuit held that the National Forests and Grasslands in Texas violated sections 7 and 9 of the Endangered Species Act of 1973, as amended, in regard to management of red-cockaded woodpecker populations. Repercussions of this suit, some with very negative impacts on red-cockaded woodpeckers, continue in the legal arena (see Discussion). However, the initial result of this ruling in federal court was a significant improvement in the management of red-cockaded woodpecker populations on public lands throughout the range of the species (Conner et al. 2001a).

In view of these changes and the passage of more than a decade, it is an opportune time to assess the current status of the red-cockaded woodpecker. Here we provide current information on populations, recent trends, and some comments on current management in relation to the proposed management strategy (Conner et al. 2001a, Rudolph et al. 2004b) for populations of the West Gulf Coastal Plain and Interior Highlands of Arkansas, Louisiana, Oklahoma, and Texas.

METHODS

Data on all known red-cockaded woodpecker management entities in Arkansas, Louisiana, Oklahoma, and Texas were compiled from records of the U.S. Fish and Wildlife Service, U.S. Forest Service, state natural resource agencies, and owners of private forest lands supporting red-cockaded woodpeckers. For completeness we have included the Florida parishes of Louisiana, which are actually east of the Mississippi River. The basic data requested were the numbers of red-cockaded woodpecker active clusters for 1990 through 2002. Data pertaining to the pre-breeding season were preferred, but not always available. Management entities were generally defined by ownership of land and do not, in most instances, correspond to demographically defined populations.

We also obtained information on basic management activities being applied to each management entity. This information was obtained from managers and from personal knowledge of the authors. The following 3 specific management activities were assessed. The first activity assessed was overall habitat management directed at maintaining or restoring pine-dominated habitat with a suitably low abundance of woody midstory vegetation. Prescribed fire was considered the preferred management tool to achieve suitable habitat conditions, especially in the long-term. Mechanical and chemical treatments were considered appropriate, at least in the short-term. Second, management of cavity availability was assessed in relation to the existing population and to provide for future population increase. Installation of sufficient numbers of artificial cavities for existing groups of red-cockaded woodpeckers, and construction of recruitment clusters with suitable habitat conditions and artificial cavities to provide for future population increase, were considered appropriate. Silvicultural systems that will ultimately provide sufficient numbers of potential cavity trees of suitable age and condition are long-term objectives beyond the scope of this evaluation. Third, we assessed management directed at minimizing the negative effects of demographic deficiencies in small and isolated populations. Translocation of birds and development of suitably positioned recruitment clusters in all but the largest populations were considered appropriate management activities.

These management activities are of particular relevance because they address the 3 critical objectives considered necessary and sufficient to achieve population increase in the management strategy proposed by Conner et al. (2001a) and summarized by Rudolph et al. (2004b, see also U. S. Fish and Wildlife Service 2003). Additional management activities directed at improving vital rates (i.e., control of flying squirrel populations, reduction of rat snake predation) were not considered necessary or cost effective in most instances (Conner et al. 2001a, Rudolph et al. 2004b). Consequently, these management activities were not assessed.

Assessments of the adequacy of current (1998-2002) management activities were based on conversations with managers and personal knowledge of the authors. We made no attempt to quantify management activities; consequently, assessments for individual management entities are highly subjective. Individual red-cockaded woodpecker entities were assigned a level of sufficiency (poor, adequate, good) for each of the 3 management activities. For each management activity, intensity was defined as adequate if the following general criteria were met (see Conner et al. 2001a, Rudolph et al. 2004b for justification of these criteria):

1. Overall habitat management: sufficient pine-dominated habitat provided; midstory control adequate within clusters; prescribed fire as the primary method of managing vegetation structure.
2. Cavity management: sufficient usable cavities present in nearly all occupied clusters; recruitment clusters with suitable midstory condition and suitable cavities present to allow population increase.
3. Demographic considerations: clusters with solitary bird groups received translocated mates in most instances; translocation of multiple pairs to populations of less than 30 groups; recruitment clusters with suitable cavities provided to support population increase; recruitment clusters and translocated pairs located so as to reduce isolation of existing groups. The demographic situation was considered good for large, concentrated populations even without active management.

