



Biological Assessment of the Effects of the Proposed Revision of the 1994 "Management Guidelines for the Red-cockaded Woodpecker on Army Installations"

by
Timothy J. Hayden

This biological assessment evaluates the effects on threatened or endangered species of implementing the proposed revision to the 1994 "Management Guidelines for the Red-cockaded Woodpecker (RCW) on Army Installations" in compliance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended. These Department of the Army guidelines provide programmatic guidance for managing RCW populations and habitats on Army installations.

This assessment determines that, based on available knowledge, implementing the proposed revision may affect the endangered RCW. Although some individual RCWs and habitat may be subject to greater training activity and resulting disturbance under the proposed revision, this programmatic guidance, when implemented, is expected to stabilize and expand RCW populations on Army installations where this guidance is implemented. This assessment determines that implementation of the proposed revision will have no adverse effect on other listed species considered in this assessment.

Fully implemented, it is anticipated the proposed revision will meet conservation objectives for the RCW, assist species recovery, fulfill regulatory requirements of the ESA, and alleviate current restrictions on Army training.



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Foreword

This study was conducted for Headquarters, Department of the Army under Military Interdepartmental Purchase Request (MIPR) No. 3446; Work Unit NE6, "Biological Assessment and Environmental Assessment for Proposed Revision to the Army Red-Cockaded Woodpecker Management Guidelines." The technical monitors were Phil Pierce, DAIM-ED-N; MAJ Tom Ayres, DAJA-EL; and MAJ Mark Lindon, DCSOPS. Scott Belfit was Contract Officer Representative for the Army Environmental Center.

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1 Introduction

1.1 Background

The primary mission of the Army is to train and prepare troops to fight and win military conflicts anywhere in the world on terms favorable to the United States and its allies. In support of the National Military Strategy, Army installations provide the platforms from which the Army sustains and projects its forces. Realistic training conducted at Army installations is a key facet of current Army doctrine. Field Manual (FM) 100-5 (June 1993) describes the relationship between training and readiness; "On the day of battle, soldiers and units will fight as well or poorly as they are trained. Training to high standards is essential in both peace and war; never can Army forces afford not to train and maintain the highest levels of readiness. Every commander, every soldier, every unit in a force-projection army must be trained and ready to deploy."

The Army must maintain an adequate land base that meets current and future requirements for realistic training and operations in support of its mission. The leadership of the Department of Defense (DoD) recognizes that to fulfill long-term mission requirements, the military must achieve environmental objectives of sustainability of training lands and full compliance with conservation requirements under law. The Army is committed to maintaining its role as a national leader in the conservation of threatened and endangered species on Army lands (AR 200-3, Chapter 11).

The red-cockaded woodpecker (*Picoides borealis*, RCW) was listed as federally endangered in 1970, becoming one of the first species protected by the Endangered Species Act (ESA) of 1973, as amended. This species historically was found throughout the pine woods and savannahs of the southeastern United States, and its historical range encompasses military installations in several southeastern states. Existing RCW populations on military lands play an increasingly important role in the recovery of this species because populations have declined throughout much of the RCWs range due to fragmentation and loss of critical nesting habitat.

In 1994, in an effort to meet conservation obligations under the ESA, the Army developed programmatic guidance for management of RCWs on Army lands. The 1994 "Management Guidelines for RCWs on Army Installations" (Appendix A) established procedures for

determining installation population goals, inventory and monitoring requirements, management and forestry practices, and protective measures for RCWs and their habitat on Army lands. The 1994 guidelines were a significant milestone in implementing state-of-the-art management practices to enhance RCW conservation on Army lands. However, training restrictions due to the presence of RCWs on Army lands continued to impact mission readiness.

This issue came to light in the spring of 1995 during hearings before the Senate's Environment and Public Works Committee. At the hearings, the idea of exempting military installations from compliance with Endangered Species Act was discussed. An amendment to Senate Bill S.503 addressing the possibility of exemptions to military installations was introduced and withdrawn by Senator Jesse Helms (R-NC). Both the Department of the Interior and Department of the Army testified that no additional exemption process was necessary for military installations. The hearings, however, highlighted that training restrictions due to the presence of RCWs negatively impacts training realism, and in some specific cases, compromises unit readiness (Appendix B; "Questions and Answers of MG Richard E. Davis to the Committee on Environment and Public Works").

Subsequent to the hearings, the Secretary of the Interior contacted the Secretary of the Army in order to determine if action could be taken to resolve the perceived conflicts (29 June 1995, letter by Bruce Babbitt). In response, the Secretary of the Army instructed that members of his staff meet with the U.S. Fish and Wildlife Service (USFWS) to determine measures that would enhance realistic training while continuing the conservation and recovery of the RCW (20 July 1995, letter by Togo West). Consequently, the Army reconstituted the Endangered Species Team (EST) which had facilitated development and approval of the 1994 "Management Guidelines for Red-cockaded Woodpeckers on Army Installations."

The EST is comprised of representatives of the Assistant Chief of Staff of Installation Management (ACSIM), the Deputy Chief of Staff for Operations and Plans (DCSOPS), and Office of the Judge Advocate General, Environmental Law Division (ELD). The task of the EST is to work with the USFWS to find solutions to maintain mission readiness while continuing to effectively meet RCW conservation requirements on Army lands.

The EST first met with the USFWS in Washington D.C. on 31 July 1995. Subsequent

meetings through the end of 1995 revealed two major areas of concern. First, definition of training activities restricted in RCW habitats detailed in the Army's 1994 RCW management guidelines did not adequately reflect conduct and requirements of the training mission. Second, the 1994 RCW management guidelines failed to provide sufficient measures for military installations to assist attaining recovery populations while allowing access to an adequate land inventory for mission essential training. In response to resolving these two issues, the EST has proposed a revision to the 1994 "Management Guidelines for Red-cockaded Woodpeckers on Army Installations."

1.2 Objective

The objective of this biological assessment is to assess the effects of implementing the proposed revision of the 1994 Army RCW guidelines on RCW populations and other threatened or endangered species on Army installations.

1.3 Scope

The action of concern in this assessment is implementation of the proposed revision of the 1994 Army RCW management guidelines. Full text of the 1994 guidelines is provided in **Appendix A**. Text of the proposed revision is provided in **Appendix C**.

The 1994 Army guidelines provide the baseline for evaluating effects of the proposed revision. Effects of the 1994 Army RCW guidelines were determined in a biological assessment dated 10 February 1994 (Hayden and Carter 1994). This assessment only evaluates proposed revisions to the 1994 Army guidelines (**Appendix A**). In general, biological management of active RCW clusters and foraging habitats, including forest management practices, remain unchanged under the proposed revision. The focus of this assessment therefore will be on the following proposed changes:

- Definition of installation population goals.
- Additional recruiting and provisioning measures to assist reaching regional recovery goals.
- Configuration of RCW buffer zones relative to allowable training activities.

- Allowable training activities within protective buffer zones.
- Monitoring requirements to assess effects of training on RCWs and associated habitats.
- Remedial actions to mitigate potential effects of training on RCWs and associated habitats.

Army installations subject to the proposed revision are the same as those subject to the 1994 Army guidelines (Table 1). The 1994 Army RCW guidelines and the proposed revision are Department of Army initiatives. The scope of this biological assessment is limited to those Army installations with lands under Department of Army management authority that meet the following criteria:

- Installations with currently active RCW cluster sites.
- Installations with inactive cluster sites that installations continue to manage to promote reactivation.

Nine Army installations (Table 1) meet the above criteria. In general, only those installations with significant training and operations of combat and combat support units will be affected by changes under the proposed revision. These installations include Fort Benning, Fort Bragg, Fort Gordon, Fort Jackson, Fort Polk, and Fort Stewart. Active RCW cluster sites currently are known to occur on seven Army installations subject to the current guidelines. Two installations, Louisiana Army Ammunition Plant and Fort McClellan, had RCW populations historically and are managing habitat associated with inactive cluster sites to some extent.

National Guard installations are not subject to the 1994 Army guidelines or the proposed revision and are not considered in this assessment. These lands are owned primarily by the states and/or Department of Agriculture, U.S. Forest Service. Natural resource management on these installations is the responsibility of the States and the Forest Service, not the Department of Army.

Table 1. Army installations subject to the proposed revision of the 1994 "Management Guidelines for RCWs on Army Installations."

Installation	State	Population Status
Fort Benning	Georgia	RCWs present
Fort Bragg	North Carolina	RCWs present
Fort Gordon	Georgia	RCW present
Fort Jackson	South Carolina	RCWs present
Fort McClellan	Alabama	Historical population
Fort Polk	Louisiana	RCWs present
Fort Stewart	Georgia	RCWs present
Louisiana Army Ammunition Plant	Louisiana	Historical population
Sunny Point Military Ocean Terminal	North Carolina	RCWs present

Although the Army conducts activities on private, state, and federal lands that are not under the Army's direct management authority, the Army is still responsible for effects of its activities on threatened and endangered species occurring on these lands. To achieve recovery objectives, it will be in the Army's interest to assist, where possible, in conservation initiatives on non-Army lands. However, ultimate management authority on these lands rests with the responsible land owner or agency.

1.4 Approach

To assess effects of the proposed revision, reviews were conducted of pertinent scientific literature, literature reviews, installation biological assessments and opinions, other installation environmental regulatory documentation, and unpublished data and personal communications. Installation site descriptions and current status and trends of RCW

populations and habitats were solicited from installations. Site visits were conducted to selected installations to obtain additional site-specific data and obtain expert views of installation biologists and installation trainers. This included site visits by installation biologists, Army trainers and representatives of the USFWS to Fort Stewart and Fort Bragg during 27-29 March to observe training activities relevant to the proposed revision. Drafts of this assessment were submitted to installation biologists and trainers, Army Major Commands (MACOMS), and the EST for review and comment.

Based on the best scientific data available and professional judgement of Army biologists and trainers, an assessment was made of the effects of implementing the proposed revision of the 1994 Army RCW management guidelines on threatened or endangered species occurring on Army installations subject to the proposed revision. This assessment represents the best professional judgement of Army expertise on the known and anticipated effects of implementing the proposed revision. Background and qualifications of many of the Army natural resource managers and biologists who contributed to this assessment and participated in discussions between the Army and USFWS are provided in **Appendix D**. Collectively, these biologists represent 63 years experience working in natural resource management and research on Army installations. Most of this experience has been working with endangered species, predominately related to RCW management on Army lands. Other individuals who provided information and review are acknowledged in the **Foreward** of this assessment.

1.5 Mode of Technology Transfer

This biological assessment will be submitted to the U.S. Fish and Wildlife Service in compliance with Section 7, Endangered Species Act of 1973, as amended and implementing regulation 50 CFR Part 402.

2 Site Descriptions

The objective of the following site descriptions is to provide a brief summary of the location, history, physical environment, and military activities for each installation subject to the proposed revision of the 1994 "Management Guidelines for RCWs on Army Installations." The following site descriptions update information provided in the biological assessment (Hayden and Carter 1994) of the 1994 Army RCW guidelines.

2.1 Fort Benning, Georgia

2.1.1 Mission and History

The primary mission of the installation is to support the U.S. Army Infantry School (USAIS). Currently, USAIS has 30 courses for officers and non-commissioned officer professional development with combined-arms oriented instruction. Fort Benning is under U.S. Army Training and Doctrine Command (TRADOC), but has significant Forces Command (FORSCOM) activities.

Fort Benning was established on 7 October 1918 for the purpose of consolidating three widely dispersed infantry schools and became a permanent military installation on 8 February 1922.

2.1.2 Physiographic and Habitat Features

Fort Benning covers 73,325 contiguous hectares in Georgia's Muscogee and Chattahoochee counties (68,438 ha) and Alabama's Russell county (4887 ha). It is bounded on the north and west by the City of Columbus, Georgia.

The installation is located in the Fall Line Sandhills of the Atlantic Coastal Plain Province. A small portion of the reservations northern edge is classified as Midland Section of the Piedmont Province. Soils range from sands to clays but are primarily sands in the Sandhill physiographic region where Fort Benning is located. As erosion dissected the area, the more resistant sands remained in place, becoming the present uplands. More erodible clay silts and finer sands were deposited in drainages.

Pine and mixed pine-hardwood are the major upland habitat associations occurring on Fort Benning. In this habitat, pines dominate (longleaf, loblolly, and shortleaf), usually occurring in mixed species associations.

The Chattahoochee River is the prominent aquatic feature on the installation, and is fed by Upatoi Creek, Uchee Creek and numerous smaller tributaries. Significant wetlands, swamps, and bottomland hardwood associations occur throughout the installation.

2.1.3 Military Activities

2.1.3.1 Mission Activities and Force Structure:

Total annual student input of the USAIS is 34,375 with an average daily load of 3,400. The Infantry Training Brigade conducts One Station Unit Training for infantry soldiers with an annual trainee load of 17,000 and an average daily load of 4,700. FORSCOM units that use maneuver areas include the 3rd Brigade, 24th Infantry Division and 36th Engineer Group. Special Operations Command units also train here, including the 75th Ranger Regiment Headquarters and the 3rd Battalion, 75th Ranger Regiment. These units, coupled with the Reserve Component units and visiting armed services total a military strength of 24,000 personnel.

2.1.3.2 Maneuver and Aviation:

Squads through brigades conduct exercises including attack, defensive, retrograde and delayed maneuvers. The full range of troop and vehicle (wheeled and tracked) maneuver activities associated with these activities are conducted on Fort Benning. Units assigned helicopters conduct training which includes nap of the earth flights, night vision training, tactical airlift, and support of ranger and pathfinder classes.

2.1.3.3 Weapons Live Fire:

Weapons sustainment and qualification training for all units include small arms, machine guns, grenade launchers, hand grenades, anti-armor weapons, mortars, mines, artillery, Bradley Fighting Vehicles, tanks, helicopters, and Air Force tactical aircraft.

2.1.3.4 Training Areas/Ranges:

There are 60 ranges designed to support a diversity of requirements. Most ranges accommodate multiple weapons systems for multiple echelons of training and to satisfy requirements for qualification and sustainment training. Live-fire areas are characterized by target areas, impact areas, surface danger, and permanent dud areas. The majority of live-fire ranges are located around three major impact areas. Approximately 24,222 ha are dedicated to live-fire ranges/areas. Most of the remaining training area (approximately 44,408 ha) is available for maneuver exercises. Some areas are dedicated to specific training activities including land navigation, airborne drop zones, aircraft landing strips and individual tactical training exercises. Because most of the area is forested, maneuver training is restricted and channeled.

2.2 Fort Bragg, North Carolina

2.2.1 Mission and History

The primary mission of Fort Bragg is the training, logistical, and mobilization deployment support of the XVIII Airborne Corps. Fort Bragg is a FORSCOM installation. Camp Mackall is a subsidiary training facility under Fort Bragg administration and is located approximately 13 km southwest of Fort Bragg.

"Camp" Bragg began as a field artillery training site in 1918, becoming a permanent Army installation, Fort Bragg, in 1922. Airborne training at Fort Bragg began in 1942, with all five World War II airborne divisions training at the installation. Beginning in 1980, Armor, Artillery, and Mechanized Infantry Reserve Component units utilized Fort Bragg for Inactive Duty Training and Annual Training in addition to the airborne mission. The 82nd Airborne Division was assigned to Fort Bragg at the end of World War II. In 1951, the XVIII Airborne Corps was organized at Fort Bragg. The Psychological Warfare Center (now U.S. Army Special Operations Command) was established in 1952, and Fort Bragg became headquarters for Special Forces soldiers. During the Vietnam War period, 1966-70, more than 200,000 soldiers took basic combat training at the installation. Camp Mackall was established in 1943 to meet World War II training requirements.

2.2.2 Physiographic and Habitat Features

Fort Bragg encompasses 58,136 ha in Cumberland, Moore, Hoke, and Harnett counties, located between the cities of Southern Pines and Fayetteville, North Carolina. Camp Mackall consists of 2641 ha in Scotland and Richmond counties, North Carolina.

Fort Bragg and Camp Mackall are located in the Sandhills Region of North Carolina's Upper Coastal Plain. The topography is gently rolling. Upland soils on Fort Bragg include Blaney loamy sand, Gilead loamy sand, Candor Sand, and Lakeland sand. These soils typically are well drained and low in fertility. Soils in drainages generally are classified as Johnston loam and are usually richer and poorly drained. Predominate soils on Camp Mackall are Lakeland sand and Gilead loamy sand.

Forests on the upper sandy ridges of Fort Bragg are dominated by longleaf pine mixed with scrub oaks and associated with wiregrass. Loblolly pine is more common near creek bottoms. Pond pine, bald cypress, and Atlantic white cedar are the dominant overstory species in creek bottoms. Overstory hardwoods in creek bottoms are typically black gum (*Nyssa biflora*) and red maple (*Acer rubrum*). A diverse midstory of broadleaf shrubs occurs in mesic sites. Vegetation on Camp Mackall is similar to that found on Fort Bragg.

Fort Bragg watersheds drain north into James Creek and Little River and south into Rockfish Creek, part of the Cape Fear River Basin. Camp Mackall watersheds drain into Drowning Creek, Big Muddy Creek, and Beaver Dam Creek as part of the Lumber River Basin.

2.2.3 Military Activities

2.2.3.1 Mission Activities and Force Structure:

Fort Bragg is the most active military installation in the United States and serves as one of the Army's major troop bases and training installations. Approximately 44,000 military personnel are assigned to Fort Bragg. Tenant units include the 82nd Airborne Division, the Army Special Operations Command, 1st Corps Support Command, 10th Corps Artillery, and Headquarters First ROTC Region. Other tenant units include eight diverse brigades attached to the XVIII Airborne Corps, the JFK Special Warfare Center and School, and Womack Army Medical Center. Reserve units and the North Carolina and South Carolina National

Guards regularly conduct training at Fort Bragg. Five battalions of the 10th Marine Regiment annually spend two 3-week periods training at Fort Bragg.

Significant training also occurs on the Sandhills Game Lands next to Camp Mackall and on nearby National Forest Lands. However, RCW management on these lands is the responsibility of other agencies, so these lands are not considered further in this assessment. Restrictions to military activities in RCW colonies apply in these areas.

2.2.3.2 Maneuver and Aviation:

Maneuver and training exercises are conducted at all levels of command from platoon to brigade level to ensure combat readiness. Some exercises bring the equivalent of a division (10,000-15,000 soldiers) into the field. Battalion size elements (300-1000 soldiers) are the greatest users of training areas. Unit training typically includes ground movements, air operations, weapons firing, and development of bivouac and defensive positions. Exercises are conducted year-round and 24 hours per day, averaging 2 million man-days per year during the last five years (over 3 million man-days in FY95). Maneuver activities include troops on foot and both wheeled and tracked vehicles. Approximately 3,000-4,000 paradrops (120,000-175,000 personnel) and 2,000-4,000 equipment drops are conducted annually over drop zones at Fort Bragg and Camp Mackall.

Aviation training on Fort Bragg and Camp Mackall is conducted primarily in support of the airborne mission. Aircraft sorties totaled 173,834 during fiscal year 1995. Training consists of both fixed and rotary wing aircraft conducting troop and equipment paradrops and insertions, and providing close air support for ground units.

2.2.3.3 Weapons Live Fire:

Weapons live-fire training includes small arms, machine guns, grenades, all calibers of mortars and artillery (including the Multiple Launch Rocket System), tank cannon, recoilless rifles, aircraft rocketry, bombing and strafing, and a variety of missiles including Hellfire, TOW, Shillelagh, Dragon, stinger, Avenger, AT-4 and LAW. Demolition training includes shaped, cratering, and steel-cutting charges as well as anti-personnel and anti-vehicle mines.

2.2.3.4 Training Areas/Ranges:

Approximately 37,986 ha, including six major drop zones, are available for maneuver training areas on Fort Bragg. A Special Forces support facility and an airfield used for Army rotary wing, Air Force airlift, Low Altitude Parachute Extraction System, and airmobile training are located on Camp Mackall. One drop zone is located on Camp Mackall.

There are 64 fixed ranges and 13 designated live-fire areas at Fort Bragg for practice and qualification. Manchester Impact Area is primarily a small arms impact area of 1142 ha. MacRidge Impact Area (approximately 4307 ha) is primarily a small arms impact area with moderate amounts of light artillery, demolitions, and mortar fire. Coleman Impact Area (5430 ha) is the primary impact area on the reservation supporting the entire range of weapons types used on Fort Bragg. McPherson Impact Area (2792 ha) has activities similar to the Coleman area. An average of over a quarter of a million soldiers used fixed firing ranges during the last five years, and about 200,000 personnel used impact areas and Observation Posts during the same period.

2.3 Fort Gordon, Georgia

2.3.1 Mission and History

The primary mission of Fort Gordon is to provide a multforce power projection platform for mobilization, training and military readiness and to support the Department of Defense Southeastern Regional Medical Center.

Fort Gordon was established as Camp Gordon in 1941 to train infantry and armored divisions. After World II, Camp Gordon subsequently became a permanent Army installation in 1956, renamed as Fort Gordon.

2.3.2 Physiographic and Habitat Features

Fort Gordon is located approximately 14.5 km west of the center of Augusta, Georgia, and encompasses parts of Richmond, Columbia, Jefferson, and McDuffie counties. The installation comprises 22,438 ha.

Fort Gordon is in the Fall Line Sandhills physiographic province and is characterized by deeply dissected uplands with moderate slopes. Upland soils tend to be sandy, xeric, and low in fertility. Poorly drained silty or loamy soils distinguish bottomland areas.

Naturally regenerated forests and plantations of longleaf, slash, and loblolly pine dominate the xerophytic upland acreage. Persimmon, turkey oak, and scrubby post oak may be found mixed with pine species on the most well-drained soils. Mixed hardwood stands are found along stream bottoms and low lying areas.

Fort Gordon is located within the Savannah River watershed and is drained by numerous creeks. Wetlands are an important hydrological feature along these drainages and contribute significantly to the installation's biodiversity.

2.3.3 Military Activities

2.3.3.1 Mission Activities and Force Structure:

Mission activities focus on specialized training in operation and maintenance of sophisticated electronic communications equipment. In 1991 more than 24,000 officers, enlisted soldiers, and civilians were programmed for training at the Signal Center. The 15th Signal Brigade is the principal signal training unit with a normal contingent of more than 5,000 soldiers.

Support is provided for the Regional Signal Operations Center, 11th Signal Brigade, 513th Military Intelligence Brigade, Army Reserve units, Army National Guard units and ROTC activities. Fort Gordon is also home to the Dwight David Eisenhower Army Medical Center providing specialized care to beneficiaries in a seven-state area.

2.3.3.2 Maneuver and Aviation:

Vehicle maneuver activity is limited to established roadways and adjoining training sites because of highly erodible soils and moderate to severe topographic relief. Field exercises typically involve deployment of tactical electronic communications equipment and associated troop bivouacs. Individual to battalion level training is conducted.

2.3.3.3 Weapons Live Fire:

Live-fire training is limited primarily to small-caliber weapons up to 50 caliber machine guns. Army Reserve units intermittently use an artillery impact area.

2.3.3.4 Training Areas/Ranges:

Fourteen ranges bound a 3028+ ha small arms impact area. A 2018 ha artillery impact area is also located on the installation. In addition to these impact areas, 49 training areas encompassing approximately 15,704 ha are available for unit training.

2.4 Fort Jackson, South Carolina

2.4.1 Mission and History

The primary mission at Fort Jackson is to provide training for soldiers of the U.S. Army, including Basic Training and Advanced Individual Training. Fort Jackson is a designated U.S. Army Training Center within TRADOC.

Fort Jackson was established in 1917 to train troops during World War I. For most of the period between the two World Wars, the installation was under the control of the State National Guard. In 1940, the installation reverted to Federal government control for troop training during World War II, and the Korean and Vietnam conflicts.

2.4.2 Physiographic and Habitat Features

Fort Jackson is located in Richland County, South Carolina, adjacent to the City of Columbia. The installation comprises 21,174 ha. The training areas of Fort Jackson comprise 19,096 ha.

Fort Jackson is located in the northwestern edge of the Atlantic Coastal Plain Province, a region of low to moderate relief and gently rolling hills. The Fall Line Sandhills, a zone that marks the boundary between the younger, softer sediments of the Coastal Plain Province and the ancient, crystalline rocks of the Piedmont Province, lies approximately four miles west of the cantonment area. Terrain on the installation is characterized by rolling, low hills. Soils

are predominantly sands and kaolin clays.

Most forest land on Fort Jackson is composed of pine-scrub oak sandhill community type. Longleaf pine is the dominant overstory species. Wetlands occupy approximately 2,705 ha, and wetland hardwood is the dominant wetland community.

The installation drains into watersheds of the Wateree and Congaree Rivers. There are approximately 306 km of mostly narrow streams on the installation, and 31 named ponds or reservoirs cover approximately 173 ha.

2.4.3 Military Activities

2.4.3.1 *Mission Activities and Force Structure:*

Fort Jackson is an Army Training Center within TRADOC. The primary mission of Fort Jackson is Initial Entry Training of soldiers. Fort Jackson's annual training load is approximately 50,000 soldiers who receive Basic Combat Training and Advanced Individual Training.

Fort Jackson supports activities of the Drill Sergeant School, battalion and brigade Pre-Command Course and the Cadre Training Course for company grade officers and enlisted personnel. The Soldier Support Institute is also located on Fort Jackson. It consists of training schools for Recruiting and Retention, Finance officer and enlisted Military Occupational Specialty (MOS) courses, Adjutant General officer courses and enlisted MOS courses and Non-commissioned Officer Academy instruction program for enlisted soldiers. The Chaplain Center and School for officer and enlisted personnel training is located on Fort Jackson.

Fort Jackson hosts one FORSCOM unit, the 48th Explosive Ordnance Demolition. Fort Jackson also hosts two reserve centers for the Army and Marine Corps, the 1st US Army Readiness Group, MEDDAC and DENTAC activities, HQs 120th ARCOM, 120th ARCOM Equipment Concentration Site, Military Entrance Processing Station, a Corp of Engineer South Carolina area office, a South Carolina Army Reserve and National Guard (SCARNG) Unit Training and Equipment Site, a Regional Training Bus, and a Regional Coordinating Element.

Fort Jackson also supports SCARNG training requirements through two licenses for the use of Fort Jackson property. A Cantonment license of 114 ha allows the SCARNG to conduct Officer Candidate School training, three artillery enlisted MOS courses, a 1SG course, a PLDC school, BNCOC and ANCOC courses, as well as a 19D (Scouts) armor MOS course. A license for 5,296 ha is issued for SCARNG maneuver and field training requirements on Fort Jackson.

Fort Jackson supports other Army active duty units, as well as other military service units on its weapons ranges and training land. Currently, Fort Jackson supports training of over 60,000 reserve, SCARNG, and ROTC personnel annually on its weapon ranges and training land.

Future activities involve the completion of an 800 member Army Reserve Center and the relocation of the Department of Defense Polygraph Institute to Fort Jackson.

2.4.3.2 Maneuver and Aviation:

Maneuver activity associated with the Basic Training, Advanced Individual Training, and school missions on Fort Jackson is low intensity, and consists primarily of foot traffic and wheeled vehicles limited to established roads, trails, and firebreaks. Most vehicle maneuvers are associated with troop transport to outlying bivouac, training, and field training exercise sites.

The bulk of wheeled and tracked vehicle maneuver is associated with SCARNG, Army Reserve, and Marine Corps Reserve training activities. Except for the 224 ha Free Maneuver Area in the southeastern portion of the installation, tracked vehicles are restricted to maintained roads, tank trails, and firebreaks. Most of this training occurs at the squad, platoon, or company level.

Helicopter aviation training is conducted primarily by the SCARNG. Occasionally, units from other installations conduct aviation training on Fort Jackson, but no associated live-fire training is conducted from helicopters.

2.4.3.3 Weapons Live Fire:

Weaponry used in live-fire training include: small arms, machine guns, grenade launchers, hand grenades, anti-armor weapons, mortars (up through 120 mm HE), demolition, artillery (up through 203 mm HE), and Bradley Fighting Vehicle and tank main armament target practice rounds (25, 105, and 120 mm [TP]).

2.4.3.4 Training Areas/Ranges:

Fort Jackson contains 19 small arms ranges around the boundary of the 1919 ha Small Arms Impact Area. Nine ranges are located along the boundary of the 2301 ha South Impact Area, which is used for M-16 rifle, machine gun, AT-4/M203 (TP), AT-4 (HE), demolition, Bradley (25 mm), tank [(105 and 120 mm (TP))], and 60 mm, 81 mm, and 107 mm mortars (HE, WP, and ILL). It also has seven mortar firing points bordering the South Impact Area. The South Impact Area also serves as the artillery and mortar impact area.

Foot maneuver activities can occur anywhere on the installation, exclusive of impact areas. Off-road vehicle maneuver is limited to the 224 ha Free Maneuver Area located in the southeast portion of the installation.

2.5 Fort McClellan

2.5.1 Mission and History

The mission of Fort McClellan is to administer and conduct training associated with three major organizations: U.S. Army Military Police School (USAMPS), U.S. Army Chemical School (USACMLS), and Training Center (under direction of Training Brigade). Fort McClellan is under TRADOC command.

Military use of lands in the area of present-day Fort McClellan began with the establishment of Camp Shipp before 1900. In 1917, "Camp" McClellan was established as a National Guard Camp. The camp was expanded during the 1930's and World War II. Deactivated after World War II, the installation resumed active status with the beginning of the Korean War. The Chemical Corps School and Women's Army Corps Center were established in 1954, but both were closed in the 1970s. The U.S. Army Chemical School was relocated to

Fort McClellan in 1979 and the Military Police School was established in 1975.

2.5.2 Physiographic and Habitat Features

Fort McClellan consists of three tracts of land located in Calhoun County, Alabama. The Main Post (7649 ha) is on the north side and adjacent to Anniston, Alabama. Pelham Range (8981 ha) is located approximately eight km west of the Main Post. Choccolocco Corridor (1812 ha) is adjacent to the Main Post and allows movement for training exercises to National Forest lands to the east. Fort McClellan leases the corridor from the Alabama Forestry Commission. The Forestry Commission has sole responsibility for natural resource management on corridor lands.

Fort McClellan lies almost entirely in the Valley and Ridge physiographic province of the Appalachian Highlands. The Main Post is characterized by mountainous ridges on the south and east, which are known as Choccolocco Mountain. Elevations range from 213 to 629 m above sea level. The rest of the Main Post is gently rolling and contains the cantonment area. Pelham Range is characterized by moderately rolling hills with elevations ranging from 146 to 288 m. Five major soil series occur on Fort McClellan. Approximately 80 percent of the Main Post is composed of the Stony Rough Land Soil association.

The steep terrain on the eastern and southern portion of the Main Post is predominated by upland hardwoods. Within this area, isolated stands of pine are mixed with hardwoods. Virginia pine is encountered along the ridges, whereas longleaf pine occurs along the lower slopes of many hills and ridges. The more gentle terrain of the western and northern portions of Main Post has been cleared for cantonment areas or training areas and ranges. Although upland hardwoods are common in this area, loblolly and/or shortleaf pine often occur as prominent species. Bottomland hardwoods are restricted to narrow strips along tributary streams. A 35-year planting program has established nearly 2019 ha of loblolly pine.

Fort McClellan's watershed consists of Cane and Cave creeks. Cane Creek bisects both the Main Post and Pelham Range. Cave Creek drains the northern half of Main Post.

2.5.3 Military Activities

2.5.3.1 *Mission Activities and Force Structure:*

Mission activities are related to training and operations of the three major organizations on Fort McClellan and other subordinate commands.

In addition to the USAMPS, USACMLS, and the Training Brigade, other tenant unit commands include Health Services Command, Support Staff, and Alabama National Guard detachments. As of 1989, military personnel totaled 7,889, and civilian personnel numbered approximately 3,300.

2.5.3.2 *Maneuver and Aviation:*

Mechanized maneuver on Fort McClellan is limited due to terrain and mission requirements. Major activities consist of small unit training, transport of troops, and activities associated with Chemical School activities, including smoke generation and Military Police training. Bivouac areas accommodate company to battalion units and are located on both the Main Post and Pelham Range. Most mechanized training occurs on Pelham Range. Aviation is limited on Fort McClellan.

2.5.3.3 *Weapons Live Fire:*

Weapons training includes small arms, machine gun, tank machine gun, grenade, LAW, claymore mines, mortars, and artillery including 105 mm, 155 mm, and 8" howitzer.

2.5.3.4 *Training Areas/Ranges:*

There are 16 training areas on the Main Post and six training areas on Pelham range. Training areas on the Main Post support Basic Training, MP School, and Chemical school activities including ranges for radiation training, decontamination, and chemical basic training. Training areas on Pelham Range include a mock POW camp and a drop zone for troop and supply drops.

Fort McClellan has 18 ranges on the Main Post and four at Pelham Range. A Large

(Artillery) Impact Area and a Small Impact Area occur on Pelham Range. Two Dudded Impact Areas are located on the Main Post. Ranges on the Main Post support primarily small caliber, nonexplosive ordnance, grenade, and LAW training. Ranges on Pelham Range support mechanized machine gun training, mortar, and heavy artillery fire.

2.6 Fort Polk

2.6.1 Mission and History

Under Base Realignment and Closure, the mission of Fort Polk has changed. The 5th Infantry Division (Mechanized) was relocated to Fort Hood, Texas. Fort Polk gained the Joint Readiness Training Center (JRTC). The mission of JRTC is to provide advanced level joint training for Army and Air Force contingency forces under tough, simulated conditions that replicate, as closely as possible, those of real low- and mid-intensity conflicts.

2.6.2 Physiographic and Habitat Features

Fort Polk is located in west central Louisiana in Vernon Parish near the communities of Leesville and DeRidder. The post consists of two separate land areas, the main post (42,794 ha) and Peason Ridge (13,322 ha). Approximately 15,996 ha of the main post and 194 ha of Peason Ridge are under the administrative control of the U.S. Forest Service.

Fort Polk is located in the West Gulf Coastal Plain section of the Coastal Plain physiographic province. The topography of both main post and Peason Ridge is rolling, well-rounded hills. Soils at Fort Polk are variable, including clays, silty loams, sandy loams, sands, and silts. The Soil Conservation Service classifies Fort Polk soils as highly erodible.

Fort Polk is located in the southwest Louisiana pinelands region of the Gulf Coastal Plain. In its virgin state, the sandy uplands of this area were characterized by park-like stands of longleaf pine and an understory dominated by bluestem grasses. This upland community is a fire subclimax community dependent on frequent fires to retard hardwood encroachment. While longleaf pine is still dominant on much of Fort Polk, widespread reductions in longleaf acreage have occurred throughout the region. Loblolly and shortleaf pines are native to Fort Polk and are the dominant pines in the stiff clay soils found in the northwest and southwest portions of the installation. Loblolly is the dominant pine on poorly drained sites throughout

Fort Polk.

The main post of Fort Polk is mostly within the Calcasieu River watershed, except for Bayou Zourie, which drains from part of the installation into the Sabine Basin. Peason Ridge is primarily within the Sabine River, Red River, and Kisatchie Bayou systems, with limited drainage in the eastern portion of the Comrade Creek-Calcasieu River system.

2.6.3 Military Activities

2.6.3.1 Mission Activities and Force Structure:

JRTC provides rotational units with the opportunity to conduct joint operations that emphasize contingency force missions. The major training effort of the JRTC is focused on Army light forces, which may be augmented by armor/mechanized forces, special operations forces, Navy fire support, and the Air Force.

Resident units include the Joint Readiness Training Center and the 2nd Armored Cavalry Regiment to serve as an Opposing Force. Typical rotational units include elements from several infantry and airborne divisions, Ranger forces, and Special Forces Groups.

Although non-JRTC units and training may be conducted, these activities are subordinate to JRTC operations.

2.6.3.2 Maneuver and Aviation:

JRTC operations will result in an estimated 83% reduction in tracked vehicle use compared with levels before realignment. Ten JRTC training rotations involving approximately four thousand troops each are anticipated annually. Rotation activities include dismounted ground maneuver, helicopter operations, operation of wheeled vehicles, establishment of field operating sites for logistics and aviation units, and preparation of field fortifications. All activity is characterized by extensive movement of aircraft, vehicles, and troops throughout the maneuver area and by use of blanks and pyrotechnics by all players. A tank company may be employed to support the Army task force.

2.6.3.3 Weapons Live Fire:

Live-fire training allows execution of light infantry and special operations platoon operations with the integration of all organic weapons, artillery and mortar indirect fire, and demolitions. Integration of close air support is included as specific events during most exercises. Larger caliber weapons such as artillery and mortars are integrated to fire on unit objectives prior, during, and after live-fire exercises. Mechanized/armor live-fire is planned during seven rotations annually.

2.6.3.4 Training Areas/Ranges:

The JRTC has priority use of 18,248 ha of contiguous maneuver area for each rotation. On the main post, JRTC operations call for three large mid-intensity maneuver areas, each with an associated forward landing strip/drop zone and seven low-intensity maneuver areas. Peason has one mid-intensity and seven low-intensity maneuver areas. The main post is the primary area for force-on-force operations.

Two dedicated impact areas (598 ha and 2294 ha) are located on the main post. A 1525 ha impact area is located at Peason Ridge. Fort Polk supports 51 live-fire ranges for all weapons types, ranging from pistol-firing ranges to automated Multipurpose Range Complexes.

2.7 Fort Stewart, Georgia

2.7.1 Mission and History

The primary mission of Fort Stewart is training and operational readiness of the 24th Infantry Division (Mechanized) and other non-divisional units. Fort Stewart is under Forces Command. A satellite installation, Hunter Army Airfield (HAAF), is under operational command of Fort Stewart. Future references to Fort Stewart and "the installation" are inclusive of HAAF.

Land initially was purchased in 1941 for use as the Third Army Antiaircraft Training Center, and was used for that purpose until 1947. The installation was placed on inactive status until 1950 when it was reactivated as an Antiaircraft Training Center. In 1954, tank training was

added to the installation's mission. In 1956 the post was officially designated as a permanent military installation and became Fort Stewart Antiaircraft Artillery and Tank Training Center. In 1967, Fort Stewart and HAAF were designated the U.S. Army Flight Training Center, supporting an accelerated helicopter training program in response to the Vietnam War. Aviation was de-emphasized and infantry training added to the mission during the 1970's. The 24th Infantry Division was activated in 1975 and redesignated as a mechanized division in 1979.

2.7.2 Physiographic and Habitat Features

Fort Stewart is 112,745 ha in size and is located in Liberty, Long, Bryan, Tattnall, and Evans counties. The cantonment area is adjacent to Hinesville, Georgia. HAAF occupies 2168 ha in south Savannah, Georgia (Chatham county).

The installation lies in the lower Atlantic Coastal Plain physiographic province. Topography is generally flat with elevations ranging from 2-60 m above sea level. The soils of the area reflect their divergent origins. Relict barrier islands and lagoons retain their xeric and mesic qualities, respectively. The sandhills of the islands are well drained by a rolling topography and sandy soils. Ponds of prehistoric lagoons are poorly drained due to both topography and clay soils. The prehistoric sea floor is identified by flat topography and seasonal variation from mesic to xeric due to a porous surface closely underlain by a relatively impermeable substrate.

Fort Stewart is in a floristically diverse region of the country. Nearly one thousand species of vascular plants have been reported in the six-county region that encompasses the installation. In low-lying or poorly drained soils, hydrophytic hardwood species, and conifers such as cypress and pond pine occur. Along tops of low ridges and better drained areas, pine and xeric hardwood species occur, including loblolly pine, longleaf pine, slash pine, and various oak species. HAAF also has a salt-marsh community component.

2.7.3 Military Activities

2.7.3.1 Mission Activities and Force Structure:

Fort Stewart is home to the 24th Infantry Division (Mechanized), 1st/75th Ranger Battalion,

92nd engineer battalion, 260th Quartermaster Battalion, and other non-divisional units. Training by Army National Guard and Reserve units also occurs on Fort Stewart.

2.7.3.2 Maneuver and Aviation:

Maneuver and training exercises are conducted by units from platoon through brigade level. Maneuver exercises conducted by the 24th Infantry Division (Mechanized) and other units use several vehicle types including tanks, Bradley Infantry Fighting Vehicles, armored personnel carriers, and other wheeled vehicles. Mechanized brigades of the Georgia and South Carolina National Guards also conduct training exercises on Fort Stewart. Exercises are conducted year-round with the greatest use of mechanized units occurring on the west side of the installation. On the east side of the installation, the presence of Red Cloud Range limits use for maneuver training.

Aviation units stationed at Hunter Army Airfield support both rotary and fixed-wing airlift requirements for ground units stationed at Fort Stewart. Fixed-wing aircraft used the Artillery Impact Area for live-fire activities during 148 days in FY90.

2.7.3.3 Weapons Live Fire:

Live-fire weapons training includes small arms, machine gun, grenade, all caliber artillery, tank guns, aircraft bombing and strafing, mortars, and antitank missiles including TOW.

2.7.3.4 Training Areas/Ranges:

Major live-fire ranges on Fort Stewart include an Artillery Impact Area (AIA, approximately 5200 ha), Luzon Range (an approximately 650 ha aerial gunnery range), a Small Arms Impact Area (approximately 2300 ha), and the Red Cloud Multipurpose Range Complex, which is adjacent to the west boundary of the AIA. Current requirements call for installation firing ranges to support 10,724 training elements for mechanized crews. Approximately 27,000 rounds were fired into the AIA in 1989.

There are seven drop zones on the installation. Three small aerial gunnery ranges are located in the northern part of the installation. The remainder of the installation, exclusive of the cantonment area, is available for vehicle maneuver and dismounted training.

2.8 Military Ocean Terminal, Sunny Point, North Carolina

2.8.1 Mission and History

The mission of the Military Ocean Terminal, Sunny Point (MOTSU) is to ship military explosives destined for various parts of the world. The terminal is under the Military Traffic Management Command (MTMC).

Military Ocean Terminal, Sunny Point (MOTSU) was opened in 1953. Before opening, approximately 1/4 of the installation was under cultivation, 1/4 was heavily grazed by livestock, and the remaining 1/2 supported well-stocked stands of pine and hardwood timber.

2.8.2 Physiographic and Habitat Features

The terminal encompasses 6591 ha in three parcels of land. The main terminal facility is located approximately 8 km north of Southport, North Carolina in Brunswick County. The Leland interchange yard (263 ha) is located 29 km west of the main terminal. An 854 ha parcel (Fort Fisher purchase) is located on the east bank of the Cape Fear River in New Hanover County.

The installation is located on the Coastal Plain Province and is characterized by flat to gently rolling plains with sandy soils. The dominant vegetation associations are longleaf pine-scrub oak sandhill, pine flatwoods, pond pine pocosins, and limited bald cypress swamps. Forest habitat covers approximately 2980 ha of the terminal.

Aquatic habitats are common on the terminal. Sixty-six naturally formed ponds ranging from less than one to eight hectares (43 ha total) occur on the terminal. Forested wetlands (including pocosins) and 363 ha of tidal marshes also occur. There are 9.7 km of river frontage along the Cape Fear River.

2.8.3 Military Activities

Shipment of military explosives is the sole activity of the terminal. This activity can entail movement, temporary storage, and handling of munitions on the 97 miles of railroad and 50

miles of roadway throughout the installation. No training or maneuver activities are conducted on the installation. A single firing range is maintained for security personnel to qualify with their weapons. The current personnel complement is 12 military and 258 civilian employees.

2.9 Louisiana Army Ammunition Plant, Louisiana

2.9.1 Mission and History

The mission of the Louisiana Army Ammunition Plant (LAAP) is to manufacture ammunition metal parts, load and assemble ammunition, receive and store bulk explosives and ammunition, and demilitarization of unserviceable ammunition. LAAP is under the U.S. Army Materiel Command (AMC).

Land for LAAP was purchased in 1941, and munitions manufacturing was initiated in 1942 to meet demands of World War II. LAAP was inactive for brief periods between World War II and the Korean War and between the Korean and Vietnam wars. Reactivated in 1961, LAAP has continued production and improvement of conventional munitions to the present time. Munitions manufacture at LAAP is scheduled to be placed on layaway status effective October 1994.

2.9.2 Physiographic and Habitat Features

LAAP encompasses 6045 ha in Bossier and Webster Parishes approximately 35 km east of Shreveport, Louisiana.

Most of LAAP lies in the Interior Flatwoods, a subregion of the Lower Loam Hills Region of the Hilly Coastal Plain Province. There is little topographic relief and soil drainage is typically poor. The dominant soil types of the Interior Flatwoods on LAAP are Alfisols and Ultisols.

The presettlement dominant upland vegetation on LAAP was primarily loblolly and shortleaf pines mixed with upland hardwoods, mostly oaks and hickories. Bottomlands were dominated by a variety of oak species, hickory, and sweetgum. Forest regeneration on LAAP has similar species composition to presettlement associations.

LAAP is bounded by Clark Bayou on the western boundary and Dorcheat Bayou on the east side. Dorcheat Bayou and its approaches are part of the Miscellaneous Alluvial Floodplains Region of the Alluvial Floodplain Province.

2.9.3 Military Activities

Training is not a primary mission of LAAP. Army Reserve and Army National Guard units have conducted limited training exercises, primarily by medical engineering units because of restrictions on vehicle operations, smoke, and live-fire. There is one small arms range on LAAP. Current force levels are two military and 1,117 contractor personnel.