Adequate management intensity represents our subjective evaluation of the intensity of management required to provide a reasonable probability of population growth. Management intensities substantially better or worse than adequate were considered good or poor, respectively.

RESULTS

A total of 949 active clusters of red-cockaded woodpeckers was reported from the West Gulf Coastal Plain and Interior Highlands for 2002 (Table1). This number falls between the 876 and 976 reported for the same states in 1990 (James 1995) and 1993/1994 (Costa and Walker 1995), respectively. Our estimate for 1990 is 926 groups. Table 1 presents the number of groups for each management entity for 1990-2002. As was the case in 1990, additional clusters undoubtedly exist, at least in Arkansas and Louisiana, primarily on private lands.

An assessment of recent population trend and management intensity for each management entity is presented in Table 2. Based on the criteria used to evaluate trend, 6 management entities are increasing, 12 are decreasing, and 12 are stable; 7 are extirpated. Limited data preclude assessment of 2 entities.

Substantial differences exist in the overall red-cockaded woodpecker population trends on different ownership categories. On national forest lands, populations have increased approximately 12% since 1990, an increase of less than 1% per year. On all other public lands populations have declined approximately 19% since 1990. Populations on military lands (Fort Polk and Peason Ridge) have increased slightly and nearly all others have declined. One substantial population (Felsenthal National Wildlife Refuge) has declined by 64% and accounts for 64% of the non-forest service public land losses. On private lands, red-cockaded woodpeckers have declined by approximately 36% since 1990, including some sites that did not enter the data set until the mid-1990s. Red-cockaded woodpecker populations have not increased on any private land management entity, as delineated in this paper, since 1990, with the partial exception of Temple-Inland lands where birds have been translocated from other sites.

Management intensity for the 3 necessary and sufficient criteria (prescribed fire, cavity management, and translocation of birds) varies widely among management entities (Table 2). Of the 33 entities listed for which information is available, 11 have received adequate or good intensity of management (if required) in all 3 categories, 6 in 2 of the 3 categories, and 16 in less than 2 categories.

ASSESSMENT OF SELECTED INDIVIDUAL "POPULATIONS"

Sam Houston National Forest, Texas

Management intensity is adequate or good for 2 of the 3 management criteria. Prescribed fire, supplemented by some mechanical midstory control, is inadequate with the limited exception of most of the immediate cluster areas. Provisioning of recruitment stands with cavities is likewise limited, primarily due to the inability to manage habitat appropriately. The recent population trend is generally stable by our criteria, although it has

Table 1. Number of active red-cockaded woodpecker clusters in Arkansas, Louisiana, Oklahoma, and Texas for 1990 to 2002 by management entity.