3 Current Conditions

The following section describes current trends and conditions that affect the occurrence of RCWs on subject installations. This information was obtained from installation site visits by USACERL and documentation provided by installation natural resources personnel.

3.1 Status of Installation RCW Populations and Surveys

Knowledge of current population status (Table 2) and trends varies among installations. Comprehensive installation-wide surveys for RCWs have only recently been completed on most installations and data on long-term trends is limited for most installations. Current knowledge of RCW clusters and cavity tree activity was obtained from historical records, surveys of known cluster sites, and project-related surveys of available habitat.

Table 2. Current number of active and inactive cluster sites known to occur on Army installations. See text for status of surveys

Installation	Inactive	Active	Total
Fort Benning	89	192	281
Fort Bragg	162	252	414
Fort Gordon	30+	1	30+
Fort Jackson	35	10	45
Fort McClellan	see text	0	0
Fort Polk	54 (Army lands) 30 (Forest Service)	74 (Army lands) 90 (Forest Service)	128 (Army lands) 120 (Forest Service)
Fort Stewart	82	165	247
LAAP	2	0	2
Sunny Point	3	6	9

3.1.1 Fort Benning

A survey for RCWs on the installation was conducted during 1993/94. As of December 1995, 192 active clusters and 91 inactive clusters are known to occur on the installation. Historical data available for Fort Benning are not sufficient to accurately determine RCW population trends on the installation in recent years. Inventory and monitoring activities currently initiated on Fort Benning will help determine whether populations are stable, increasing, or declining.

3.1.2 Fort Bragg

A 100% survey of Fort Bragg was completed in 1992. In 1995, RCW activity was observed at 252 cluster sites. The total of active sites includes clusters with extraterritorial roosters or transients, so the actual number of RCW breeding groups is fewer than 252. An additional 162 clusters (including five historical sites) were inactive in 1995. Populations on Fort Bragg and Camp MacKall are considered separate subpopulations. Twelve active clusters and 6 inactive clusters were observed on Camp Mackall in 1995. Data presented by the U.S. Fish and Wildlife Service in a 1992 Biological Opinion for Fort Bragg suggest that in the period 1988-91, breeding pairs in the North Carolina Sandhills population declined from an estimated 404 to 371 pairs. From 1992 to 1995, the number of estimated pairs on Fort Bragg/Camp MacKall declined from 237 to 218, which may suggest that the Fort Bragg population currently is declining.

3.1.3 Fort Gordon

The small population historically known to occur on Fort Gordon has declined steadily since the 1970s. In 1979, at least seven active breeding groups were known to occur on Fort Gordon. By 1989, three active groups were known on the installation.

No activity at RCW cluster sites had been observed on the installation since the summer of 1990. In October 1993 a single RCW was observed in an area between two inactive cluster sites by a crew conducting an RCW foraging habitat survey. In February 1996, an installation biologist discovered a cluster site in training area 21 had been activated in the late summer/early fall. The male which activated this site has been identified as a male that fledged at the Savannah River Site in 1995. There are no indications at this time that a

female is present in the cluster

A survey of potential RCW habitat was conducted during the period December 1990 to May 1992. A total of 128 inactive cavity trees was located on the installation, representing 30+ clusters. No surveys were conducted in the Artillery Impact Area, but little potential habitat occurs in this area. Surveys were conducted in some areas of potential habitat in the Small Arms Impact Area based on interpretation of aerial photos. A few cavity trees were located near Thomas Lake in the Small Arms Impact Area.

3.1.4 Fort Jackson

In 1996, 10 active and 35 inactive clusters were known on Fort Jackson. This is a decrease from 35 active clusters observed on the installation in 1980-81 and 19 active clusters observed in 1992. Activity status in 1996 was determined directly by monitoring groups. In previous years, activity status was inferred from observations of cavity trees. Current forest condition provides limited foraging habitat availability for additional recruitment clusters.

3.1.5 Fort McClellan

Although considered common in the area as late as the 1950s, RCW populations had declined to one breeding pair by 1968, and no live birds have been sighted since 1978-79. Surveys of potential habitat on Fort McClellan were conducted in 1992. The objective of this survey was to document the presence of live birds, not to inventory cavity trees. Although some inactive cavity trees were located (both in historical sites and previously unknown locations), no RCWs or cavity tree activity were detected. Historical cavity trees still present on the installation are in poor condition and not currently suitable for occupation by RCWs.

3.1.6 Fort Polk

A total of 248 cluster sites is known on Fort Polk and Peason Ridge training areas. Of these, 120 (90 active) are located on lands under administrative control of the U.S. Forest Service. Military training occurs on these lands under agreement with the U.S. Forest Service; however, the U.S. Forest Service has management responsibility for RCWs on these lands.

Fort Polk has direct management responsibility for RCWs occurring on Army lands. On Army lands, 128 cavity tree clusters were documented in 1995, 74 of which were active. Forty-four of the active clusters were on Fort Polk proper, and the remaining 30 clusters were located on Peason Ridge.

3.1.7 Fort Stewart

A complete installation endangered species survey was completed in 1994. In 1995, 165 active RCW clusters and 82 inactive clusters were observed on Fort Stewart. Of the 165 active clusters, nests were observed at 110 sites. Twenty-two clusters that were active in 1980 are currently inactive. During this period two new clusters were observed in areas where it is relatively certain none had previously occurred.

3.1.8 Louisiana Army Ammunition Plant (LAAP)

Two inactive cluster sites with a total of 13 cavity trees are known on the LAAP. Surveys conducted during the last 7-12 years by the U.S. Fish and Wildlife Service and the Louisiana Department of Fish and Wildlife have not documented any RCW activity at these sites. A few active clusters may occur on private timber company lands adjacent to the installation, but information on these possible sites was not forthcoming from the timber company.

3.1.9 Military Ocean Terminal, Sunny Point (Sunny Point)

Nine cluster sites are known within the boundaries of Sunny Point, six active and three inactive. An additional four clusters occur adjacent to Sunny Point, and birds from these clusters may use foraging habitat available on the installation.

3.2 Forest Management

Historically, production of commercial forest products had priority over management for other values, including endangered species. Currently, due to Biological Opinions and other regulatory requirements of the Endangered Species Act, production of commercial forest products in RCW habitats is subordinate to RCW habitat management requirements.

Timber management on Army installations in the Southeast once emphasized production of

pine sawtimber, pole, and pulpwood products. Silvicultural practices were typified by even-aged management using large clearcuts, seed tree, and shelterwood cuts, and short rotations of less than 80 years. Establishment of pine plantations heavily favored loblolly and slash pine over longleaf. Active fire suppression in pine habitats favored natural regeneration of loblolly and slash pine and hardwood species over longleaf. The general effect on forest composition was similar to trends in commercially managed pine forests throughout the southeastern U.S., including a decrease in longleaf acreage and forests characterized by young, even-aged stands dominated by loblolly, slash, and other off-site pine species.

The requirement of RCWs for old-growth pine for nest cavity construction and foraging habitat has shifted forestry management programs to increased rotation age in RCW habitat. While even-aged management forest prescriptions are still practiced on installations, restrictions on cutting of large sawtimber quality trees have resulted in an increased emphasis on thinning cuts and single-tree selection. Recent installation forest plans increasingly emphasize conversion to longleaf on appropriate sites. Currently, the dominant methods for longleaf regeneration on installations are seedtree and shelterwood cuts that remove pine species other than longleaf in longleaf/mixed pine stands or thinning existing longleaf stands together with a prescribed burn program. The incidence of planting longleaf is increasing. At Fort Bragg, over 20,000 acres have been planted with longleaf pine since 1956.

Prescribed burning programs are in transition for reasons similar to those affecting timber harvest. Historically, wildfires were actively suppressed and prescribed burns were limited primarily to improving downrange visibility in live-fire areas and prevention of wildfires. The result was increased fuel loads and midstory encroachment, which was an important factor in RCW population declines on some installations. Increasingly, installations are implementing management prescriptions that increase the area and frequency of prescribed burns with an increased emphasis on growing season burns for improved midstory control in RCW habitat.

3.3 Current Restrictions on Military Activities in RCW Cluster Sites

Under the current Army RCW management guidelines clusters are defined as "The aggregate are encompassing cavity trees occupied or formerly occupied by an RCW group plus a 200 foot buffer zone." According to current Army guidelines (**Appendix A**), training within RCW clusters (active and inactive) is limited to dismounted training of a transient nature.

Bivouacking, digging, and cutting of vegetation (except hardwoods) are prohibited. Use of CS gas, smoke, flares, incendiary devices, artillery, artillery simulators, mortars, and similar devices are not permitted. Vehicle travel through clusters is limited to designated maintained roads, trails, and firebreaks illustrated on installation maps, with the exception that vehicles weighing five tons or less may travel within clusters during specific exercises, if the vehicles stay at least 100 feet from all cavity trees, and the U.S. Fish and Wildlife Service concurs with each specific exception. If such exceptions are granted, the installation will monitor affected sites to determine the effects of such use on the RCW and its habitat.

4 Analysis of Effects

The U.S. Fish and Wildlife Service provided in a letter dated 12 March 1996 a list of threatened or endangered species known to occur or potentially occurring in association with red-cockaded woodpecker (RCW) habitats (Table 3, all tables and figures referenced in this section are located after Section 5; Conclusion of this assessment) on installations subject to the proposed revision of the 1994 "Management Guidelines for the Red-cockaded Woodpecker on Army Installations." As required by Section 7 of the Endangered Species Act, this assessment addresses effects of implementing the proposed revision of the 1994 Army RCW management guidelines on threatened or endangered species occurring in association with RCW habitats on Army installations (see Table 1 for installations subject to the proposed revision).

The proposed revision (Appendix C) to the Army RCW guidelines makes significant changes to the current Army RCW management guidelines (Appendix A) in the following areas:

- Definition of installation RCW population goals.
- Additional recruiting and provisioning measures to assist reaching regional recovery goals.
- Configuration of RCW buffer zones relative to allowable training activities.
- Allowable training activities within protective RCW buffer zones.
- Monitoring requirements to assess effects of training on RCWs and associated habitats.
- Remedial actions to mitigate potential effects of training on RCWs and associated habitats.

This assessment determines whether implementing the above proposed changes will affect RCWs occurring on Army installations and the implications of this determination for viability of RCW populations on Army lands. The current Army guidelines will provide the baseline for determining effects of the proposed revision on RCWs and other associated threatened or

endangered species. The proposed revision does not change habitat and biological management practices on installations relative to the RCW. Effects of management practices in the current guidelines were assessed in a biological assessment dated 10 February 1994 (Hayden and Carter 1994). This assessment assumes that current training levels on installations will not change as a result of implementing the proposed revision.

This analysis first discloses known effects of military training on RCWs and associated habitats. The analysis then evaluates anticipated effects on the RCW and associated habitats of implementing specific changes to current Army RCW management under the proposed revision.

4.1 Known Effects of Training on Red-cockaded Woodpeckers and Associated Habitats

Knowledge of documented, quantifiable effects of military training on RCWs is limited. However, the long-term co-existence of RCW populations on Army installations that have conducted military training since 1917 demonstrates some degree of compatibility between military training activities and RCW populations. This compatibility is due, in part, to the training requirement. The Army historically has maintained installations in a relatively natural condition relative to many surrounding land uses, particularly urban and agricultural development and commercial forestry, to maintain opportunities for realistic training scenarios. In the southeastern U.S., fire is of major importance in maintaining a functional longleaf pine system. Use of live ammunition and pyrotechnics, and controlled burns to open forests and maintain military ranges for training have contributed to maintaining this important functional process on significant areas of many Army installations. When declining RCW populations have been documented on installations, factors other than training, such as aggressive fire suppression and commercial forestry practices, have been cited as major contributing factors (e.g. Fort Bragg biological opinion, USFWS, 1990). Typically, the relationship of training to observed declines in RCW populations is cited as not well studied or unknown.

Potential effects of maneuver training and associated activities (e.g. weapons firing, use of obscurant smokes, bivouacs, etc.) are most relevant to proposed changes in the Army RCW guidelines.

Gutzwiller and Hayden (*in press*) conducted a literature review of peer-reviewed publications to evaluate actual and potential effects of military maneuver activity on avian behavior, reproduction, and community structure. They presented conclusions and knowledge gaps that are excerpted in Tables 4 and 5. In general, Gutzwiller and Hayden's review indicates that available data generally are inadequate to accurately predict effects of military training on avian species and that anticipated effects likely will be site-specific and will exhibit wide interspecific as well as intraspecific, individual variation.

Based on literature reviews (Gutzwiller and Hayden *in press*, Trame *in press*) and field observations on Army installations, maneuver training could have several potential effects on RCWs and their habitats. These potential effects include:

- Direct effects on individuals
 - Behavioral disturbance resulting in lower reproductive success.
 - Increased mortality due to physiological stress and behavioral disturbance.

- Indirect effects due to habitat disturbance
 - Reduced herbaceous and woody shrub cover.
 - Reduced foraging habitat due to increased tree mortality from root damage and direct destruction.
 - Reduced regeneration.
 - Loss of cavity trees from root damage and direct destruction.

Potential habitat effects listed above have been observed, though not well quantified, in RCW habitats on Army installations, particularly in those areas where mechanized units train regularly. Knowledge of direct effects of maneuver training is limited. The extent to which potential direct and indirect effects of military training affect RCW populations would depend on the type, intensity, duration and frequency of training activities in RCW habitats. While adequate and statistically significant quantifiable data that specifically address these training characteristics are limited, particularly at the site-specific level, it is the best professional judgement of installation biologists with resident RCW populations that if the proposed revision is fully implemented, the proposed changes in training restrictions will have minimal

effect on populations. Personal communications and data supporting these professional judgements are discussed in greater detail in the following sections of this assessment.

Two preliminary studies are in progress specifically to evaluate effects of training and military land use on RCWs.

On Fort Benning, Georgia, The Nature Conservancy (TNC) has completed the second year of a three year study to evaluate potential impacts of military training on RCWs. TNC is studying 23 clusters located in or in close proximity to range or impact areas, or have routine tracked vehicle activity. An additional 10 clusters are monitored as control sites. To date, TNC has not completed analyses of these data to evaluate impacts of military training. However, of 14 nest attempts in 1994 and 17 nest attempts in 1995, all were successful suggesting no overt effect on nest success due to training associated with sample sites. Since this study is in progress and data analyses are preliminary, these results should not be used to draw definitive conclusions concerning potential impacts of training on RCWs (John Doresky, TNC, memorandum dated 14 February 1996).

One preliminary study has been conducted by North Carolina State University researchers (Mobley, Carter and Clarke, unpublished data) to correlate RCW reproductive, demographic and habitat parameters with various types of military land use on Fort Bragg, North Carolina including bivouac areas, artillery firing points, drop zones, and impact areas. Data from this unpublished study are discussed here to provide insight into potential population level effects of training disturbance.

In their study, Mobley, Carter and Clarke examined RCW reproductive and demographic data over a ten year period, 1981-90. Demographic and reproductive data for clusters associated with sites with intensive training activities (impact and danger zones, bivouac areas, drop zones, and artillery sites) were compared with clusters from a variety of control groups. Control groups were selected from RCW populations in North Carolina occurring at Camp Mackall, Southern Game Lands, the area of Southern Pines, and from randomly selected clusters on Fort Bragg that were not associated with the type of heavily impacted land uses noted above, but were, however, subject to typical maneuver training activities.

Although Mobley, Carter and Clarke compared a variety of demographic and reproductive variables (Tables 6 and 7), population level effects ultimately would be expressed through

two key variables: fecundity (number of young fledged per female) and survival. Survival estimates for female RCWs cannot be derived from data currently available to USACERL (J. Mobley and J. H. Carter, personal communication). However, estimates of fecundity are available. **Figure 1** shows mean number of young fledged per female at control sites versus clusters associated with various intensive military land uses. Mobley, Carter and Clarke combined data for bivouac and drop zones due to low sample size.

Several points need to be made in relation to the Mobley, Carter and Clarke data. First, these data are from observational data and a causal relationship should not be assumed. Second, training was unrestricted in cluster sites on Fort Bragg during the period 1981-90 (T. Meyers, personal communication). The fact that the Fort Bragg control sites had fecundities equivalent (in fact slightly higher) than any other control groups suggests two possible interpretations; (1) the general level of training on Fort Bragg during this period had no effect on RCW fecundity, or (2) management practices or habitat condition in the Fort Bragg control clusters compensated for any military-related impacts that did occur. A third point is that some military land uses may be conducive and compatible with RCWs. Although sample size was small ($N = 4$), fecundity of clusters associated with artillery firing points was higher than any control group. Finally, the lowest fecundity was associated with bivouac and drop zones where the training is characterized by intensive, relatively long-term human presence and other fixed activities.

Implications of the Mobley, Carter and Clarke data for viability of RCW populations under the proposed revision is discussed and evaluated further under **Section 4.2** below.

4.2 Population Goals

The current Army RCW guidelines outlines requirements and procedures for determining installation population goals (**Appendix A, Section V.B and V.A**). A key feature in determining population goals under the current guidelines is determination of mission requirements that are incompatible with RCW conservation requirements, including current training restrictions. The current guidelines state that mission requirements will be one of the determining factors in establishing installation RCW population goals (**Appendix A, Section V.B.2**). Other factors in determining installation goals are current population size, available habitat, and physiographic region recovery goals, among others.

Under Section 7(a) of the ESA, Federal agencies have an obligation to support conservation objectives for listed species. Under the current guidelines, installations could decrement population goals due to mission requirements below USFWS regional recovery goals. This creates a potential conflict between determination of installation population goals and the Army's conservation obligations under Section 7(a).

Lost training opportunity due to training restrictions in RCW habitats would be the primary reason to exclude potentially suitable habitats from RCW management under the current guidelines. On some installations, significant areas of potentially suitable habitat might not be actively managed for RCWs due to potential training constraints. On Fort Stewart, for example, it is estimated that habitat sufficient to support 189 clusters (15,260 ha) may not be actively managed for RCWs under the current guidelines due to potential training restrictions. Although the current guidelines specifically state that installations will set a population goal at least equal to the current population (**Appendix A, Section V.A.3**), significant opportunity for population increase could be lost due to incompatibility with mission requirements due to training restrictions.

The proposed revision establishes three categories of population goals as defined in **Section IV (Appendix C)**:

- Installation mission compatible goal.
- Installation regional recovery goal.
- Recovery population goal.

The "installation mission compatible goal" would be equivalent to the "installation population goal" as determined under the current guidelines. This goal represents the number of RCWs that can be supported given habitat availability and current mission requirements and training restrictions. Training restrictions under the proposed revision would apply to all current active clusters and "primary recruitment clusters" required to meet the installation mission compatible goal (**Appendix C, Section IV**).

The "installation regional recovery goal" may or may not be equivalent to the installation mission compatible goal. The installation regional recovery goal represents the installation's

contribution to the "recovery population goal" which is determined by the USFWS as the population required to ensure recovery of RCWs in the respective physiographic region. "Recovery population goals" are detailed in the USFWS Recovery Plan (1985) for RCWs. The installation regional recovery goal is based primarily on available suitable habitat and is independent of mission requirements.

If the installation regional recovery goal exceeds the installation mission compatible goal, the proposed revision establishes a procedure to attain the installation regional recovery goal through addition of "supplemental recruitment clusters" (**Appendix C, Section V.B.3.b**). Supplemental clusters are exempt from training restrictions and are essentially "invisible" to training while maintaining all other management requirements.

Under either the current guidelines or the proposed revision, primary cluster sites will maintain greater training restrictions than unprotected Fort Bragg cluster sites monitored during 1981-90. As noted in **Section 4.1**, Fort Bragg control sites during this period had relatively high fecundities. Under the proposed revision some supplemental recruitment clusters could be subject to activities similar to those conducted in association with bivouac areas and drop zones during 1981-90, which had the lowest observed fecundities during this period.

It is unknown at this time how many supplemental recruitment clusters would be subject to training activities similar to those associated with bivouac and drop zones during 1981-90 on Fort Bragg. These activities would be characterized by intensive, relatively long-term human presence and other fixed activities. Under the proposed revision, preliminary estimates indicate supplemental clusters would comprise 18.6 percent (81 clusters) of the suggested installation regional recovery goal for Fort Bragg of 436 clusters. Percentage of supplemental clusters on other installations would likely be less than estimates for Fort Bragg due to smaller populations or greater available land base to achieve recovery goals. On Fort Stewart, for example, the preliminary mission compatible goal would be approximately 474 clusters, which is nearly the USFWS Recovery Plan goal of 500 clusters for its physiographic region. On Fort Stewart only 5.2 percent of the total clusters would have to be designated as supplemental clusters to attain the regional recovery goal based on preliminary estimates of the installation mission compatible goal. It is anticipated that only a small percentage of supplemental clusters would be subject to training levels similar to those associated with bivouac or drop zones. Army biologists responsible for managing RCWs

understand it would be counterproductive to locate supplement clusters in areas subject to intensive, repeated training activities of relatively long duration.

To evaluate population-level effects of lower fecundity for an unknown proportion of groups, USACERL analyzed data from Mobley, Carter and Clarke (unpublished data) using RAMAS population models (see Appendix E for details of the analysis). As noted in Section 4.1, another key factor in determining population viability, female survival, could not be modeled because these data are not available to USACERL for these training sites. This analysis evaluated extinction probabilities based on the proportion of heavily impacted groups to control groups. We evaluated the worst-case scenario using fecundity estimates for bivouac and drop zones and the Fort Bragg control groups. For the purpose of comparing relative effects of differences in fecundity in different segments of the population, HY survival rate was set so that the average population rate of increase (λ) was 1.03 (three percent annual increase) for primary cluster sites when fecundity equaled that of the Fort Bragg control group. This rate of increase is a conservative estimate of anticipated rates in primary clusters under the proposed revision and is based on observed increases in other actively managed populations. Growth rates in the undisturbed population lower than three percent would shift the curve to the left. Growth rates greater than three percent would shift the curve to the right.

It should be stressed that this analysis models effects of only one key variable (fecundity) on population viability and assumes all other variables (e.g. survival) are equivalent between control groups and impacted groups. RAMAS does not directly incorporate some demographic variables such as mean breeding age or group size. However, in terms of individual fitness, these variables would be expressed in the model through differences in fecundity or survival.

Figure 2 shows the change in the probability of extinction as the proportion of impacted sites increases. Extinction probabilities shown are not precise estimates due to how the model parameters other than fecundity were derived. For example, temporal variance of fecundity was estimated based on published literature values and set equal for both impacted and control fecundity estimates. However, the *shape* of the curve should reasonably represent the effect of lower fecundities in an increasing proportion of impacted cluster sites. In other words, the effect on populations is relatively minimal when the proportion of clusters with low productivity is small. However, at some point the probability of extinction begins to

increase rapidly as the proportion of impacted clusters increases.

Under the assumptions of the analysis (**Appendix E**) there is relatively little effect on extinction probabilities until approximately 30 percent of the population exhibits the low fecundities observed in association with bivouac and drop zones on Fort Bragg during 1981-90. At approximately 30 percent, extinction probability starts to increase rapidly as the proportion of sites with lower fecundities increases. Even if all 81 supplemental clusters (18.6 percent of suggested installation regional recovery goal) on Fort Bragg exhibited fecundities similar to those observed at bivouac and drop zones, the proportion of impacted sites would be below 30 percent of the suggested installation regional recovery goal. In reality, the level of military activity in most supplemental clusters would likely be similar to that occurring in Fort Bragg control sites during 1981-90 when training essentially was unrestricted in cluster sites. Results of this analysis using fecundity estimates for impact areas is shown in **Figure 3**.

The effect of changes in identifying population goals is to provide the capability and incentive to manage for RCWs in areas that would otherwise not be available for RCW management due to mission requirements. If supplemental clusters are required to meet the installation regional recovery goal, these clusters potentially will be subject to greater levels of training effects due to the lack of training restrictions. The population effects of potentially reduced fecundities in supplemental clusters due to no training restrictions in supplemental clusters is expected to be negligible based on anticipated mission compatible and installation regional recovery goals and results of population analyses. If installations are capable of maintaining active groups in supplemental recruitment clusters, there would be a net increase in the installation RCW population that otherwise would not occur under the current guidelines.

4.3 Protective Buffer Zones

The current guidelines establish a 200 foot buffer around the aggregate of cavity trees occupied or formerly occupied by an RCW group (**Appendix A, Sections IV and V.I**). An RCW cluster is defined by this aggregate of cavity trees plus buffer under the current guidelines. Under this definition, the cluster defines a unit of area for habitat management purposes as well as restriction of training activities.

The proposed revision divorces the definition of a cluster for management purposes from the establishment of protective buffer zones for implementing training restrictions.

Under the proposed revision, protective buffers will be limited to a 200 foot radius around individual cavity trees (**Appendix C, Section IV**). However, for management purposes, the current definition of a cluster will remain unchanged under the proposed revision (**Appendix C, Section V.I.2.a**). Management in cluster sites will not be considered further in this assessment since the proposed revision does not represent a change from the current baseline condition. In general, current biological and habitat management guidelines emphasize conservation benefits for RCWs (Hayden and Carter 1994, Biological Assessment for 1994 "Management Guidelines for the RCW on Army Installations").

Figure 4 shows a representative sample of clusters on Fort Bragg and the potential change in the configuration and extent of protective buffer zones. The main effect of the revised buffer zones is to permit training in portions of the cluster where training is restricted under the current guidelines while maintaining protection of cavity trees and nesting RCWs. Based on 1995 clusters, restricted training lands on Fort Bragg would decrease by approximately 60 percent (4,834 to 1,918 hectares for 1995 cluster configuration). On Fort Stewart, lands with restricted training would decrease an estimated 10 to 20 percent under the proposed revision (T. Beaty, personal communication). Fort Benning estimates a decrease in area with training restrictions from the current 1,834 ha to 1,346 ha (27 percent decrease) under the proposed revision. Fort Benning also estimates that of 2,574 cavity trees currently known on the installation, 184 (seven percent) would be individually isolated from buffer zones of other cavity trees under the proposed revision.

The 1984 Army RCW guidelines and early installation biological opinions initially established 200 foot buffer zones to identify RCW management units and protect nesting habitats from deleterious management practices, particularly commercial timber production. Subsequent installation biological opinions extended the purpose of buffers to restrict training activities in the vicinity of breeding habitats (e.g. Fort Bragg Biological Opinion, USFWS, 1990).

Training restrictions within protective buffer zones protect nesting RCWs and active and inactive cavity trees from potential behavioral and physical effects of military training. Known effects of training are discussed in **Section 4.1** of this biological assessment.

The potential for increased behavioral impacts on nesting RCWs due to activities greater than two hours in duration would remain substantially unchanged under the proposed revision due to changes in configuration of the protective buffer. Potential effects of changes in allowable transient training activities within protective buffer zones are discussed in Section 4.4. In both the current guidelines and the proposed revision, unrestricted training greater than two hours in duration could occur no closer than 200 feet from cavity trees. Exposure of any individual cavity tree to increased training activity around the 360 degree circumference of the buffer zone at any particular point in time is unlikely. Tactical dispersal of fixed activities such as field command posts and communication sites in the vicinity of buffer zones would make it unlikely that these kind of activities would occur in greater concentration within proximity to any individual tree than under current buffer zone configurations (reference training staff personal communications, site visits, 27-29 February 1996).

Increased behavioral disturbance of nesting RCWs due to training activities greater than two hours in duration or increased damage to cavity trees is not expected due to reconfiguration of protective buffer zones. However, some habitat that currently is protected in clusters under current guidelines will be exposed to unrestricted training under the proposed revision. Training effects in these areas may include increased soil disturbance, loss of herbaceous and woody shrub cover, reduced pine regeneration, and possibly increased tree mortality, although not to cavity trees, due to root damage. These effects could reduce foraging substrate and long-term recruitment of potential cavity trees within some areas of current cluster sites. A potential positive benefit could be reduction in midstory encroachment. The net effect on habitats at any particular site would have to be assessed on a site by site basis considering current habitat conditions and anticipated intensity of training at particular sites.

No quantitative data or predictive models currently exist to definitively evaluate habitat effects at specific sites due to changes in configuration of buffer zones. The best professional judgement of installation natural resource managers, based on condition of foraging habitat in areas currently with unrestricted training, is that current management practices and remedial management practices prescribed under the proposed revision (see Section 4.6) will adequately compensate for any effects on foraging availability due to off-road vehicle maneuvers. Also, the proposed revision does not relieve installations from maintaining adequate foraging habitat to support installation regional recovery goals.

This assessment assumes that overall frequency, magnitude or duration of training will not

change as a result of implementing the proposed revision. This implies that while current training may have a different spatial distribution across the landscape, off-road miles would not change as a result of implementing the proposed revision, and the net effect on foraging availability would remain essentially unchanged. In some cases, a redistribution of the training activity may serve to more evenly distribute effects of training over the landscape, reducing severe impacts in some areas where vehicle movements are concentrated due to current restrictions and increasing training activity in currently undisturbed sites. The current configuration of buffer zones tends to channelize military movements between cluster sites increasing the intensity and frequency of training in some areas (see **Figures 5 and 6**). The result, under the current guidelines, may be increased damage at specific locations in RCW foraging habitats that could be lessened if the activity were more dispersed over the landscape.

4.4 Training Activities Within Protective Buffers

In the proposed revision, training activities allowed within buffer zones are determined primarily by whether they are transient (less than two hours) or fixed activities. The proposed revision permits the following training activities (**Appendix C, Section V.I.2**) within protective buffer zones that are not permitted under current guidelines.

- Transient, off-road vehicle travel within 50 feet of cavity trees.
- Hand-digging of hasty individual fighting positions.
- Firing of 50 caliber blanks, artillery/hand grenade simulators, and Hoffman type devices.
- Use of smoke grenades and star clusters/parachute flares.
- Infiltration of smoke, haze operations only.

None of these activities may be conducted with a duration greater than two hours. Potential worst case effects would be the inability of adults to tend young or eggs in the nest for periods up to two hours, complete abandonment of the cluster site, or destruction of cavity trees.

Potential effects of training activities listed above within protective buffers will largely depend on the duration, frequency, and intensity of these activities in proximity to cavity trees. Limited data currently exist to quantify these training characteristics, particularly at the site-specific level. However, training doctrine and implementation do provide information relevant to anticipated duration, frequency, and intensity of these activities in proximity to RCW cavity trees. For this reason a brief description of relevant training doctrine and implementation is provided below followed by descriptions and anticipated effects of these training activities. Descriptions of training requirements and conduct were derived from Army Field Manuals (FMs) and other doctrinal and training manuals, site visits, and personnel communications from Army trainers.

4.4.1 Training doctrine and implementation.

The role of Army training is to prepare soldiers, leaders and units to mobilize, deploy, fight, and sustain combat operations. The driving principle of Army training is that units must train in peacetime as they will fight during war. This training is task based and guided by Army doctrine which provides correct procedures and principles for effective training.

Proficiency at required tasks must be accomplished at all organizational levels from the individual soldier through the highest command elements, and training must be conducted to sustain proficiency through time. To accomplish sustained proficiency, training is cyclic and typically progresses from training individual soldier tasks and lower echelon units to complex, realistic training events involving upper echelon units training the full spectrum of mission required tasks.

Of particular relevance to this assessment are those training events that would result in transient training activities within 200 feet of cavity trees. These training events are primarily situational training exercises (STX), field training exercises (FTX), and external evaluations (EXEVAL). Other training events use training lands but are not likely to result in transient activity within protected buffer zones. For example, weapons firing during live-fire exercises (LFX) and combined arms live-fire exercises (CALFEX) are typically conducted on dedicated ranges, facilities, or multi-purpose ranges. Construction and use of these dedicated ranges and facilities are subject to project level biological assessments. Command and control exercises such as command field exercises (CFX) may set up command field posts but do not actually maneuver units in the field. Activities such as

command field posts represent activities greater than two hours in duration which are not permitted in buffer zones under the proposed revision.

FTXs provide units and leaders the opportunity to sustain proficiency by integrating all mission essential tasks in a realistic scenario as close to combat conditions as possible. During STXs units train subelements of an FTX. An EXEVAL is an externally graded FTX. FTXs, STXs, and EXEVAL are conducted at all organizational levels. Units conducting field training exercises typically maneuver, attack and defend against an opposing force. These exercises are usually developed based on a sequence of related tasks identified in a unit's mission essential task list (METL), which is developed by unit leaders based on the unit's mission requirement and tasks outlined in Mission Training Plans. The purpose of the METL is to identify and provide objective training standards for those tasks essential to completing a unit's assigned combat mission. Typical elements of an FTX are assembly of the unit, movement to an objective, and attack or defense against the opposing force. **Figure 7** shows a typical mission outline for a company FTX with required tasks to accomplish the mission. **Figure 8** illustrates graphically the sequence of events in this FTX. Tasks that are most relevant to anticipated activities in RCW clusters are "Tactical Movement" and "Actions on Contact." Tasks such as "Tactical Road March" are conducted on established roads and trails. Occupation of assembly areas and defensive positions usually represent activities greater than two hours in duration which would not be allowed in RCW buffer zones.

Tactical movement can be accomplished in a variety of ways, either by road or off-road. In all cases it connotes unit formations and sequence of movement that provide unit security, coordination, and reaction flexibility in the presence of enemy forces. Actions on contact represent those drills and procedures implemented when a unit encounters enemy forces. Typically these actions would comprise fire and maneuver.

The duration, intensity, and frequency of allowable transient training activities in RCW clusters will depend on unit size, training cycles, and doctrinal requirements. **Tables 8, 9, and 10** show allocations of soldiers, weapons and vehicles for typical infantry, mechanized infantry, and armor units through the battalion level (data provided by Forces Command G3, Operations).

Duration and frequency of FTXs is correlated with organizational level of the unit.

Typically, duration increases and frequency decreases with increasing organizational level. In most cases, a battalion is the largest unit that would operate synchronously as a maneuver element during an FTX. Most FTXs are conducted at the company level or below. Battalion FTXs for armored and mechanized infantry units usually are conducted 1-3 times per year. FTXs at company level and below typically are conducted 3-5 times annually. Duration of FTXs will vary depending on the training objective; however, battalion and brigade FTXs are usually 5-10 days in duration. FTXs for company level and below are usually 1-4 days in duration. Units normally would not be scheduled simultaneously in the same area of operation during an FTX.

During any particular FTX only a limited amount of time is spent conducting actions that would result in transient activity in RCW clusters. For example, **Figure 9** shows a sample time allocation for a 24 hour company FTX. Three hours of this 24 hour exercise are allocated for tasks which might result in off-road transient activity in buffer zones (perform tactical movement, defend against air attack, perform actions on contact). This three hour period represents a movement action, so time at any one location would be some fraction of this three hour period.

An anecdotal observation further illustrates that off-road transient activities are a limited subset of the total training requirement. During the 29 February 1996 site visit by installation biologists and USFWS representatives at Fort Stewart a mechanized infantry brigade FTX was in progress. One objective of the site visit was to observe off-road vehicle movements during a tactical operation. Despite the fact a major FTX was in progress and that unit schedulers familiar with the area of operation were present, no off-road vehicle movements could be located during a six hour survey of the area of operation.

A fundamental tenet of all tactical operations is dispersal of units and personnel to provide a balance of effective force and protection of soldiers and equipment from incoming enemy fire. **Figures 5 and 6** show a tank company in a typical tactical formation, "company wedge", conducting a movement to contact in proximity to RCW clusters. Note in **Figure 5** that the tactical formation is disrupted and vehicles are channelized by current buffer zone configurations. Vehicles maneuvering through clusters and maintaining a 50 foot distance from cavity trees are able to maintain integrity of the tactical formation (**Figure 6**).

Typical unit frontages (length of a battle line for which a unit is responsible) are presented in

Table 11 (data provided by Forces Command G3, Operations). For example, an armor company of 14 tracked vehicles typically would be responsible for a frontage of 350-600 meters during offensive operations and 3-5 kilometers during defensive operations. Vehicle and troop densities during tactical movement will vary somewhat depending on the tactical situation and training scenario; however, soldier and vehicle densities in proximity to individual cavity trees will be relatively low due to tactical dispersal requirements and operation area.

More specific training information relevant to conduct of training activities in proximity to cavity trees is provided in the following sections of this assessment. To summarize characteristics of training relevant to this analysis of effects:

- Most field training exercises potentially involving off-road transient activities are conducted at company level or below.
- Density (relevant to intensity of activity) of soldiers and vehicles in proximity to cavity trees during off-road transient activities will be relatively low due to tactical dispersal requirements.
- Frequency of off-road transient activities at any individual location will in most cases be no more than daily and likely at greater intervals given the frequency and duration of field training exercises.
- Duration of off-road transient activities in proximity to any particular cavity tree will in most cases be well within the two-hour limitation under the proposed guidelines.

4.4.2 Transient, off-road vehicle travel within 50 feet of cavity trees.

Vehicle travel, both wheeled and tracked, in the proximity of cavity trees could have two principal effects: (1) direct disturbance of birds trying to use cavities, and (2) potential physical disturbance of cavity trees due to root disturbance.

During typical vehicle movements, the guidance for tactical dispersal of vehicles is 50 to 100 meters (164-328 feet; FM 17-15). Normally, off-road movements are in formations other

than "in column" (vehicles following in line). This means that during normal off-road movements, vehicles of individual units will not be making multiple passes over the same piece of ground, and usually no more than one or two vehicles would be passing simultaneously within 200 feet of a cavity tree (see Figure 6).

4.4.2.1 *Physical disturbance of cavity trees*

Vehicle traffic in the protected buffers will increase soil disturbance and consequently potential root damage to cavity trees. Two species, longleaf pine (*P. palustris*) and loblolly pine (*P. taeda*) are the predominate species used by RCWs for cavity construction on Army lands. Stone and Kalisz (1991) in their review of data on the maximum extent of tree roots provided data on the maximum depth and radius of longleaf pine roots. Data on maximum depth but not radius of loblolly roots were summarized by Stone and Kalisz. Longleaf is the preferred species for cavity construction and current management on Army lands is directed toward reestablishment of longleaf on appropriate sites. The average radius of longleaf roots in "mature" trees from three studies was 18.1 m (61.6 feet) with a maximum radius reported of 22.2 m (72.8 feet). Studies in pine and pine/mixed hardwood forests show that fine feeder roots, primarily responsible for nutrient uptake, are predominantly found in the top organic layers of forest soils (Brown and Lacate 1961, Farrish 1991, Stone and Kalisz 1991, Ehrenfeld, Kaldor and Parmelee 1992). In Louisiana upland pine-hardwood forests, Farrish estimated approximately 60 percent of fine-root biomass was found in the upper 20 cm (7.9 inches) of soil. Stone and Kalisz (1991) noted that the relative importance of distant lateral roots in nutrient uptake is unclear, although some data suggest nutrient uptake by distant lateral roots is of negligible importance.

These data indicate that vehicle travel as close as 50 feet from cavity trees may impact shallow lateral roots at their outer extent. The extent to which this disturbance effects vigor or mortality of these trees is not well known and likely will depend on the intensity and frequency of vehicular traffic in proximity to cavity trees (see Section 4.4.1 for discussion on anticipated frequency of transient off-road vehicle travel in proximity to cavity trees). Likely, cavity trees in proximity to tactically important landscape features (e.g. crossroads) will be subject to greater levels of vehicle activity. Due to tactical dispersal of vehicles during off-road movements, the impact on cavity trees of an individual unit movement on any particular site is likely minimal.

Observed damage or mortality to pine trees in maneuver areas has been due primarily to direct impact from vehicles. Direct damage to pine trees currently is prohibited for RCW management purposes and also because it is tactically unsound and increases maintenance costs. For these reasons and the 50 foot limit under the proposed revision, direct damage to cavity trees is not anticipated.

4.4.2.2 *Behavioral disturbance of nesting RCWs*

As discussed in **Section 4.4.1**, limited data exists to evaluate response of RCWs in proximity to transient military vehicle traffic. Nest data and personal observations by installation biologists demonstrate that RCWs will occupy cluster sites and successfully raise young in proximity to heavily travelled roads and trails on Army installations. Off-road vehicle miles are a relatively small proportion of the total training miles, so it is anticipated that off-road vehicle traffic in proximity to cavity trees will be of similar or much lower frequency and duration than for cavity trees currently in proximity to installation roads and trails. Thus, effects on recruitment and reproductive success in cavity trees subject to off-road disturbance is anticipated to be no greater than effects observed in cavity trees in proximity to roads and trails. Data are not available to determine if recruitment rates in clusters in proximity to roads is different from clusters not associated with roads. Data on nest success are provided below.

Potential disturbance of RCWs is going to be most critical during the nesting season when adults are tending eggs or nestlings. In observations of feeding rates of RCW nestlings, average daily feeding rates ranged from an adult visit every four minutes to a visit every 15 minutes (Ligon 1970, Baker 1971, Harlow and Lennartz 1977, Lennartz and Harlow 1979, Boone 1980). Baker (1971) noted the longest periods he observed without feeding bouts were one hour 36 minutes and one hour 22 minutes at two cluster sites, respectively.

Military activities in cluster sites, including vehicles, is limited to two hours. In the worst case, adults would not attend nests for the maximum time (2 hours) that military activities, including transient vehicle travel, could occur in proximity to nest cavities. Absence of feeding over a period of two hours is outside the normal range of feeding frequency. No data are available on the effects of not feeding RCW young or incubating eggs for a period of two hours. Potential effects likely would depend on a number of factors including ambient temperature, age of nestlings, condition of nestlings, time of day, and frequency of

disturbance events (see Section 4.4.1 for anticipated frequency of training events).

In reality it is unlikely that off-road vehicles will be in proximity to cavity nest trees for extended periods of time under normal training conditions; therefore, it is anticipated that population effects due to behavioral disturbance will be minimal. Most off-road vehicle traffic will occur during "tactical movement." This task is characterized by a nearly continuous movement of the unit in a tactical formation from a staging area to a designated objective. Duration of time in proximity to cavity trees will depend primarily on speed, size, and tactical formation of the unit conducting the movement. However; based on data provided in Section 4.4.1, a platoon consisting of four vehicles likely would be the largest unit in proximity to any individual cavity tree, and rarely would more than two vehicles occur simultaneously within the buffer zone of a cavity tree because of tactical dispersal. During the 29 February 1996 site visit to Fort Stewart, the pass time of tracked vehicles equivalent to two platoons conducting a tactical road march was seven minutes.

Units conducting a tactical movement will stop primarily to coordinate and communicate actions within and among units or to "perform actions on contact". Coordination and communication actions are relatively brief because the objective of a tactical movement is to proceed expeditiously to the objective and to minimize exposure of stationary units to enemy fire. The task of "actions on contact" is typically a response to an unexpected encounter with an opposing force. The doctrinal drill for an action on contact is to assess the enemy threat, perform fire and maneuver if necessary, and either overcome the enemy threat and proceed to the objective, or disengage from the threat and maneuver from the area. In most cases, the drill for "performing actions on contact" is accomplished within 15-20 minutes or less. The objective of an "action on contact" is to overcome the threat as quickly as possible and accomplish the mission objective.

Behavioral response of RCW adults to vehicles within 50 feet of cavity trees has not been quantified. As Gutzwiller and Hayden (*in press*) notes in their review, behavioral response to visual and noise cues can be variable among species as well as having intraspecific individual variation. Habituation to regular, predictable disturbance can be key factor in variation of behavioral response among individuals. Anecdotal observations of RCW clusters adjacent to highways (Jackson 1976, 1983) suggests the potential of individual RCWs to habituate to vehicular traffic. Both Gutzwiller and Hayden (*in press*) and Jackson (1983) note that potential negative effects likely are related to the novelty and duration of the

disturbance.

Nest data for Fort Bragg for the years 1992-95 were evaluated to determine any relationship between initiation and success of RCW nest attempts and proximity to roads. **Figure 10** shows suitable cavity trees and active cavity trees 0-70 meters from roads. Chi-square analysis showed no relationship between cavity tree activity and proximity to roads based on availability of suitable cavity trees (chi-square = 0.068, $p > 0.5$). **Figure 11** and **Table 12** show reproductive data for nests 0-70 meters from roads and trails. No significant association was found between number of young fledged and distance from roads or trails (Pearson r-squared = 0.019, $p = 0.795$).

Data for 36 nest attempts during 1995 on Fort Stewart show a similar lack of association between nest success proximity to roads (Kendall coefficient = -0.023, $p = 0.869$). Mean number of young fledged from nests less than 100 m from roads (mean = 1.31, $N = 16$) was not significantly different (Wilcoxon signed rank test $p = 0.283$) than the mean number of young fledged from nests greater than 100 meters for roads (mean = 1.52, $N=21$).

In summary, data and personal observations available to date do not demonstrate any clear relationship between vehicle traffic and reproductive success. However, the following data would be useful to definitively evaluate physical, behavioral and reproductive effects of transient vehicle traffic in the vicinity of cavity trees:

- Behavioral effects and nest attendance in response to vehicle traffic.
- Effect of reduced feeding rates for limited periods of time.
- Frequency and intensity of transient vehicle travel through cluster sites.
- Soil disturbance and vegetative response at varying levels of disturbance.

4.4.3 Hand-digging of hasty individual fighting positions.

"Hasty" fighting positions provide individual protective cover when there is not time to prepare more extensive protective positions. FM 7-70 (1986) prescribes a small depression approximately 46 cm (18 inches) deep to provide protection from indirect fire. In practice

excavations are usually shallower. Hasty fighting positions are typically created by units coming under fire during movement (hasty defense), for attack overwatch positions, or for ambushes. Hasty fighting positions are not representative of the more extensive earthworks associated with fixed defensive positions and assembly or bivouac areas, which are not allowed within buffer zones.