	Year												
Locality	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
National Forests													
Sam Houston NF, TX	134	132	132	140	149	153	156	150	160	168	168	163	165
Davy Crockett NF, TX	29	30	36	37	38	38	40	39	45	49	53	55	55
Sabine NF, TX	9	10	10	15	20	20	22	23	22	25	25	27	31
Angelina NF, TX	24	21	24	27	27	27	23	27	22	20	28	28	27
Ouachita NF, AR	13	16	14	15	16	14	11	13	14	16	21	22	28
Winn District, Kisatchie NF, LA	21	18	18	21	18	12	12	12	14	17	17	18	17
Catahoula District, Kisatchie NF, LA	29	31	31	27	27	26	28	29	29	30	34	30	25
Kisatchie District, Kisatchie NF, LA	68	54	59	67	69	65	63	54	56	56	31	27	30
Vernon Unit, Kisatchie NF, LA	169	174	186	188	186	187	201	198	194	146	152	149	142
Evangeline Unit, Kisatchie NF, LA	43	46	46	50	52	64	67	68	70	72	74	73	79
Crossett Experimental Forest, AR	1-2	2	2	2	2	2	2	2	2	2	2	2	3
National Park Service													
Big Thicket National Preserve, TX	1	1	1	2	2	1	0	0	0	0	0	0	0
National Wildlife Refuges													
Felsenthal NWR, AR	28	NA	NA	NA	20	19	19	15	14	14	11	9	10
Big Branch Marsh NWR, LA									8	9	15	17	
North LA NWR Complex, LA	4	4	5	5	6	6	6	5	5	5	5	5	5
Department of Defense													
Fort Polk, LA	63[a]	NA	NA	30	30	36	40	41	39	41	46	44	40
Peason Ridge, LA	63[a]	NA	NA	NA	24	26	24	23	25	24	23	21	26
State Lands													
Pine City Natural Area, AR	3	2	2	1	1	1	1	1	1	1	1	1	1
Alexander State Forest, LA	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	12	12	10
No. Toledo Bend State Park, LA	0	0	0	0	0	0	0	0	1	1	NA	NA	0
Fontainebleau State Park, LA	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0
McCurtain Co. Wilderness Area, OK	14	NA	9	11	10	9	9	11	11	12	12	11	10
Fairchild State Forest, TX	12	9	8	8	7	7	6	4	4	4	4	4	4
Jones State Forest, TX	15	14	15	15	14	14	14	14	14	14	14	12	12
Huntsville State Fish Hatchery, TX	1	1	1	1	1	1	1	1	1	1	1	1	1
Pine Park, Dept. Transportation, TX	1	1	1	1	0	0	0	0	0	0	0	0	0
Private Industrial Forest Lands													
Potlatch Corp., AR	50	NA	NA	NA	NA	NA	36	39	34	34	28	22	18[b]
International Paper, AR	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0
Plum Creek Timber Co., AR/LA													
Previously Georgia-Pacific	94	75	93	100	94	100	94	NA	88	80	79	71	62
Previously Riverwood	NA	NA	NA	NA	NA	NA	NA	42	34	25	20	20	23
International Paper, LA	6	6	6	5	5	5	5	5	3	3	2	2	2
Temple-Inland, LA	29	29	29	29	28	30	30	30	23	21	22	21	20
Other industrial lands, AR/LA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50	55
Temple-Inland, TX, non-HMA	18	18	18	15	13	12	10	9	7	7	7	7	4
Temple-Inland, TX, HMA	4	4	4	4	4	4	4	4	5	5	8	8	12
Louisiana Pacific, TX	NA	NA	NA	NA	13	12	9	8	8	7	7	7	2
Heartwood Forest Land Fund, TX	NA	5	5	5	3	3	3	3	3	3	3	7	9
Private Non-industrial Forest Lands													
Ross Foundation, AR	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6
Pushmataha County, OK	1	1	1	1	?	0	0	0	0	0	0	0	0
Alabama-Coushatta Indian Reservation, TX	5	5	5	3	3	2	2	1	1	1	2	2	0
Cook's Branch, TX	15	NA	NA	10	10	10	10	NA	NA	NA	NA	12	13
Other private, TX	8	1	NA	NA	NA	NA	1	1	1	1	3	3	3

[a]Combined number of clusters for Ft. Polk and Peason Ridge.
[b]Numbers for 1996-2000 may be inflated due to partial surveys each year.

increased since 1990. A small decline was evident in 2002. This "population" is also the primary West Gulf Coastal Plain donor of red-cockaded woodpeckers for translocation throughout the 4 states of Arkansas, Louisiana, Oklahoma, and Texas. The translocation of 166 individuals out of the population since 1997, and additional birds prior to 1997, has not resulted in a consistent population decline. It is, however, becoming increasingly difficult to maintain population stability on this forest due to a lack of sufficient prescribed fire.

Davy Crockett National Forest, Texas

Management intensity is adequate or good for all 3 criteria and the population trend is increasing. The prescribed fire regime, supplemented by substantial mechanical midstory control, is the best of the 4 national forests in Texas. The population is currently above the limit for eligibility to receive birds from the translocation program. Maintaining and increasing the prescribed fire regime is the greatest challenge for managers of this population.

Angelina and Sabine National Forests, Texas

These 2 national forests are similar in most respects and are combined in this discussion. Management intensity is adequate for 2 of the 3 critical criteria and the population trends are stable for both forests. The prescribed fire regime is currently inadequate due to court injunctions related to a federal lawsuit brought by the Sierra Club and Texas Committee on Natural Resources (a regional environmental group). These legal challenges currently enjoin these forests from conducting prescribed fires for management of red-cockaded woodpecker habitat. Cavity management and translocation efforts have been adequate on these forests, but improvement is hampered by limitations on number of birds available for translocation. Population trends since 1990 have responded primarily to changes in midstory control. Limitations on prescribed burning due to legal challenges are the critical factor preventing population increase.

Ouachita National Forest, Arkansas

The Ouachita National Forest has committed to landscape-scale restoration of shortleaf pine (Pinus echinata)-bluestem (*Schizachyrium spp.*) communities, in part to support recovery of the red-cockaded woodpecker population. All 3 management criteria are adequately addressed and the population is increasing. The Ouachita National Forest currently has the most aggressive landscape-scale habitat restoration program for red-cockaded woodpeckers based on prescribed fire in the 4-state area.

Winn and Catahoula Districts, Kisatchie National Forest, Louisiana

Cavity management is the only critical management criteria adequately addressed on these 2 districts, although limited investment is made in habitat management and translocation of birds. These 2 populations have been essentially stable since 1990. A minimal prescribed burning program and a lack of available birds for translocation are the primary problems preventing population increase on these 2 forests.

Kisatchie District, Kisatchie National Forest, Louisiana

Management on the Kisatchie District is inadequate for all 3 critical criteria. Consequently, this population has undergone a severe decline (47% from 1989 to 2000; R. Costa, U. S. Fish and Wildlife Service, unpublished data) in recent years. In addition, inadequate population monitoring has also prevented detailed tracking of population declines. Recent management deficiencies are currently being addressed.

Calcasieu District (Vernon portion), Kisatchie National Forest, Louisiana

The Vernon portion of the Calcasieu District has served as a donor population during the 1990s. Management intensity has been good for 2 of the 3 criteria in recent years. The intensity of cavity management has been minimal. The population was reported as increasing or stable through 1998. However, between 1999 and 2001 a decrease of over 30% was reported. A decrease of this magnitude in a large population inhabiting good habitat, even in the absence of adequate cavity management, is remarkable. It is likely that a period of inadequate population monitoring followed by improved monitoring led to the perceived change. Unfortunately, uncertainty surrounding the recent population data for this population has resulted in nearly complete cessation of its use as a donor population since 1999. As 1 of only 2 potential donor populations west of the Mississippi River, this development has had substantial repercussions on the management of numerous other populations due to limitations on the number of birds available for translocation.

Calcasieu District (Evangeline portion), Kisatchie National Forest, Louisiana

Management of the Evangeline portion of the Calcasieu District has been adequate for all 3 critical criteria. It is above the threshold for receiving translocated birds. The population has been increasing in recent years, and could soon be eligible to serve as a donor population for the translocation program.

Big Branch Marsh National Wildlife Refuge, Louisiana

This is a newly established national wildlife refuge with a moderate population of red-cockaded woodpeckers formerly in private ownership. Intensive management is being initiated but it is too early to evaluate the outcome.

North Louisiana National Wildlife Refuge Complex, Louisiana

The small red-cockaded woodpecker population on this complex of 3 refuges is decreasing on a very limited land base. However, active land acquisition, some with

Table 2. Management intensity and population trends for red-cockaded woodpeckers on the West Gulf Coastal Plain and Interior Highlands during 1998-2002.