The number of hasty fighting positions within any individual buffered area during a training event will depend on tactical dispersal of the individuals and units. Tactical dispersal of personnel during movement typically is 10 m or more between individuals. Dispersal of personnel in hasty ambush or defensive positions will vary depending on terrain, vegetation, fields of fire, etc. However, due to tactical dispersal considerations, units larger than squad level (6-10 soldiers) would rarely simultaneously occupy positions within the 200 foot buffer zone around individual cavity trees.

The primary effect of digging hasty fighting positions would be disturbance of upper soil layers and herbaceous cover. As noted in Section 4.4.2, soil disturbance may reduce tree vigor. Loss of herbaceous cover could result in additional tree root disturbance due to increased erosional potential. Short-term effects of digging hasty fighting positions in the vicinity of cavity trees by squad-level units is likely minimal due the relatively small area involved and low probability of multiple positions in close proximity to any individual cavity tree. Also, the proposed revision requires that all excavations are to be filled at the completion of training. Long-term effects of recurrent digging of hasty fighting positions near cavity trees are unknown and likely will depend on the incidence, number, and frequency of digging and the ability of roots to recover from disturbance. These data will be required to assess long-term effects at individual cavity trees. However, since digging of hasty fighting positions are a response to an unpredictable training event, the likelihood is small that any particular site will be subject to intensive, repeated excavation of hasty fighting positions.

4.4.4 Firing of 50 caliber blanks, artillery/hand grenade simulators, and Hoffman type devices.

These activities represent potential noise disturbance by explosive devices. Use of these devices and firing of blanks provide training realism in field exercises where use of live rounds is prohibited due to safety considerations or cost. Tables 13 and 14 show allotments

of ammunition and devices per weapon or unit for individual and crew served weapons, simulators, illumination devices, and smoke grenades. These data are relevant to potential frequency and intensity of use in proximity to cavity trees. Although unit commanders have flexibility in tailoring ammunition allotments among subordinate units and for individual exercises, they generally cannot exceed their annual allotment. The following is a description of these weapons/devices and their use in training.

- .50 caliber heavy machine gun: This weapon is the largest caliber machine gun in the Army inventory. Although it is sometimes used as a crew-served weapon by dismounted infantry, it is typically mounted on scout vehicles and Bradley fighting vehicles.
- Artillery simulators: These devices represent ground burst artillery rounds during field training exercises.
- Hand grenade simulators: These devices replicate use of hand grenades during field training exercises.
- Hoffman device: This device replicates the firing of a main tank gun during field training exercises.

The majority of rounds and devices will be used/fired during assaults on defended objectives. Since defense is a relatively fixed activity, these events will typically occur outside of the 200 foot buffer of cavity trees. In general, firing of blank rounds and use of these devices in proximity to cavity trees would occur during encounters with an opposing force ("Action on Contact") during a movement to contact (see Section 4.1). As described in Section 4.4.2.2, the drill during an action on contact is to overcome the threat as quickly as possible. Also, available ammunition as shown in Table 13 will limit total firing time of individual weapons. For these reasons, duration of these events typically will be limited to less than 15-20 minutes and total weapon firing time will be less than 10 minutes. For example, during an observed dismounted company assault on a bunker complex, the total firing time from the order to commence fire to the order to cease fire was six minutes. The total time for the event was 11 minutes from the time the objective was reached to the time the objective was taken (27 February 1996, Fort Bragg site visit).

Red-cockaded woodpeckers have demonstrated a capability to habituate and be reproductively successful in proximity to explosive noise sources. On Fort Bragg, significant populations of RCWs persist and successfully nest in impact and direct fire ranges where they are exposed to a variety of noise sources from small arms to artillery rounds. The weapons and devices listed above are no greater a noise source than that associated with artillery fire or detonation of live artillery rounds. Limited data presented earlier in this assessment suggest that RCW clusters associated with artillery firing areas during 1981-90 had relatively high fecundities. Current data for suitable/active cavity trees in proximity to artillery positions (**Figure 12**) indicate RCWs will use areas in proximity to loud noise sources. As noted in **Section 4.1**, other observations have shown that RCW groups have successfully habituated to noise sources ranging from interstate highways to aerial bombs (Jackson 1976, 1983).

Significant noise effects, if any, will depend on site-specific intensity, duration, and frequency of the event. Data on weapons and device usage and allotment, frequency of field exercises, and training doctrine suggest that intensity, duration, and frequency of use of these weapons and devices within proximity to any individual cavity tree typically will be low. Additional data would be useful to quantify probability of occurrence and effects at the site-specific level.

4.4.5 Use of smoke grenades and star clusters/parachute flares.

4.4.5.1 Smoke grenades

These devices are used for marking and signalling purposes. Area of effect and duration of smoke grenades is limited. During an observed firing of a smoke grenade, the burn lasted approximately one minute and the resulting smoke haze dissipated within five minutes. Other activities associated with use of smoke grenades (troop/vehicle movement) will likely flush RCWs from a smoke grenade's area of effect prior to its use. **Table 14** shows average annual allotments of smoke grenades by unit size. Platoon sized units on average are allotted 59 smoke grenades annually for field training exercises which suggests use of smoke grenades at any one site during transient movement will be relatively limited.

4.4.5.2 Star clusters/parachute flares

Star clusters and parachute flares are used during field training exercises for illumination and

signalling purposes. Table 14 shows annual allotments. The major potential effect of these illumination rounds would be ignition of wildfires particularly during daylight hours. The relative risk of nighttime wildfires would be less due higher night humidities (when illumination would be in use). It has been observed that flares attached to cavity trees have ignited sap. The chance of wildfire is mitigated by midstory control and prescribed burning associated with RCW management in cluster sites. Installations have in place procedures and protocols for prevention and management of fires started by military pyrotechnics.

Effects of nighttime illumination on cavity roosting RCWs is unknown. However, these devices are short in duration and the illumination level is probably no greater than a full moon on a clear night based on subjective observation.

4.4.6 Infiltration of smoke, haze operations only.

Generation of smoke for obscurant purposes is usually accomplished by generating fog oil obscurants from vehicle mounted generators. The guidelines revision does not permit generation of smoke within buffer zones which is consistent with current guidelines. However, given the potential broad area coverage of smoke operations and the distribution of cavity trees on many installations, it is often impossible to prevent obscurant smoke infiltration in some buffer zones without terminating smoke operations entirely. The proposed revision permits smoke infiltration at a haze level of obscurance.

In terms of behavioral effects, RCWs are unlikely to perceive haze level smoke operations any differently than fire smokes to which RCWs are regularly exposed. Potential toxicity of obscurant smokes would be the primary effect of concern for RCWs.

A report by Getz et al. (1996) determined that fog oil smoke (a petroleum product) is virtually the only obscurant currently used for broad-area screening on installations. Getz et al. reviewed toxicity of fog oils and evaluated potential effects on a selected variety of threatened or endangered species, including the RCW, based on the available literature. Data reviewed for mammalian species indicates very low toxicity of fog oil even at concentrations much higher than encountered during hazing operations. Although specific data for avian species were limited, they concluded that at concentrations associated with haze operations, serious adverse effects to the RCW would be unlikely. However, the authors listed several assumptions, primarily deposition rates and exposure risks, that are

currently being tested to definitively determine potential toxic effects on RCWs.

4.5 Monitoring and reporting requirements to assess effects of implementing the proposed revision.

Much of the data necessary to accurately predict effects of military training activities, either negative or positive, are limited, particularly at the site-specific level. The proposed revision recognizes this need. Sections V.C.1.e.(2) and V.C.2.b-d of the proposed revision (Appendix C) outline monitoring, research, and reporting requirements that are an extension of current requirements. The additional monitoring and research requirements emphasize characterization and quantification of training activities in association with RCWs to address deficiencies in information noted above and to evaluate population trends in relation to military training and implementation of the proposed revision. The proposed revision requires annual reporting of these data and analyses to the USFWS for their review. Reporting formats for these data are provided as an appendix to the proposed revision.

The proposed revision provides a programmatic mechanism for reporting and evaluating observed population trends and requires the Army to take remedial actions if population decreases are observed. The threshold established in the proposed revision is a five percent decrease in the installation population. In addition to the reporting requirements noted above, the Army will host an annual meeting of installation representatives and FWS to evaluate installation RCW population data. The proposed revision requires initiation of informal consultation if an installation is accomplishing less than 50 percent of its ESMP population goals.

The effect of revisions in monitoring, research, and reporting requirements will be to address knowledge gaps identified in this assessment and provide an early warning and programmatic response for any identified adverse effects.

4.6 Remedial actions to mitigate effects of training on RCWs and associated habitats.

Potential physical impacts in buffer zones, if they occur, would primarily result from damage or loss of cavity trees due to root disturbance and increased erosion potential from vehicle traffic in buffer zones (see Sections 4.4.2.1). Section V.I.3.a-e of the proposed revision

(Appendix C) prescribes mitigation actions the installation will take in addition to current management requirements to maintain the quality of RCW habitats. These actions include:

- Prohibition of cutting or destroying of pine trees unless authorized by the installation biologist for removal.
- Reporting known damage to any marked cavity tree or cavity tree start and any known extensive soil disturbance in and around RCW clusters.
- Immediately reprovisioning (within 48 hours) a cavity tree if one is destroyed.
- Repair of damage to training lands within clusters as soon as practicable (normally within 72 hours) to prevent degradation of habitat.
- Filling of all military digging activities within a reasonable time at completion of training.

These requirements apply in RCW habitats throughout the installation with priority in RCW clusters. The effect of these proposed revisions will be to reduce potential erosion impacts due to training activities and ensure adequate availability of cavity trees. A cluster site will be reprovisioned within 48 hours when a cavity tree is significantly destroyed or damaged to the extent that it is unsuitable for use by RCWs. The ability of provisioned cavity trees to recruit and retain RCWs is well-documented (Carter, Engstrom and Purcell 1995, Gaines et al. 1995, Richardson and Stockie 1995, Walters et al. 1995a, Walters et al. 1995b, Watson et al. 1995).

In addition to these specific mitigation actions required under the proposed revision, other programs and management activities will directly or indirectly compensate for potential impacts due to revised training restrictions. Aggressive habitat management at a landscape scale for RCWs under these guidelines, including prescribed burning and silvicultural practices to promote longleaf pine regeneration, will enhance carrying capacity and habitat quality for RCW populations on Army installations. The Army's Integrated Training Area Management Program (ITAM) will monitor overall condition of training lands and will provide a mechanism for maintaining, repairing, and restoring lands damaged due to training. Under the ITAM program installations implement environmental awareness training

for soldiers to inform them of their responsibilities in maintaining the condition of training lands and conservation of sensitive resources.

It is the professional judgement of installation biologists that, in total, these proactive management activities and programs will compensate for any potential impacts due to training under the proposed revision and will result in habitat conditions conducive to increasing RCW populations and attaining recovery goals.

4.7 Threatened or Endangered Species Other Than the RCW

Table 3 lists threatened or endangered species that are known to occur or may occur in association with RCWs on Army installations in the southeastern United States. The proposed revision represents the Army's programmatic guidance specifically for management of the RCW. Implementation of the proposed revision in no way supersedes requirements of the Endangered Species Act, National Environmental Policy Act, or AR 200-3 Chapter 11 for other listed species occurring on Army lands. Installations will still be required to avoid "take" and adverse impacts on any listed species occurring in areas where military activities occur as a result of implementing the proposed revision.

As disclosed in the biological assessment of the 1994 Army RCW guidelines (Hayden and Carter 1994), prescribed habitat management practices (e.g. prescribed burning, increased forest rotation) likely will have a net benefit for listed species occurring in RCW habitats.

A report on potential effects of RCW management on Army lands on other candidate, threatened or endangered species was prepared by The Nature Conservancy under contract with USACERL (Jordan et al. *in press*). This report is included here by reference.

5 Conclusion

This assessment determines that, based on available knowledge, implementing the proposed revision to the 1994 "Management Guidelines for RCWs on Army Installations" may affect the endangered RCW. Although some individual RCWs and habitat may be subject to greater training activity and resulting disturbance under the proposed revision, this programmatic guidance, when implemented, is expected to stabilize and expand RCW populations on Army installations where this guidance is implemented. This assessment determines that implementation of the proposed revision will have no adverse effect on other listed species considered in this assessment. No critical habitat is designated for any listed species considered in this assessment.

This determination is dependent on *full implementation* of all provisions of the proposed revision including habitat management prescriptions, monitoring and research requirements, and mitigation prescriptions. Fully implemented, it is anticipated the proposed revision will meet conservation objectives for the RCW, assist species recovery, fulfill regulatory requirements of the ESA, and alleviate current restrictions on Army training.

Table 3. Endangered or threatened species known to occur on Army installations subject to the proposed revision of the Army RCW management guidelines. Table lists threatened (T) or endangered (E) species that are likely to occur in association with RCWs or their habitats. Listed species that are unlikely to occur in association with RCWs or their habitats are not included. Species list is from a report compiled by The Nature Conservancy (Jordan et al. *in press*) and a species list provided by the USFWS in a letter dated 12 March 1996.

Species Name	Common Name	Status
<u>Mammals</u>		
<i>Myotis grisescens</i>	Gray bat	E
<u>Birds</u>		
<i>Haliaeetus leucocephalus</i>	Bald eagle	T
<i>Picoides borealis</i>	Red-cockaded woodpecker	E
<u>Reptiles</u>		
<i>Drymarchon corais douperi</i>	Eastern indigo snake	T
<i>Gopherus polyphemus</i>	Gopher tortoise	T
<u>Insects</u>		
<i>Neonympha mitchellii francisci</i>	Mitchell satyr butterfly	E
<u>Plants</u>		

Table 3. (continued)

Species Name	Common Name	Status
<i>Baptisia arachnifera</i>	Hairy rattleweed	E
<i>Echinacea laevigata</i>	Smooth coneflower	E
<i>Lindera melissifolia</i>	Southern spicebush	E
<i>Lysimachia asperifolia</i>	Roughleaf loosestrife	E
<i>Oxypolis canbyi</i>	Canby's cowbane	E
<i>Rhus michauxii</i>	Michaux's sumac	E
<i>Schwalbea americana</i>	American chaffseed	E
<i>Thalictrum cooleyi</i>	Cooley's meadowrue	E
<i>Xyris tennesseensis</i>	Tennessee yellow-eyed grass	E

Table 4. Conclusions on known and potential effects of maneuver training based on survey of peer-reviewed literature. Excerpted from Gutzwiller and Hayden (*in press*).

Major Conclusions	
1.	Impacts on birds associated with maneuvers, or maneuver-like disturbances, included abandonment of nest; shifts in habitat use; changes in feeding, breeding, and roosting behavior; and alterations of reproduction, predation, density, richness, composition and biomass.
2.	The structure and floristic composition of avian habitats can be altered in significant ways during maneuvers by tracked and wheeled vehicles, and encampments. Depending on the environment, these impacts may last for decades.
3.	There is considerable variation within and among species in their responses to military and maneuver-like disturbances. The evidence suggests that some species may learn to tolerate or habituate to certain military disturbances. In these cases, few or no detrimental effects usually accrue.
4.	Most of the data reviewed were obtained from observational studies. nevertheless, the many reported impacts that are consistent with what is known about the species' life-history needs and autecology support the contention that maneuvers can generate serious negative effects on birds.
5.	Examination of effects from maneuver-like recreational (e.g., ORV events, hiking) and natural-resource (e.g., helicopter overflights) activities revealed the variety of ways in which actual maneuvers may be influential.
6.	Very few peer-reviewed studies of how military activities influence birds are available, and numerous gaps in our knowledge about this issue must be filled before installations will be able to meet their dual responsibility of preserving birds while training effective combat troops.
7.	Current data are probably the best that could have been obtained under the various resource constraints faced by investigators, but they are not adequate for discerning causal relations.
8.	Almost no studies used the same sampling or analysis techniques, which makes it difficult to draw valid inferences about the effects of disturbances on birds under different conditions.
9.	Small (<30) sample sizes and lack of control for extraneous variation probably prevented some impacts from being detected (i.e., statistical power was weak), and some reported effects were probably artifacts of pseudoreplication.
10.	Many of the studies reviewed did not control for the effects of the investigators themselves.
11.	Avian responses to military and maneuver-like disturbances can be very context-specific, so experiments for each species-installation setting may be necessary to assess associated impacts.

Table 5. Major knowledge gaps and information requirements to effectively maneuver-related impacts on avian species. Excerpted from Gutzwiller and Hayden (*in press*).

Major Information Requirements	
1.	Data from long-term experimental studies that examine direct impacts of rotor-winged, tracked, and wheeled vehicles on a variety of avian taxa.
2.	Exactly the same kind of data as mentioned in point "1." above, but for birds' habitats, so that a better understanding of indirect effects can be developed.
3.	Data from studies that use the same methods of design and analysis, but that are applied in various contexts, including different locations, habitats and climate regimes. The purpose would be to determine whether there are commonalities among the different contexts that might be useful for prediction.
4.	Data from work that manipulates the frequency, duration, seasonal timing, periodicity, and spatial scale of military disturbances. also needed are data from experiments that involve different numbers of troops, vehicles, or both.
5.	Data from telemetered birds that will reveal their immediate and long-term behavioral reactions to military disturbance.
6.	Data about impacts of maneuvers on breeding-, foraging-, and stopover-site fidelity and tenacity.
7.	Data on the degree to which birds may habituate to or learn to tolerate military disturbances.
8.	Data about how the history of military disturbance at a site influences birds.
9.	Data on cumulative, interactive, and lag effects of military activities on birds.
10.	Data from experiments that separate out the potentially confounded effects of noise, habitat alterations, and the presence of troops and vehicles.

Table 6. Demographic data for Fort Bragg control clusters and clusters in intensively used training sites. N = number of clusters included in analysis. Mean = weighted means of clusters for the period 1981-90. S.D. = standard deviation. Clutch size = mean number of eggs/cluster in breeding years. # fledged = mean number of young fledged/cluster in breeding years. Group size = mean group size/cluster in breeding years. # helpers = mean number of helpers/cluster in breeding years. "Male" and "Female Turnover" = average length of stay of breeders in cluster. "Male" and "Female Age" = average age of breeders (banded birds).

	Fort Bragg Control			Bivouac and Drop Zones			Impact Areas			Artillery Firing Points		
	Mean	N	S.D.	Mean	N	S.D.	Mean	N	S.D.	Mean	N	S.D.
Clutch size	3.18	24	3.13	2.74	11	0.43	2.75	9	0.43	3.35	4	0.32
# fledged	1.73	24	1.63	1.23	11	0.60	1.48	9	0.37	1.82	4	0.18
Group size	2.51	24	2.44	2.12	11	0.38	2.40	9	0.37	2.42	4	0.50
# helpers	0.68	24	--	0.27	11	0.35	0.53	9	0.52	0.47	4	0.44
Female age	2.47	19	2.14	2.32	9	0.77	1.74	6	0.32	3.25	2	0.35
Female turnover	2.38	24	2.04	1.82	10	0.66	2.03	9	1.89	3.54	4	1.81
Male age	3.65	19	3.25	3.08	9	1.13	3.18	8	1.14	3.53	3	1.36
Male turnover	3.47	22	2.99	2.50	10	1.10	2.57	7	0.65	2.81	4	1.28

Table 7. Demographic data for control groups other than Fort Bragg. N = number of clusters included in analysis. Mean = weighted means of clusters for the period 1981-90. S.D. = standard deviation. Clutch size = mean number of eggs/cluster in breeding years. # fledged = mean number of young fledged/cluster in breeding years. Group size = mean group size/cluster in breeding years. # helpers = mean number of helpers/cluster in breeding years. "Male" and "Female Turnover" = average length of stay of breeders in cluster. "Male" and "Female Age" = average age of breeders (banded birds).

	Southern Game Lands			Southern Pines			Camp Mackall		
	Mean	N	S.D.	Mean	N	S.D.	Mean	N	S.D.
Clutch size	3.18	24	0.37	2.97	23	0.33	2.96	9	2.95
# fledged	1.58	24	0.43	1.70	23	0.52	1.64	9	1.63
Group size	2.17	24	0.28	2.33	24	0.34	2.43	9	2.40
# helpers	0.35	24	0.35	0.67	23	0.60	0.54	9	--
Female age	2.41	22	0.76	2.37	21	1.10	2.39	6	2.21
Female turnover	2.54	23	0.98	2.43	23	1.34	2.81	8	2.38
Male age	3.36	18	1.52	3.69	20	1.27	3.19	4	3.10
Male turnover	3.64	24	1.91	3.73	23	2.17	4.28	9	3.72

Table 8. Soldier, vehicle, and weapons systems allocations for infantry units.

Infantry Units					
Unit	Number of Soldiers	Vehicles		Weapons	
		Type	Num.	Type	Num.
Platoon	33	NONE		SAW (5.56 mm)	6
				M-16 (5.56 mm)	27
				DRAGON AT	1
Company	108 - 120	HMMWV	2	SAWs	
				M-16s	
				DRAGON AT	1
				MORTARS (60 mm)	3
Battalion	500 - 600	HMMWV to 5-TON	21 - 36	SAWs	
				DRAGON AT	
				MORTARS (60 mm)	
				MORTARS (81 mm)	
				TOW AT	

Table 9. Soldier, vehicle, and weapons systems allocations for mechanized infantry units.

Mechanized Infantry Units					
Unit	Number of Soldiers	Vehicles		Weapons	
		Type	Num.	Type	Num
Platoon	32	BRADLEY	4	24 mm CHAIN GUN	4
				M-16 (5.56 mm)	30
				TOW AT	4
Company	108	BRADLEY	14	M-16	
		HMMWV	2	TOW AT	
		5 TON	2	0.50 CAL MG	3
		M-88 RECOVERY VEH	1		
Battalion	800	BRADLEY	68	M-16	
		WHEELED	99	25 mm	
		M-88	7	TOW AT	
		M-577 COMMAND TRACKS	8	0.50 CAL MG	
		M-113	24	4.2 in MORTARS	6

Table 10. Soldier, vehicle, and weapons systems allocations for armor units.

Armor Units					
Unit	Number of Soldiers	Vehicles		Weapons	
		Type	Num.	Type	Num
Platoon	16	M1-A1 TANKS	4	7.62 MG	4
				M-16 (5.56 mm)	4
				0.50 CAL MG	4
Company	83	M1-A1 TANKS	14	M-16s	
		HMMWV	2	7.62 MG	14
		5 TON	2	0.50 CAL MG	3
		M-88 RECOVERY VEH	1		
Battalion	522	BRADLEY	8	M-16	
		WHEELED	115	7.62 MG	58
		M-88	7	TOW AT	8
		M-577 COMMAND TRACKS	8	0.50 CAL MG	90
		M1-A1 TANKS	58	4.2 in MORTARS	6
		M-113 TRACK	23		

Table 11. Unit frontage (area of the battle line that units typically are responsible for during offensive or defensive operations) for light infantry and mechanized forces.

UNIT FRONTAGE		
	Light Infantry	Mechanized Forces
Offensive Operations		
Platoon	100-150 M	100-175 M
Company	300-500 M	350-600 M
Battalion	1-4 KM	3-5 KM
Defensive Operations		
Platoon	250 M	750 M
Company	1 KM	3-5 KM
Battalion	3-5 KM	15 KM

Table 12. Fort Bragg nest data 1992-95 for nests 0-70 meters from roads, trails and firebreaks.

#	Distance	# Nests	Eggs	Nestlings	Fledglings	Mean Eggs	Mean Nestlings	Mean Fledg.
1	10	2	6	6	4	3.00	3.00	2.00
2	10	2	7	5	2	3.50	2.50	1.00
3	10	4	17	7	5	4.25	1.75	1.25
4	10	2	7	3	3	3.50	1.50	1.50
5	10	3	9	7	6	3.00	2.33	2.00
6	10	1	1	0	0	1.00	0.00	0.00
7	10	2	8	5	4	4.00	2.50	2.00
8	20	4	13	7	5	3.25	1.75	1.25
9	20	4	12	10	6	3.00	2.50	1.50
10	20	1	3	2	2	3.00	2.00	2.00
11	20	1	3	0	0	3.00	0.00	0.00
12	20	1	3	0	0	3.00	0.00	0.00
13	20	3	9	8	6	3.00	2.67	2.00
14	20	3	14	7	4	4.67	2.33	1.33
15	20	1	3	3	2	3.00	3.00	2.00
16	30	2	8	6	6	4.00	3.00	3.00
17	30	1	1	0	0	1.00	0.00	0.00
18	30	1	4	3	3	4.00	3.00	3.00
19	30	2	7	4	3	3.50	2.00	1.50
20	30	4	12	10	9	3.00	2.50	2.25
21	30	4	11	11	9	2.75	2.75	2.25
22	30	2	7	6	6	3.50	3.00	3.00
23	40	3	10	7	1	3.33	2.33	0.33

Table 12. (continued)

#	Distance	# Nests	Eggs	Nestlings	Fledg - lings	Mean Eggs	Mean Nestlings	Mean Fledg.
24	40	2	5	3	3	2.50	1.50	1.50
25	40	1	3	3	0	3.00	3.00	0.00
26	40	1	4	4	2	4.00	4.00	2.00
27	50	4	12	6	5	3.00	1.50	1.25
28	50	3	12	12	11	4.00	4.00	3.67
29	50	3	11	4	4	3.67	1.33	1.33
30	50	3	11	10	8	3.67	3.33	2.67
31	50	4	15	11	10	3.75	2.75	2.50
32	50	3	6	5	5	2.00	1.67	1.67
33	50	1	3	3	2	3.00	3.00	2.00
34	50	2	7	6	4	3.50	3.00	2.00
35	50	4	16	12	5	4.00	3.00	1.25
36	50	1	4	3	2	4.00	3.00	2.00
37	60	2	6	5	3	3.00	2.50	1.50
38	60	2	6	6	3	3.00	3.00	1.50
39	60	2	5	2	2	2.50	1.00	1.00
40	60	2	5	4	3	2.50	2.00	1.50
41	60	4	14	7	6	3.50	1.75	1.50

Table 13. Ammunition allotments for individual and crew-served weapons in standard use by combat infantry and mechanized units. LMG = light machine gun (SAW). MMG = medium machine gun. HMG = heavy machine gun, usually vehicle mounted. ROF = rate of fire. "Sustained" ROF is the lowest volume of fire during combat engagements. Allotments are from Department of Army Pamphlet 350-38 (1993).

Weapon	Caliber	Events/year	Rounds/event/ weapon	Annual total/weapon	ROF (sustained)	Max. firing time min/event /weapon
M-16	5.56 mm	8	120	960	12-15 rpm	8-10
M246 (LMG)	5.56 mm	8	200-300	2,000	100-150	1.3-3
M60 (MMG)	7.62	8	400	3,200	100	4
M2 mounted .50 Cal. (HMG)	.50 caliber	5	100	500	40	2.5

Table 14. Annual allotments per vehicle or battalion for simulators, flares/star clusters and smoke grenades. Average annual allotments for company and platoon sized units are derived from annual battalion allotments. Allotments are from Department of Army Pamphlet 350-38 (1993). See text for description and purpose of devices listed.

Device	Annual Allotment			
	Per Vehicle	Battalion	Company	Platoon
Hoffman device M1A1/M1A2	216			
Hand grenade simulator	N/A	520	130	43
Artillery ground burst simulator	N/A	626	156	52
Flare/star clusters	N/A	336	84	28
Smoke grenades	N/A	704	176	59

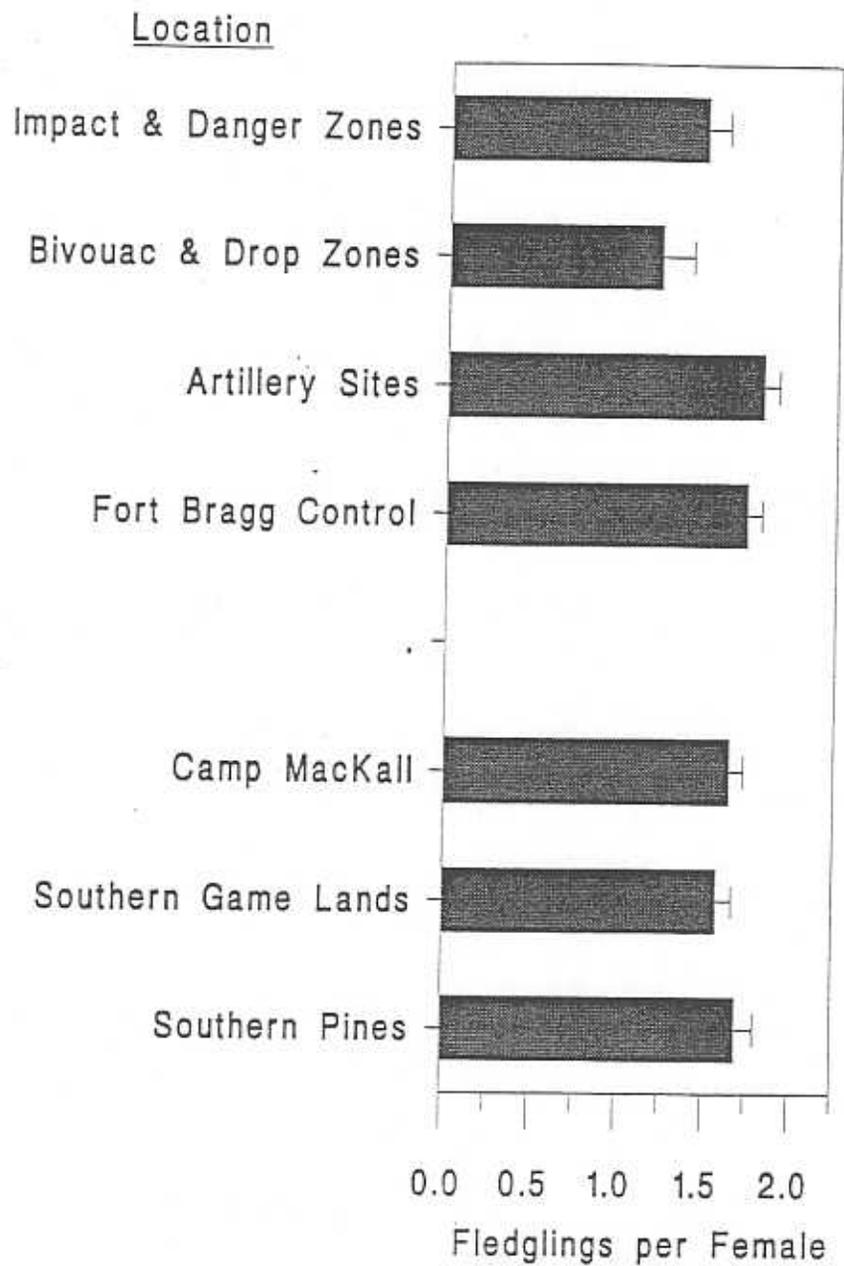


Figure 1. Mean young fledged per female RCW per year on Fort Bragg and Control sites during 1981-92. See Table 6 for additional data.

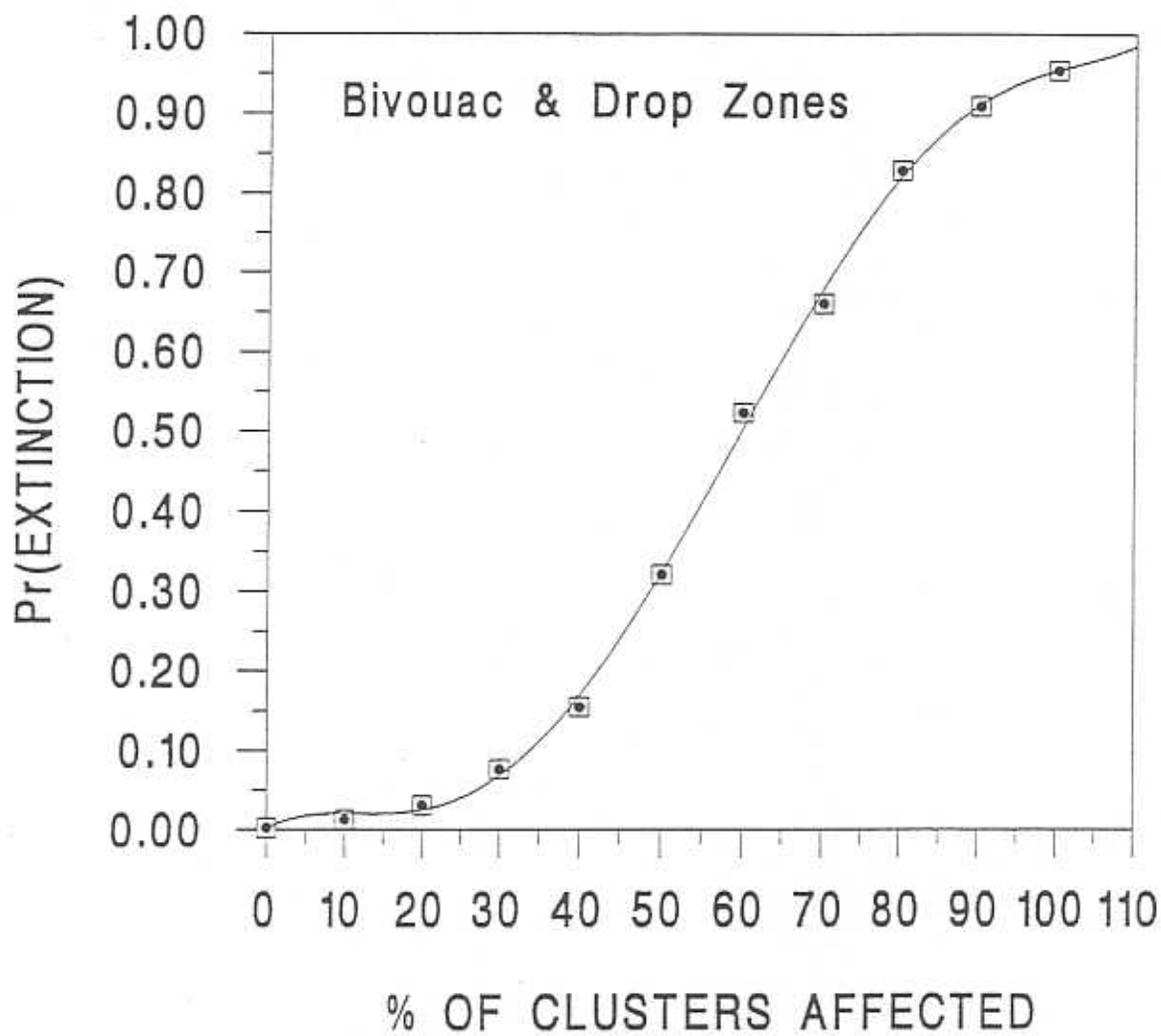


Figure 2. Extinction probability as the proportion of a population with fecundities equivalent to that observed in clusters associated with bivouacs and drop zones on Fort Bragg during 1981-90 increases. See Appendix E for additional details of this analysis.

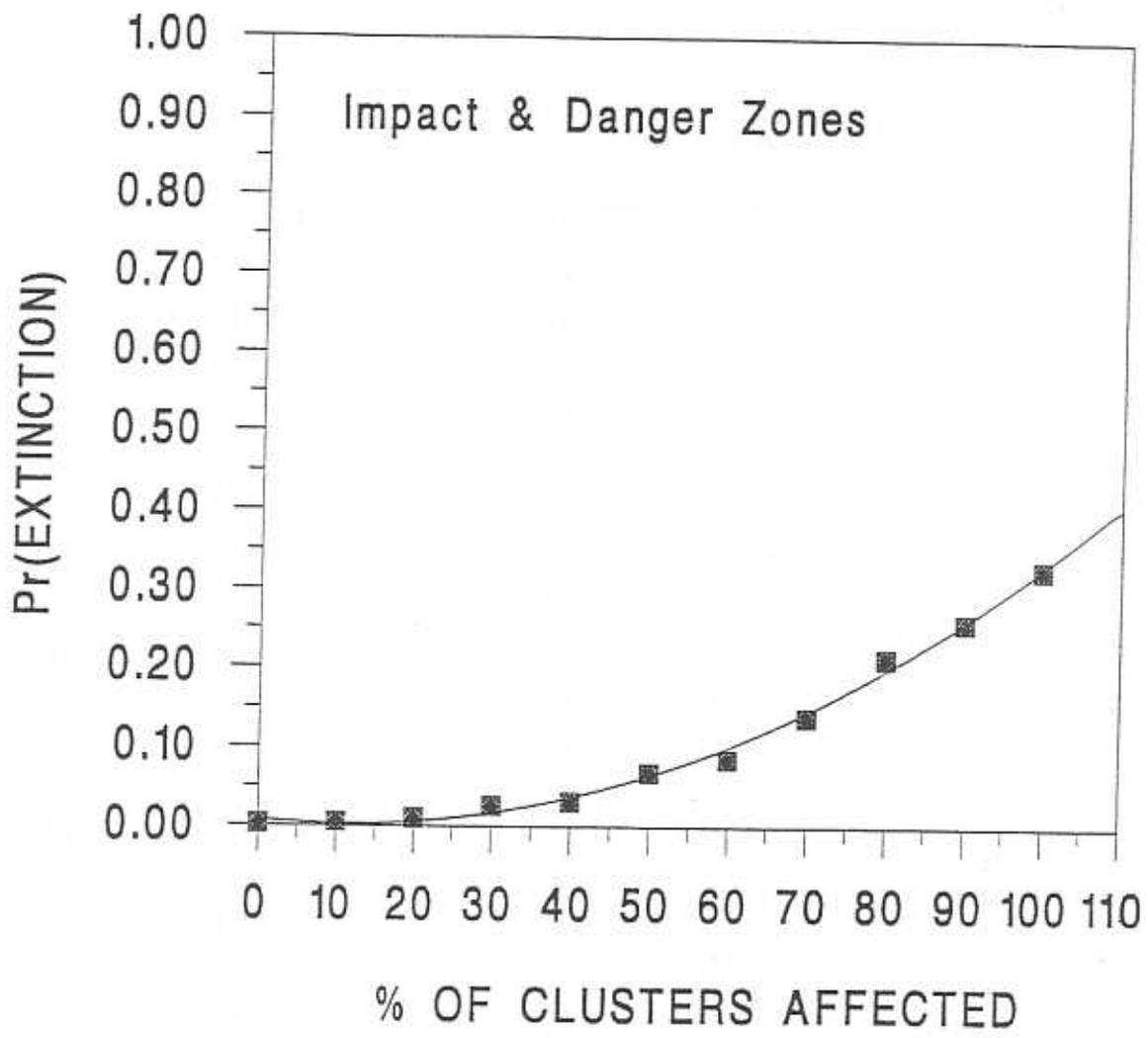


Figure 3. Extinction probability as the proportion of a population with fecundities equivalent to that observed in clusters associated with impact areas on Fort Bragg during 1981-90 increases. See Appendix E for additional details of this analysis.

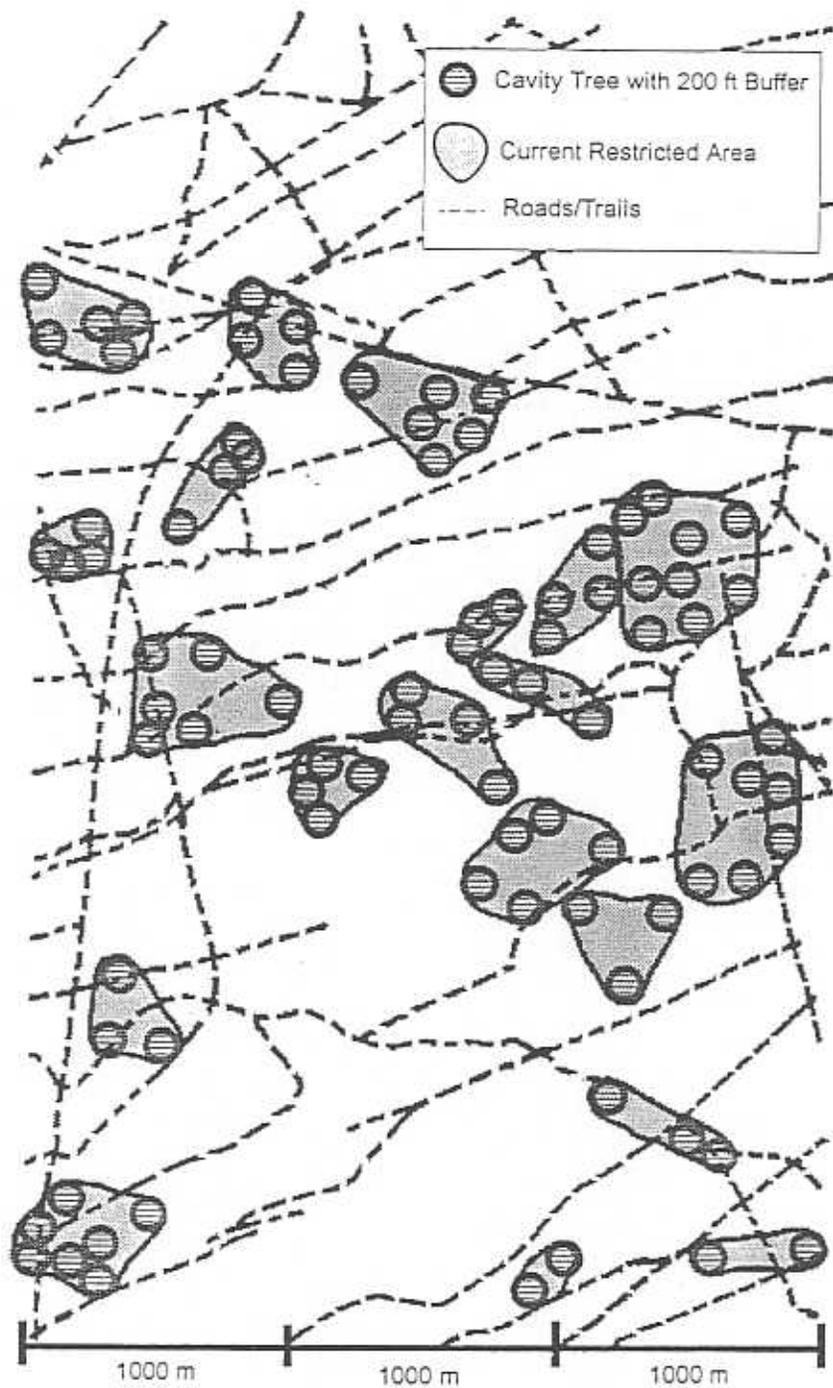


Figure 4. Buffer zones of cluster sites under the current Army guidelines and under the proposed revision. Under the proposed revision, activities over two hours in duration will be prohibited within 200 feet of individual cavity trees.

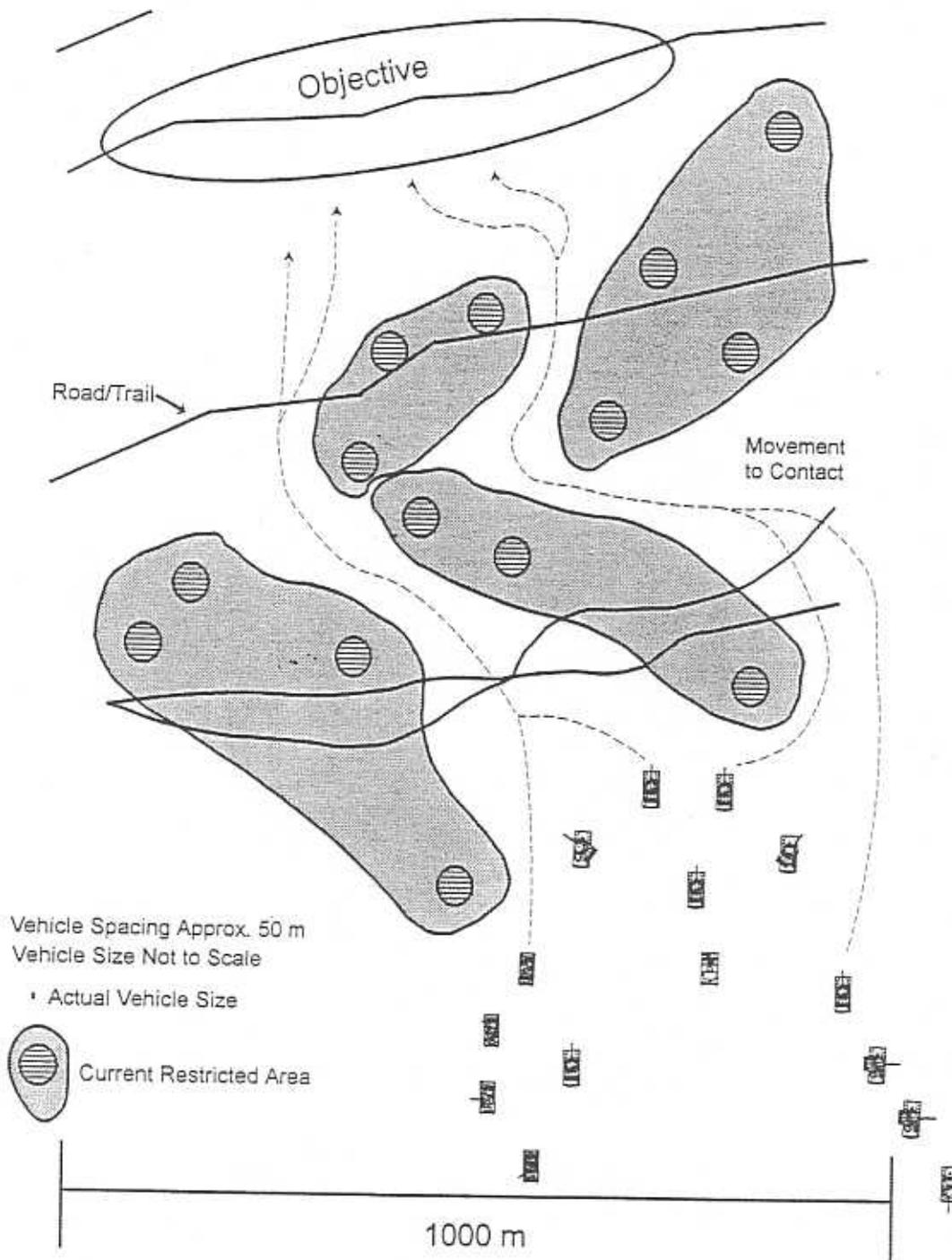


Figure 5. A tank company in typical tactical formation "company wedge" conducting a tactical movement to an objective through representative cluster sites under the current training guidelines. Buffer zones shown are from current Fort Bragg training maps. Note that vehicle movement is channelized between buffer zones and the tactical formation is disrupted. Vehicle size is not shown to scale; however, vehicle spacing is to scale.