Locality	Habitat	Cavity management	Demographics	Population trend
National Forests				
Sam Houston NF, TX	Poor	Good	Adequate	Stable
Davy Crockett NF, TX	Adequate	Good	Adequate	Increasing
Sabine NF, TX	Poor	Good	Poor	Increasing
Angelina NF, TX	Poor	Good	Poor	Stable
Ouachita NF, AR	Good	Good	Adequate	Increasing
Crossett Experimental Forest, AR	Adequate	Good	Adequate	Stable
Winn District, Kisatchie NF, LA	Poor	Adequate	Poor	Stable
Catahoula NF, Kisatchie NF, LA	Poor	Adequate	Poor	Decreasing
Kisatchie District, Kisatchie NF, LA	Poor	Poor	Poor	Decreasing
Vernon Unit, Kisatchie NF, LA	Good	Poor	Adequate	Decreasing
Evangeline Unit, Kisatchie NF, LA	Adequate	Adequate	Adequate	Increasing
National Park Service				
Big Thicket National Preserve, TX	Adequate	Poor	Poor	Extirpated
National Wildlife Refuges				
Felsenthal NWR, AR	Adequate	Poor	Poor	Decreasing
Big Branch Marsh, NWR, LA	NA	NA	NA	NA
North LA NWR Complex, LA	NA	NA	NA	NA
Department of Defense				
Fort Polk, LA	Good	Adequate	Good	Stable
Peason Ridge, LA	Good	Adequate	Good	Stable
State Lands				
Pine City Natural Area, LA	Adequate	Good	Adequate	Stable
Alexander State Forest, LA	?	?	?	?
Fontainebleau State Park, LA	Poor	Poor	Poor	Extirpated
North Toledo Bend State Park, TX	Poor	Poor	Poor	Extirpated
Fairchild State Forest, TX	Adequate	Good	Poor	Decreasing
Jones State Forest, TX	Adequate	Good	Adequate	Stable
Huntsville Fish Hatchery, TX	Adequate	Good	Adequate	Stable
Pine Park, Dept. Transportation, TX	Poor	Adequate	Poor	Extirpated
McCurtain Co. Wilderness Area, OK	Poor	Good	Poor	Stable
Private Industrial Forest Lands				
Potlatch Timber Co., AR	?	?	?	Decreasing
International Paper Co., AR	Poor	Poor	Poor	Extirpated
Plum Creek Timber Co., AR/LA	?	?	?	Decreasing
International Paper Co., LA	Poor	Poor	Poor	Decreasing
Temple-Inland, Inc., LA	Adequate	Good	Poor	Declining
Other industrial lands, LA	?	?	?	?
Temple-Inland, Inc., TX (non-HMA)	Adequate	Poor	Poor	Decreasing
Temple-Inland, Inc., TX (HMA)	Good	Good	Adequate	Increasing
Louisiana-Pacific, TX	Adequate	Adequate	Poor	Decreasing
Heartwood Forest Land Fund, TX	Good	Good	Adequate	Increasing
Private Non-industrial Forest Land				
Ross Foundation	Adequate	Adequate	Poor	Stable
Pushmataha County, OK	?	?	Poor	Extirpated
Alabama-Coushatta Indian Reservation, TX	Poor	Poor	Poor	Extirpated
Cook's Branch, TX	Adequate	Adequate	Poor	Stable
Other private lands, TX	Poor	Poor	Poor	Decreasing

a fair number of red-cockaded woodpecker groups, is ongoing. Management is intensifying and it is too early to evaluate the outcome.

Felsenthal National Wildlife Refuge, Arkansas

Management is not adequate for any of the critical criteria. Consequently, the population is declining. Felsenthal National Wildlife Refuge can potentially support a substantial population of red-cockaded woodpeckers and is adjacent to a red-cockaded woodpecker management area owned by Plum Creek Timber Company that also has considerable potential. With appropriate management this area could support a much larger population.

McCurtain County Wilderness Area, Oklahoma

The only remaining red-cockaded woodpeckers in Oklahoma are located on this state wilderness area established in 1918. Fire suppression was intense until recent efforts to use prescribed fire to manage red-cockaded woodpeckers were initiated. Restrictions on the use of prescribed fire are still limiting, precluding an aggressive translocation program. The population is currently stable at approximately 10-12 groups following a decline from 29 in 1977.

Fort Polk Military Reservation, Louisiana

The birds on Fort Polk are part of the larger population on the Vernon portion of the Calcasieu District of the Kisatchie National Forest. Habitat management using fire is good, and along with Peason Ridge, is probably the best west of the Mississippi River. As part of a large population the demographic situation is good. However, cavity management has been inadequate for a number of years. Consequently the population has been declining. Recent efforts to improve the availability of cavities will hopefully reverse this trend.

Peason Ridge Military Reservation

Habitat management using fire is good on this military installation. Cavity management is also good. Demographics began to be addressed in 2001/2002 with excellent results. Prior to 2001 the population had been essentially stable.

Fairchild State Forest, Texas

Management is adequate for 2 critical criteria, but translocation has not been part of the management in this small population. Consequently, the population is in decline and extirpation is imminent.

Jones State Forest, Texas

Management is adequate for 2 criteria. The ability of managers to use prescribed fire is severely constrained due to residential development immediately adjacent to the state forest (i.e., the Greater Houston Area), precluding effective management of vegetation structure. Although the population is small, essentially all habitat is presently occupied and translocation is not currently required. The population is currently stable.