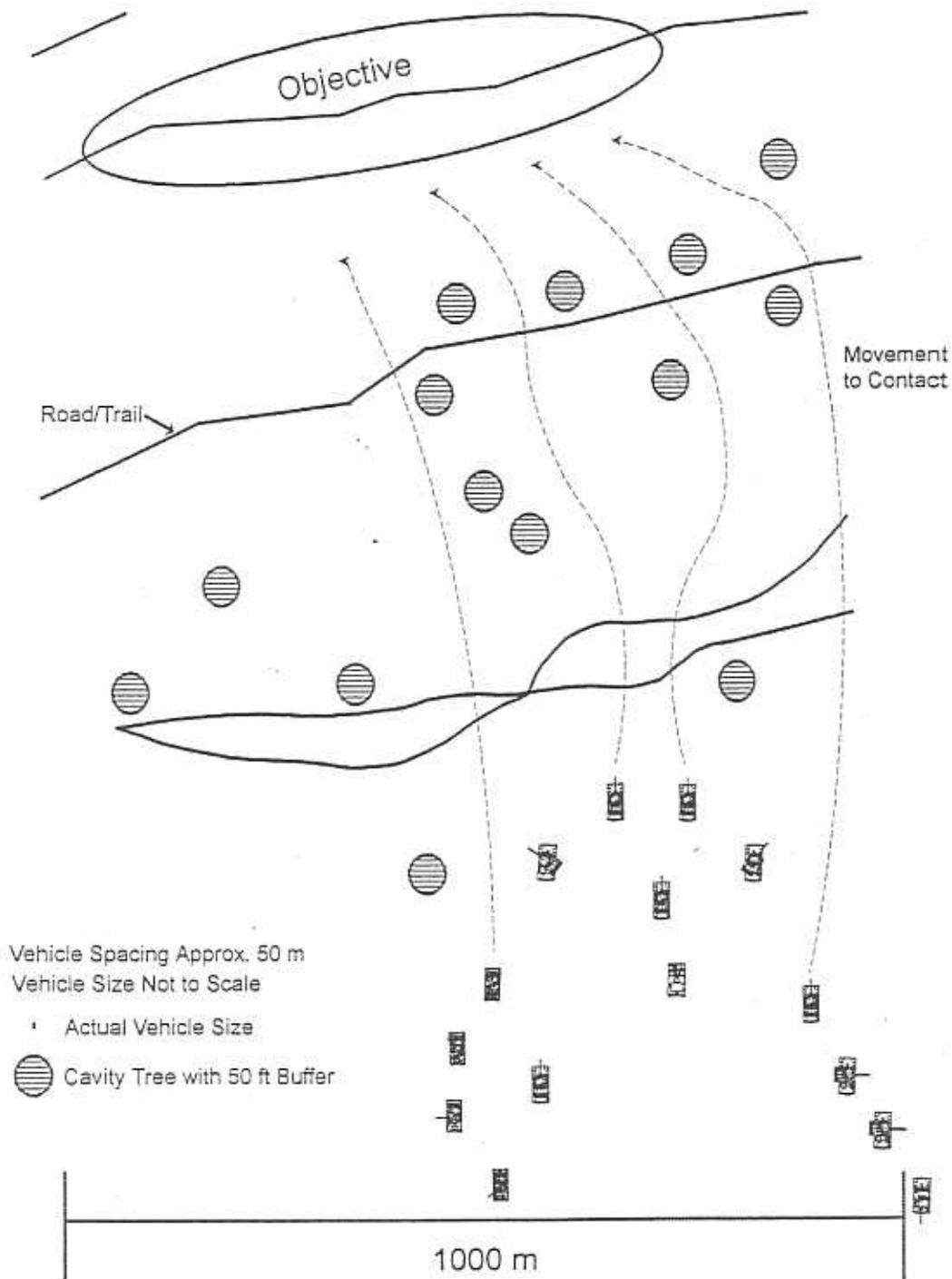


Figure 6. A tank company in typical tactical formation "company wedge" conducting a tactical movement to an objective through representative cluster sites as it would be conducted under the proposed revision. Buffered trees shown are from Fort Bragg maps. Note that vehicle movement is not channelized (see Figure 5) and integrity of the tactical formation is maintained.

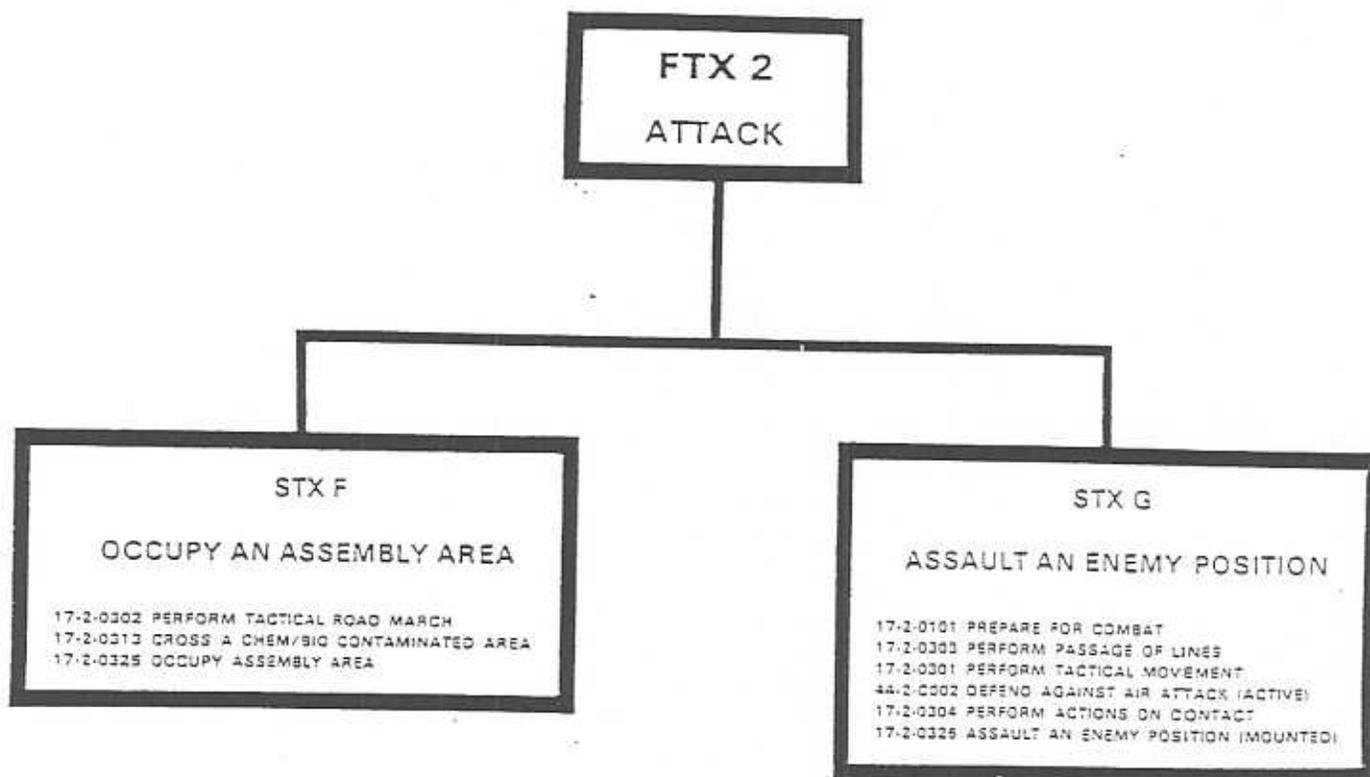


Figure 7. Task outline of a typical Field Training Exercise (FTX).

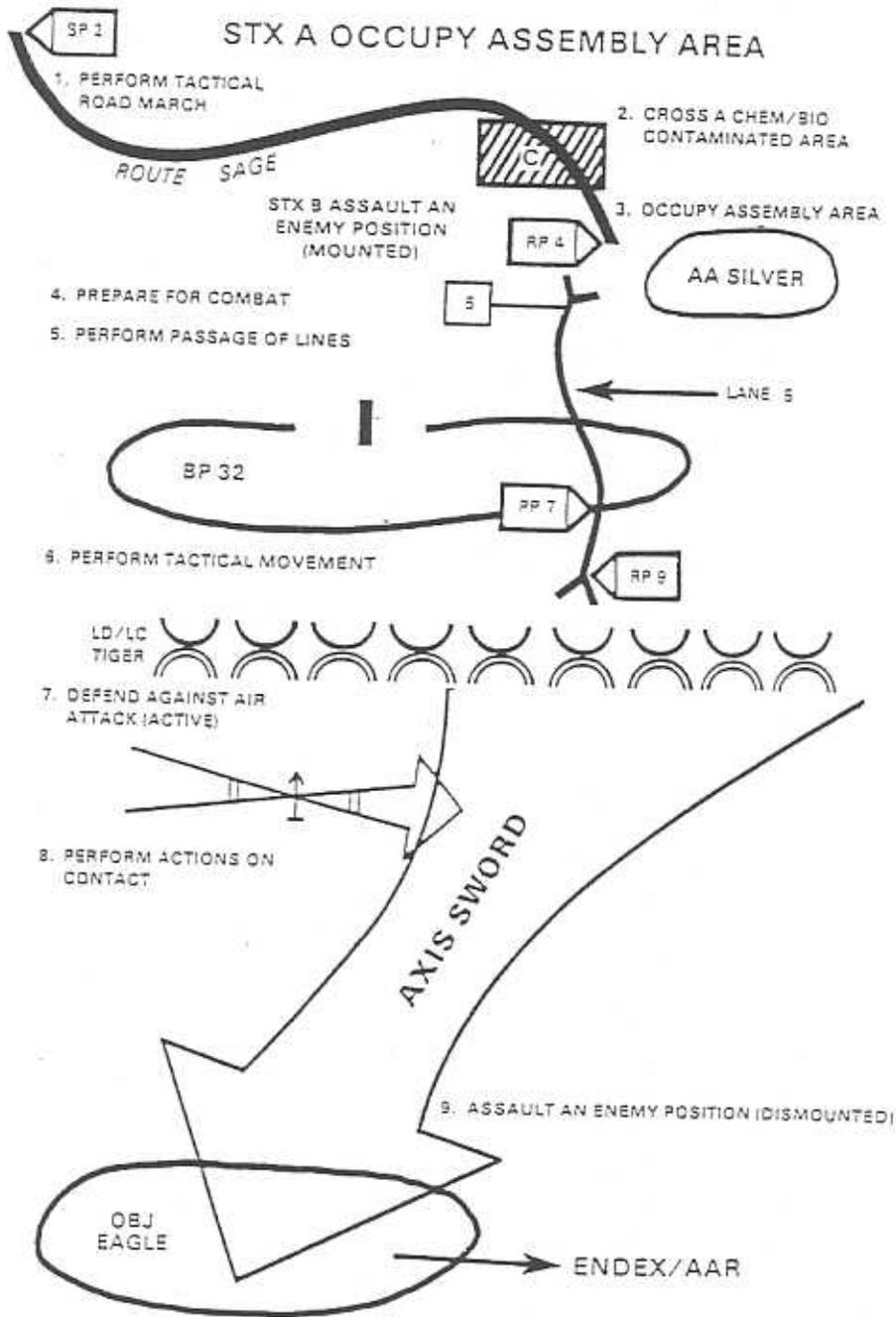


Figure 8. Schematic of a typical Field Training Exercise (FTX). Note that tasks 6, 7, and 8 are actions that are most likely result in transient activities within buffer zones under the proposed revision.

EVENT	ACTION	MAX TIME ALLOCATED
1	Receive OPORD	3 Hours
2	Issue march order for company to occupy an assembly area	1/2 Hour
3	Perform tactical road march	1 Hour
4	Cross a chemically contaminated area	1 Hour
5	Occupy assembly area with AAR (+ AAR)	2 Hours
6	Receive FRAGO to attack	1/2 Hour
7	Prepare for combat	8 Hours
8	Perform passage of lines	3 Hours
9	Perform tactical movement	2 Hours
10	Defend against air attack (active)	1/2 Hours
11	Perform actions on contact	1/2 Hours
12	Assault an enemy position (mounted)	1 Hour
13	Perform final AAR as needed	1 Hour or
TOTAL	24 Hours	

Figure 9. Time allocation for a company Field Training Exercise (FTX).

Number of Suitable/Active Cavity Trees Near Roads and Trails

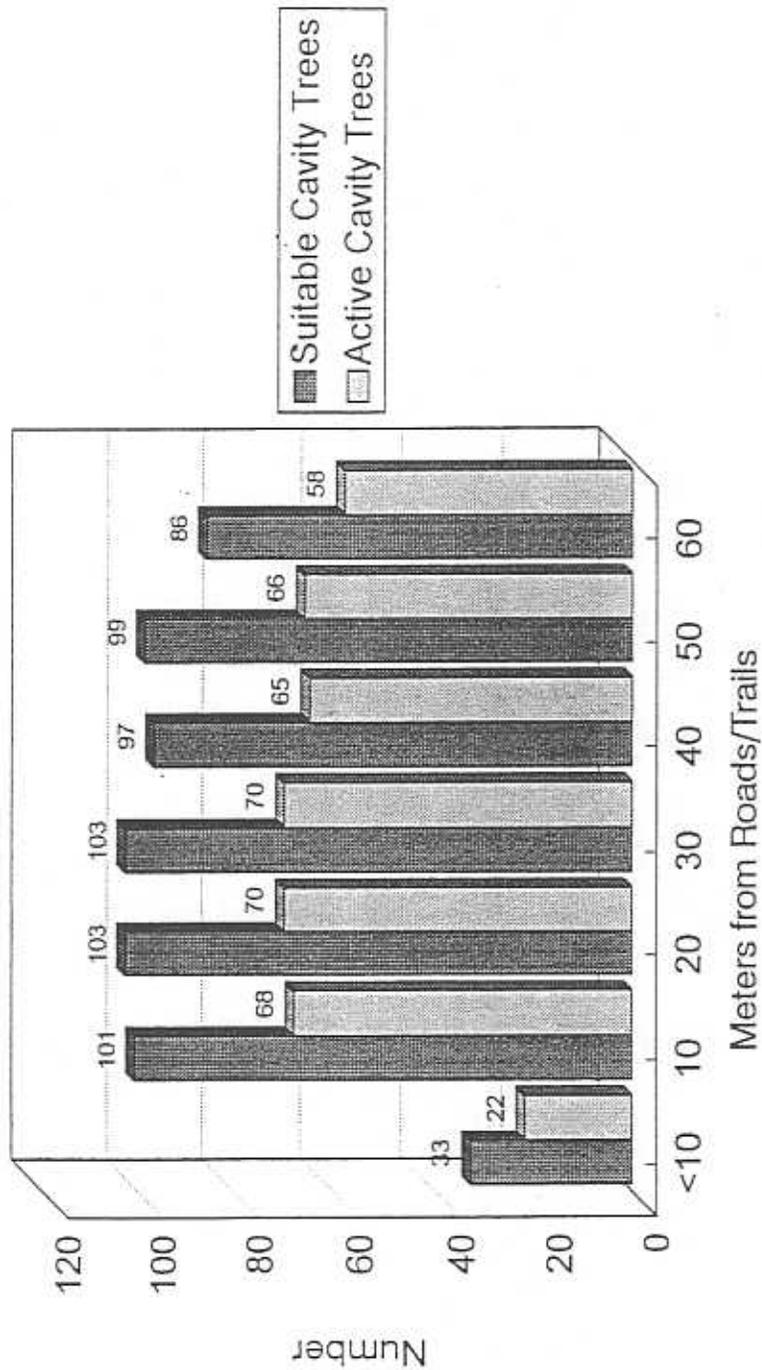


Figure 10. Suitable and active cavity trees 0-70 meters from roads, trails, or firebreaks, Fort Bragg data.

Mean Number of RCW Eggs/Nestlings/Fledglings Trees Near Roads and Trails

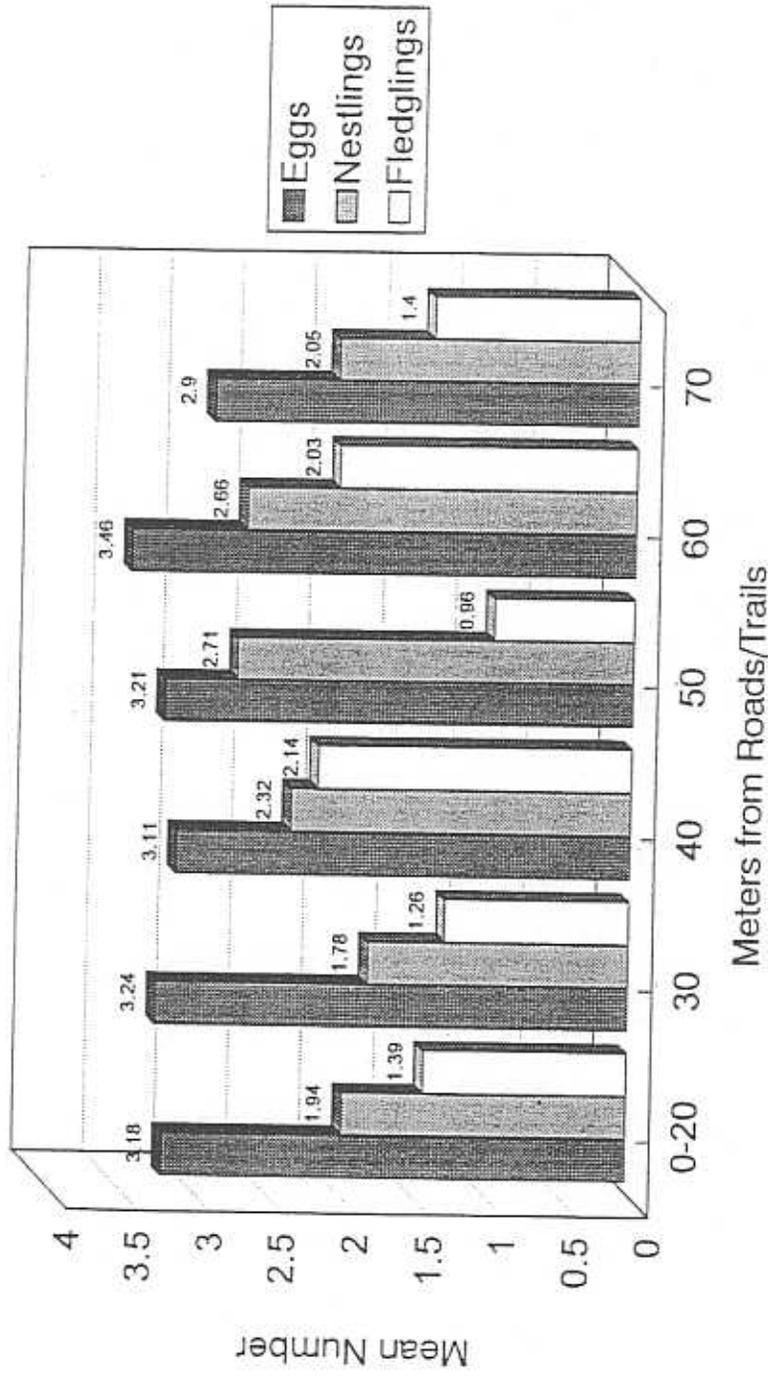


Figure 11. Reproductive data for Fort Bragg RCW nests 0-70 meters from roads, trails, or firebreaks. Data are for 1992-95. See Table 12 for additional data.

Number of Suitable/Active Cavity Trees Near Gun Positions

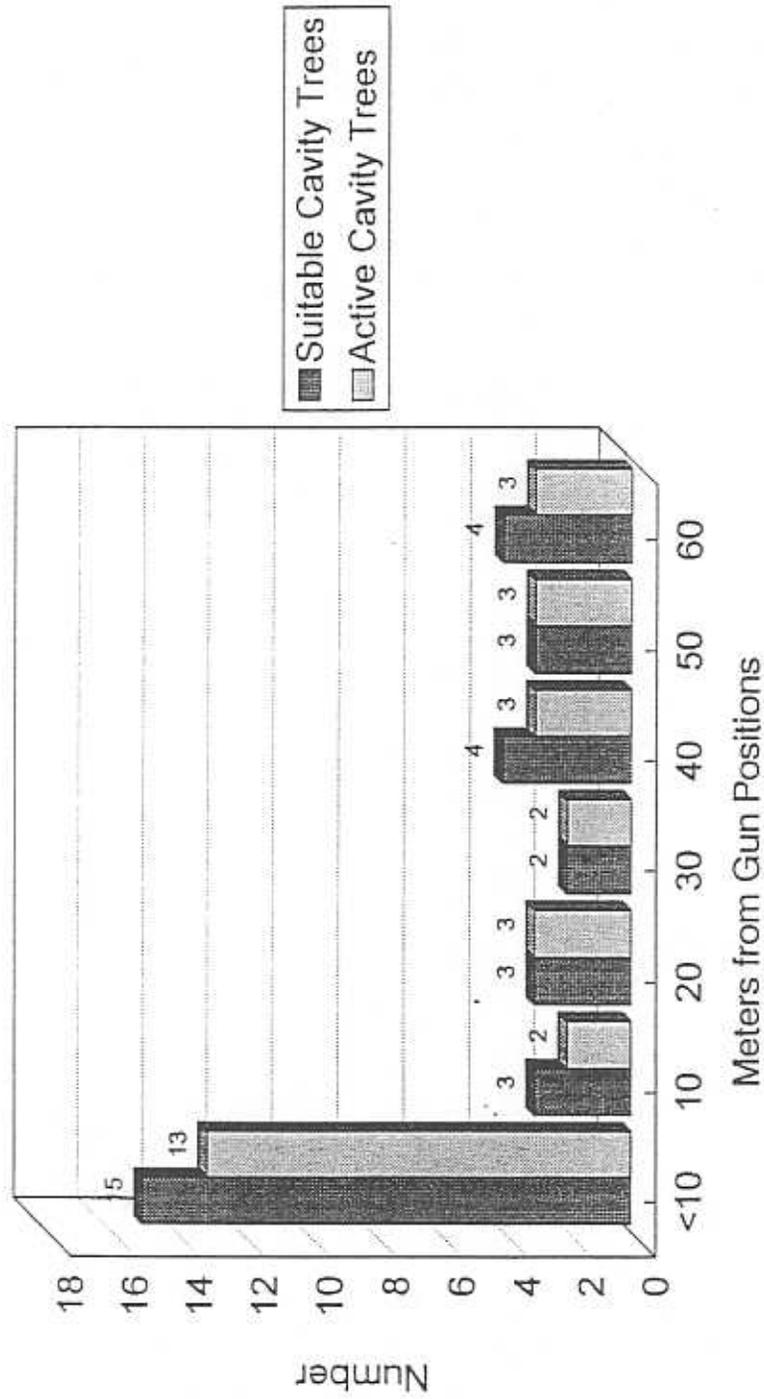


Figure 12. Suitable and active cavity trees 0-70 meters from artillery positions, Fort Bragg data.