Plum Creek Timber Company, Arkansas and Louisiana

Plum Creek Timber Company currently manages a substantial number of woodpecker groups in Arkansas and Louisiana. All of these groups were previously managed by Georgia Pacific Company and Riverwood until their lands were purchased by Plum Creek Timber Company. The current management plan is to consolidate the red-cockaded woodpecker population on 2 management areas with a combined population objective yet to be determined. Current management on the designated areas is good for each of the critical management needs. Management is less intense on the other areas pending consolidation of the birds on the designated management areas.

Temple-Inland, Inc., Texas and Louisiana

Temple-Inland is in the process of consolidating their red-cockaded woodpeckers on designated management areas, Scrappin' Valley in Newton Co., Texas and several areas in western Louisiana. Management is currently good for all 3 critical management needs on the designated management areas. Management is less intense in other areas as the birds are actively being relocated to the designated areas.

DISCUSSION

It is obvious from an examination of the data reported above that the change in the reported number of active clusters from 1990 to 2002 is due to a combination of changes in numbers of active clusters and missing data. Information from private lands is particularly incomplete due to a lack of data as well as reluctance of private landowners to divulge information concerning a federally listed endangered species. Therefore, for 2002, the numbers reported remain below the actual number of active clusters within the region assessed. Despite this shortcoming, a reasonably clear picture of population change during the period from 1990 to 2002 emerges.

As of 2002 the red-cockaded woodpecker remains extirpated from its historic range in Missouri, the Ozark highlands of Arkansas and Oklahoma, and most of the Oklahoma range except for a remnant population in the southeastern portion of the state. Throughout the rest of the West Gulf Coastal Plain and Interior Highlands remnant populations remain reasonably widely distributed.

The overall results of more than a decade of "intensive management" of the red-cockaded woodpecker are depressingly minimal. Populations on all national forests within the 4-state region have only increased by 12% since 1990, less than 1% per year. Given the level of resources expended during this period, this is a major cause for concern. Other populations on U.S. Fish and Wildlife Service lands, military installations, and state and private lands have been stable at best, although lack of detailed data from private lands makes assessments difficult in some cases.

Recent population trends in the western portion of the range of the red-cockaded woodpecker are quite variable and several factors are involved. The most pervasive problem is lack of sufficient prescribed fire to restore and maintain appropriate habitat. With a few notable exceptions (i.e., the Vernon Unit of the Kisatchie National Forest, Fort Polk, Peason Ridge, Ouachita National Forest), red-cockaded woodpecker populations occupy habitat that could be substantially improved with a more intensive prescribed fire regime. In other cases clusters are treated adequately using fire, mechanical, or chemical means, but management of the foraging habitat is inadequate or nonexistent.

Regulations governing prescribed burning, smoke management issues, fragmented ownerships, federal air quality regulations, limited resources, and legal challenges currently limit the use of prescribed fire. Most, if not all, of these impediments will likely become more severe in the future. The legal challenges that currently prohibit the use of prescribed fire for woodpecker habitat management on the Angelina and Sabine National Forests are particularly disturbing. The Sierra Club and Texas Committee on Natural Resources have, while expressing concern for the management of red-cockaded woodpeckers and the fire-maintained pine ecosystem as a whole, challenged the use of prescribed fire. They have achieved considerable success in the federal courts to the detriment of fire-maintained ecosystems. Should these types of challenges succeed and proliferate, management of fire-maintained ecosystems and the high biodiversity they contain, including red-cockaded woodpeckers, will become impossible.

The designation of urban areas as non-attainment areas under the U.S. Clean Air Act is placing increasing restrictions on the ability of land managers to conduct prescribed burning. Currently, this constraint is most detrimental on the Sam Houston National Forest, the second largest population in the 4 states west of the Mississippi River. Smoke management issues are also increasing rapidly as roads, vehicular traffic, and suburban and rural development expand in the highly fragmented property ownership patterns that exist in the region.

The management of cavity availability is more encouraging. Artificial cavity technology (Copeyon 1990, Allen 1991) and the understanding of the necessity of providing adequate cavities (Walters et al. 1992a) have resulted in, at a minimum, adequate management of this critical resource in most populations within the region. It is anticipated that the need to actively manage for cavity availability will decline in the future as silvicultural practices are adjusted to provide sufficient older pines for cavity excavation by red-cockaded woodpeckers. A frequent concern of individuals directly responsible for management of red-cockaded woodpeckers is, that while cavity management is primarily their responsibility and is usually accomplished, other aspects of management, prescribed fire in particular, require cooperation from others, and these management needs are much less likely to be accomplished.

Management to minimize demographic problems is also a major concern. Most red-cockaded woodpecker populations in the region are currently small and isolated. Some, primarily on private lands, are not viable on the current landscape, and will disappear or be removed in various mitigation programs. Others exist in blocks of habitat too small to support a demographically viable population, and will require continued intensive management even after carrying capacity is achieved. However, several populations, once they reach carrying capacity or stated population goals, will be of sufficient size to be reasonably viable and will require minimal management to address demographic concerns.

In order to set translocation strategies and priorities, an informal regional consortium of federal and state agencies and private landowners with management responsibilities for red-cockaded woodpeckers has been organized, the Western Range Translocation Cooperative. The goal of this consortium has been to maximize the numbers of red-cockaded woodpeckers translocated and to efficiently achieve recovery of the numerous small populations in the region (Saenz et al. 2002). The framework exists to efficiently solve the demographic problems of red-cockaded woodpecker populations of the West Gulf Coastal Plain and Interior Highlands.

In the short-term, however, serious deficiencies exist. Only 2 populations with a minimum of 100 groups are present in the 4 states, the Sam Houston National Forest and the Vernon portion of the Kisatchie National Forest, to serve as donor populations. Only the Sam Houston National Forest currently has a stable to increasing population trend. Limitations on the number of red-cockaded woodpeckers available for translocation prevent many populations from obtaining birds for translocation in most years. As a result, despite a well-coordinated reintroduction program, management has not yet raised a single population to the threshold above which they are no longer eligible to receive birds (30 potential breeding groups) since translocation efforts began in the early 1990s. The situation has deteriorated significantly in the last several years because birds have not been available from the Vernon population due to lack of reliable population trend data, and possible population declines. It is imperative that this problem is resolved quickly so that this donor population can again provide birds for translocation. Without a substantial and timely translocation effort, numerous populations will remain small for extended periods and require more intensive and costly management to achieve their ultimate recovery.

The possibility also exists for management to increase the size of 1 or more medium-sized populations to a minimum of 100 groups so that they would then be eligible to become donor populations. The Davy Crockett National Forest and the Evangeline Unit of the Kisatchie National Forest are the best candidates at the present time. Unfortunately, the Kisatchie District of the Kisatchie National Forest, which was in a similar situation in the mid-1990s, has declined severely, and was itself a recipient of translocated birds in 2001-2002. Additional donor populations would provide the dual benefits of additional numbers of birds for translocation and reduce the dependence on the current donor population.

The translocation effort is also severely hampered by the lack of sufficient habitat management, primarily prescribed fire, to allow the establishment of suitable recruitment stands complete with artificial cavities. Consequently, managers of many small populations do not even request birds for translocation each year. This problem seems to be increasing in severity in recent years.

The management strategy proposed by Conner et al. (2001a) consists of a small number of necessary and sufficient management objectives. The biological knowledge and means of implementation are generally well understood for this species. The implementation of these objectives--habitat management primarily to produce a fire-maintained ecosystem with suitable levels of woody midstory vegetation, provisioning of adequate usable cavities, and management of demographic deficiencies--is straightforward. Populations across the range of the red-cockaded woodpecker in which these management objectives have been met have responded with rapid population increases, often in excess of 5% per year (Rudolph et al. 2004b). The management strategy works well. Conversely, lack of appropriate management leads to population decline and eventual extirpation (Saenz et al. 2001b).

Overall red-cockaded woodpecker populations of the West Gulf Coastal Plain and Interior Highlands have been relatively stable since 1990. A few have increased, but most have remained stable or decreased. With a management strategy that is capable of producing annual population increases of 5-10%, it is abundantly clear that management intensity has been insufficient to realize adequate rates of population increase in most instances.

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