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Appendix A: 1994 "Management Guidelines for the Red-cockaded Woodpecker on Army Installations"

DEPARTMENT OF THE ARMY

Management Guidelines
for the
Red-Cockaded Woodpecker
on Army Installations

21 June 1994

Management Guidelines
for the Red-cockaded Woodpecker
on Army Installations

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I. General.

A. Purpose. The purpose of these guidelines is to provide standard RCW management guidance to Army installations for developing installation endangered species management plans (ESMPs) for the Red-cockaded Woodpecker (RCW). Installation RCW ESMPs will be prepared according to these guidelines and chapter 11, AR 420-74, Land, Forest, and Wildlife Management. These guidelines establish the baseline standards for Army installations in managing the RCW and its habitat. Installation RCW ESMPs will supplement these guidelines with detailed measures to meet installation-specific RCW conservation needs. The requirements in RCW ESMPs will apply to all activities on the installation.

B. Applicability. The guidelines are applicable to Army installations where the RCW is present and to installations with inactive clusters that the installation, in consultation with the U.S. Fish and Wildlife Service (FWS), continues to manage in an effort to promote reactivation.

C. Revision. These guidelines will be revised as necessary to be consistent with the latest RCW recovery plan and to incorporate the latest and best scientific data available.

D. Mission. The Army's goal is to train for assigned combat and other missions while concurrently developing and implementing methods to assist in the recovery and delisting of the RCW.

E. Existing Biological Opinions. Installations will continue to comply with the requirements of existing biological opinions until RCW ESMPs are prepared in accordance with these management guidelines and chapter 11, AR 420-74 and are approved through consultation with the FWS. RCW ESMPs should be drafted to incorporate the requirements of existing biological opinions, as modified to conform to these management guidelines through consultation with the FWS.

II. Consultation.

A. In preparing RCW ESMPs and taking action that may affect the RCW, installations will comply with the consultation requirements of section 7 of the Endangered Species Act (ESA); the implementing FWS regulations at 50 CFR part 402; and chapter 11, AR 420-74.

B. Early entry into informal consultation with the FWS is key to resolving potential problems and establishing the foundation to address issues in a proactive and positive manner. If, through informal consultation, the FWS concurs in writing that the RCW ESMP or other action is not likely to adversely

affect any endangered or threatened species, formal consultation is not required. Issue resolution through informal consultation is the preferred method of consultation.

C. In consulting with the FWS on RCW ESMPs and other actions that may affect the RCW, the opinions of the FWS will normally be consistent with these guidelines. In exceptional cases, however, FWS opinions may require installations to take measures inconsistent with these guidelines. After every effort has been made at the installation and MACOM levels to resolve inconsistencies, installations will report, through MACOM channels, to the Office of the Director of Environmental Programs (ODEP), Headquarters, Department of the Army, FWS opinions that are not consistent with these guidelines. ODEP will expeditiously review these reports and determine if HQDA-level action is necessary. If feasible, installations should delay implementation of measures recommended by the FWS that are inconsistent with these guidelines until after the ODEP review is completed.

III. Army Policies Applicable to RCW Management.

A. *Conservation.* Implementation of RCW ESMPs, prepared in accordance with these guidelines, will meet the Army's responsibility under the ESA to assist in conservation of the RCW. Conservation, as defined by the ESA, means the use of all methods and procedures which are necessary for endangered and threatened species survival and to bring such species to the point of recovery where measures provided by the ESA are no longer necessary.

B. *Mission Requirements.* Installation and tenant unit mission requirements do not justify violating the ESA. The keys to successfully balancing mission and conservation requirements are long-term planning and effective RCW management to prevent conflicts between these interests. In consultations with the FWS, installations will attempt to preserve the ability to maintain training readiness, while meeting ESA conservation requirements.

C. *Cooperation with U.S. Fish and Wildlife Service.* The Army will work closely and cooperatively with the FWS on RCW conservation. Installations should routinely engage in informal consultation with the FWS to ensure that proposed actions are consistent with the ESA requirements.

D. *Ecosystem Management.* Conservation of the RCW and other species is part of a broader goal to conserve biological diversity on Army lands consistent with the Army's mission. Biological diversity and the long-term survival of individual species, such as the RCW, ultimately depend upon the health of the sustaining ecosystem. Therefore, RCW ESMPs should promote

ecosystem integrity. Maintenance of ecosystem integrity and health also benefit the Army by preserving and restoring training lands for long-term use.

E. *Staffing and Funding.* Installation commanders are responsible for ensuring that adequate professional personnel and funds are provided for the conservation measures prescribed by these guidelines and RCW ESMPs. Commanders are responsible for accurately identifying the funding needed to meet the requirements of these guidelines. RCW conservation projects are funded through environmental channels and will be identified in the Environmental, Pollution Prevention, Control and Abatement Report (RCS 1383).

F. *Conservation on Adjacent Lands.* Necessary habitat for the RCW includes nesting and foraging areas. Both of these RCW habitat components may be located entirely on installation lands. There may be instances, however, where one of these components is located on installation land, while the other is located on adjacent or near-by non-Army land. Installations should initiate cooperative management efforts with these landowners, if such efforts would compliment installation RCW conservation initiatives.

G. *Regional Conservation.* The interests of the Army and the RCW are best served by encouraging conservation measures in areas off the installation. Installations should participate in promoting cooperative RCW conservation plans, solutions, and efforts with other federal, state, and private landowners in the surrounding area.

H. *Management Strategy.* These guidelines require installations to adopt a long-term approach to RCW management consistent with the military mission and the Endangered Species Act. First, installations are required to establish an installation RCW population goal in consultation with the FWS using the methodology described in para V.B below. Once established, the installation must designate sufficient nesting and foraging habitat to attain and sustain the goal. The goal will also dictate the required management intensity level. Next, installations must develop an ESMP to attain and sustain the installation RCW population goal in perpetuity in accordance with chapter 11, AR 420-74. Third, installations are required to ensure that all units and personnel that conduct training and other activities at the installation comply with the requirements of the installation RCW ESMP.

IV. Definitions.

Augmentation - Relocation of an RCW, normally a juvenile/fledgling female, from one active cluster to another active cluster.

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Basal area (BA) - The cross-sectional area (square feet) of trees per acre measured at approximately four and one-half feet from the ground.

Biological diversity - The variety of life and its processes. It includes the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.

Buffer zone - The zone extending outward 200 feet from the outermost cavity trees in a cluster.

Cavity - An excavation in a tree made, or artificially created, for roosting and nesting by RCWs.

Cavity restrictor - A metal plate that is placed around an RCW cavity to prevent access by larger species. A restrictor also prevents a cavity from being enlarged, or if already enlarged, shrinks the cavity entrance diameter to a size that prevents access by larger competing species.

Cavity start - An incomplete cavity excavated by, or artificially created for, RCWs.

Cavity tree - A tree containing one or more active or inactive RCW cavities or cavity starts.

Cluster - The aggregate area encompassing cavity trees occupied or formerly occupied by an RCW group plus a 200 foot buffer zone (formerly called "colony").

Effective breeding pairs - Groups that successfully fledge young.

Group - A social unit of one or more RCWs that inhabits a cluster (formerly called "clan"). A group may include a solitary, territorial male; a mated pair; or a pair with helpers (offspring from previous years).

Habitat Management Unit (HMU) - Designated area(s) managed for RCW nesting and foraging, including clusters and areas determined to be appropriate for recruitment and replacement stands.

Impact/danger areas - The ground within the training complex used to contain fired or launched ammunition or explosives and the resulting fragments, debris, and components from various weapons systems.

Population - A RCW population is the aggregate of groups which are close enough together so that the dispersal of individuals maintains genetic diversity and all the groups are

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capable of genetic interchange. Population delineations should be made irrespective of land ownership.

Provisioning - The artificial construction of cavities or cavity starts.

Recovery population - A total of 250 or more effective breeding pairs annually, for a five year period.

Recruitment - The designation and management of habitat for the purpose of attracting a new breeding group to that habitat.

Recruitment stand - A stand of trees, minimum of 10 acres in size, with sufficient suitable RCW nesting habitat identified to support a new RCW group. Stand and supporting foraging area should be located 3/8 mile to 3/4 mile from a cluster or other recruitment stand.

Relict tree - a pine tree usually more than 100 years old having characteristics making it attractive to the RCW for cavity excavation.

Replacement stand - a stand of trees, minimum of 10 acres in size, identified to provide suitable nesting habitat for colonization when the current cluster becomes unsuitable. The stand should be approximately 20 - 30 years younger than the active cluster. While it is preferable for replacement stands to be contiguous to the active colony, at no time should they be more than 1/4 mile from the cluster, unless there is no suitable alternative.

Stand - an aggregation of trees occupying a specific area and sufficiently uniform in species composition, age, arrangement, and condition so as to be distinguishable from the forest on adjoining areas.

Sub-population - the aggregate of groups which are close enough together to allow for demographic interchange between groups. A sub-population does not have a significant demographic influence on adjacent sub-populations, but there is sufficient genetic interchange between the sub-populations to be considered one population.

Translocation - the relocation of one or more RCWs from an active cluster to an inactive cluster or recruitment stand that contains artificially constructed cavities.

V. Guidelines for Installation RCW ESMPs.

Installations will prepare RCW ESMPs and manage RCW populations according to the following guidelines.

A. RCW ESMP Development Process.

Preparation of installation RCW ESMPs requires a systematic, step-by-step approach. RCW populations (current and goal), RCW habitat (current and potential), and training and other mission requirements (present and future) must be identified. Detailed analysis of these factors and their interrelated impacts are required as a first step in the development of an ESMP. Installations should use the following or a similar methodology in conducting this analysis:

1. Identify the current RCW population and its distribution on the installation.
2. Identify areas on the installation suitable or potentially suitable for RCW nesting and foraging habitat.
3. Establish the installation RCW population goal with the FWS according to the guidance in B below. The installation RCW population goal will at least equal the current population.
4. Identify installation and tenant unit mission requirements. Overlay these requirements on the RCW distribution scheme.
5. Identify mission requirements that are incompatible with the conservation of RCW habitat.
6. Identify areas where conflicting mission requirements could be relocated to avoid RCW habitat.
7. Identify critical mission areas where activities cannot be relocated.
8. In consultation with the FWS, identify areas that will be subject to the expanded training guidelines in paragraph V.I.2.c below.
9. Identify areas which could support RCW augmentation or translocation.
10. Identify areas suitable for RCW habitat and free of conflicting present and projected mission activities. These are prime areas for designation as recruitment stands.
11. Analyze the information developed above using the guidance contained in these guidelines.
12. Prepare the RCW ESMP to implement the best combination of options, consistent with meeting the established RCW population goal, while minimizing adverse impacts to training readiness and other mission requirements.

B. *RCW Population Goal.*

1. One of the first steps in RCW management is to determine an installation population goal in accordance with paragraph V.B.2 below. Once this goal is established, it is used to designate the amount of land needed for RCW HMUs and the appropriate level of management intensity.

2. ESMPs must clearly state the installation RCW population goal. This goal will be established through informal or formal consultation with FWS. Goals should be carefully calculated considering the current and future installation and tenant unit missions, the amount and distribution of current and future suitable habitat on and off the installation, the quality of the habitat, the current size of the RCW population, the distribution of clusters, the configuration of sub-populations, the land ownership patterns, the recovery potential (see 3 below), the RCW Recovery Plan objectives, etc. The goal should strike a reasonable balance between the present and future installation and tenant unit missions and conservation. Once established, the population goal will determine the amount of installation land to be managed as RCW habitat. Goals should be considered long-term but are subject to change, through consultation with the FWS, based upon changing circumstances and new scientific information

3. The population goal established for an installation will dictate the required RCW management intensity level. A population that has achieved the installation goal need only be maintained at that level, however, installations should continue to encourage population growth where feasible and compatible with the military mission. In contrast, any population that has not achieved its population goal requires an active recruitment/augmentation strategy. A maintenance strategy is appropriate for populations which have attained the maximum population that can be supported by available suitable habitat, irrespective of population size. However, maintenance activities will vary according to the population size, for example, smaller nonviable populations may require occasional augmentation, predator control, etc.

C. *Surveys, Inspections, and Monitoring Programs.*

1. Installations will conduct the following surveys and monitoring programs.

a. Five-Year installation-wide RCW surveys. Effective management of the RCW requires an accurate survey of installation land for RCW cavity and cavity-start trees. The survey must document the location of RCW cavity and cavity-start trees as accurately and precisely as possible (using Global Positioning System and Geographic Information System, if

available) and the activity within all clusters. An installation-wide survey will be conducted every five years. Installations may conduct the survey over the five year period, annually surveying one-fifth of the installation.

b. Project surveys. Prior to any timber harvesting operations, construction, or other significant land-disturbing activities, excluding burning, a 100-percent survey of the affected area will be conducted by natural resources personnel trained and experienced in RCW survey techniques and supervised by a RCW biologist, if one has not occurred within the preceding year. Installations will conduct project surveys in accordance with the survey guidance in V. Henry, Guidelines for Preparation of Biological Assessments and Evaluations for the Red-cockaded Woodpecker, U.S. Fish and Wildlife Service, Southeast Region, Atlanta, Georgia (September 1989). In the case of range construction, the survey will also include the surface danger zone for the weapons to be used on that range.

c. Annual inspections. Clusters that have not been deleted from management in accordance with paragraph V.D.2.b below and recruitment stands must be inspected annually. These are prescriptive inspections, used to develop treatments and modifications of treatments to maintain suitable nesting habitat. At a minimum, installations will inspect and record data for:

- (1) density and height of hardwood encroachment;
- (2) height of RCW cavities;
- (3) condition of cavity trees and cavities;
- (4) a description of damage from training, fires (prescribed or wild), etc.; and
- (5) evidence of RCW activity for each cavity tree (includes each cavity in the tree) within the cluster. See 2a below for guidance on the maintenance of survey and monitoring records.

d. Ten-year forest survey. In addition to an RCW survey required in 1a above, installations will conduct, as required by AR 420-74, an installation-wide forest survey at least every ten years. In conducting the forest survey, data will be gathered to accurately determine the quantity and quality of available foraging and nesting habitat for the RCW. Alternately, installations may survey ten percent of the installation annually. Forest surveys will be conducted using a recognized plot sampling technique, such as the random line plot cruise, the random point sample cruise, or the line strip cruise method. Forest surveys in impact areas may be conducted using

scientifically accepted, aerial photography interpretation methods.

e. Monitoring. Installations will conduct monitoring programs to scientifically determine demographic trends within the population as a whole. Sample sizes will be determined by the number of clusters and their dispersion on the installation by habitat category (e.g., longleaf pine/scrub oak, pine flatwoods, pine mixed hardwoods) and by category of use (e.g., non-dud producing ranges, mounted and dismounted training areas, cantonment areas, bivouac areas, etc.). Sample sizes will be of sufficient size to have statistical validity and to ensure that population trends and important biological information can be determined for the entire installation. Installations with 25 clusters or less will monitor all sites. Installations with greater than 25 clusters will monitor sample sizes based on the following: 25 percent of the RCW clusters (active and inactive) located in each habitat and usage category on the installation, with a minimum of three RCW clusters per habitat type or a total of 25 clusters, whichever is greater. Monitoring activities will be done annually to acquire data to determine the number of adults and fledglings per site, sex of birds, number of breeding groups, and number of nests. Monitoring will include color banding of birds.

2. Results from surveys and monitoring will be recorded as follows:

a. Survey/monitoring records. Survey and monitoring results will be recorded and retained permanently allowing for trend analysis.

b. RCW map. Survey data will be used to generate installation RCW maps accurately depicting the location of RCW clusters, HMUs, etc. The map will be widely distributed for use by those conducting land use activities on the installation, including military training, construction projects, range maintenance, etc. Maps will be updated at least every five years to coincide with the installation-wide RCW survey or when a 20 percent change in the number of clusters occurs, whichever is sooner.

D. RCW Habitat Management Units.

1. Designation of habitat management units (HMUs). Installation RCW ESMPs will provide for the designation of nesting and foraging areas within HMUs sufficient to attain and sustain the installation RCW population goal. Determination of the installation population goal is a prerequisite to HMU designation. HMU delineation is an important step in the planning process because it defines the future geographic configuration of the installation RCW population. Areas

designated as HMUs must be managed according to these guidelines.

2. Areas included within HMUs.

a. HMUs will encompass all clusters, areas designated for recruitment and replacement, and adequate foraging areas as specified in d below.

b. After consultation with the FWS, clusters that have been documented as continuously inactive for a period of five consecutive years or more may be deleted from HMUs. Once deletion of a cluster from management is approved by the FWS, existing cavities may be covered to discourage reactivation. This will be part of a long-term plan to shift the RCW population to areas on the installation where conflicts between RCW management and critical mission requirements will be minimized. Inactive clusters will not be deleted from HMU management unless sufficient clusters and recruitment stands exist on the installation, provisioned in accordance with these guidelines, to support the installation's RCW population goal (See 1 above).

c. In designating HMUs, fragmentation of nesting habitat will be avoided. Installations will attempt to link HMUs with HMU corridors, allowing for demographic interchange throughout the installation population.

d. Adequate foraging habitat, in size, quality, and location, must be provided within HMUs. The foraging habitat needed to support clusters will be calculated and designated according to the range-wide guidelines in V. Henry, Guidelines for Preparation of Biological Assessments and Evaluations for the Red-cockaded Woodpecker, U.S. Fish and Wildlife Service, Southeast Region, Atlanta, Georgia (September 1989) or other physiographic-specific guidelines approved by the FWS. The objective is to provide high quality habitat as close as possible to the cluster, rather than large areas of poor habitat.

3. Minimization of RCW management impacts on the installation's mission.

a. To the extent consistent with RCW biological needs, HMUs should be located where there will be a minimum impact upon current and planned installation missions/operations and should be consistent with land usage requirements in the Real Property Master Plan. This is particularly important regarding HMUs designated for recruitment/replacement purposes.

b. On installations where the RCW is present in areas where there are or potentially could be significant impacts on installation missions/operations, especially training-related operations, the RCW ESMP should provide for the following:

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(1) The installation should designate additional HMUs beyond those needed to attain and sustain the installation population goal. Installations should manage these additional HMUs to promote population growth in these areas.

(2) To the extent that RCW biological and demographic needs allow, installations should locate these additional HMUs where RCW management requirements will not have a significant impact on mission/operations. This will allow for a gradual, long-term shifting of RCW sub-populations into more suitable areas through natural demographic shifting, recruitment, and, in exceptional cases, augmentation and translocation (described in paragraph V.J below). In accordance with 2 above, the movement of RCWs away from high mission-conflict areas can be further encouraged by the deletion of documented, inactive clusters from RCW management, while at the same time providing quality recruitment/replacement sites in areas with reduced mission conflicts.

4. Demographic and genetic interchange.

Installations should delineate HMUs to maximize the linkage between sub-populations on and off the installations and with populations off the installation. Where fragmentation exists, installations should develop plans to link sub-populations on the installation by designating habitat corridors where practical.

E. *HMU Management Practices.* All HMU management activities and practices will be consistent with the conservation of other candidate and federally listed species.

1. Clusters and recruitment stands within HMUs.

a. Due to RCW biological needs, clusters require a higher management intensity level than other areas within HMUs. Within HMUs, maintenance priority will be given to active clusters over both inactive clusters and recruitment stands.

b. Clusters and recruitment stands will be kept clear of dense midstory. An open, park-like pine stand is optimal. All midstory within 50 feet of cavity trees will be eliminated. Beyond 50 feet, some pine midstory should be retained for regeneration and some selected hardwoods may be retained for foraging by species other than the RCW. Hardwoods should not exceed 10 percent of the area of the canopy cover nor 10 percent of the below canopy cover within the cluster or recruitment stand. Hardwood stocking should be kept below 10 square feet per acre.

c. The priority of forest management in cluster sites and recruitment stands is maintenance and production of potential cavity trees greater than 100 years of age. For this reason, no rotation age shall be set in these areas. In thinning

clusters and recruitment stands, dead, dying, or inactive cavity trees will be left for use by competitor species. Thinning should occur only when pine species basal area (BA) exceeds 80 and should not exceed the removal of more than 30 BA to avoid habitat disruption (timber prescriptions within clusters should normally be on a 10 year cycle). Pine species basal areas should be kept within the range of approximately 50 to 80 square feet, maintaining average spacing of 20 to 25 feet between trees, but retaining clumps of trees.

d. Trees within HMUs affected by beetle (e.g., Ips beetle, southern pine beetle) infestation should be evaluated for treatment and treated appropriately. Treatment options will be developed in consultation with the FWS. Possible treatments include the use of pheromones or cutting and leaving, cutting and removing, or cutting and burning infected trees. Cavity trees may be cut only with the approval of the FWS. Prior to cutting an infected cavity tree, a suitable replacement cavity tree will be identified and provisioned.

e. Timber cutting, pine straw harvesting, and habitat maintenance activities, with the exception of burning activities, will not be conducted during the nesting season, occurring from April through July depending upon the installation's location. If a biologist, experienced in RCW management practices, determines that habitat maintenance activities, exclusive of timber cutting and pine straw harvesting, will have no effect on nesting activities, they may be conducted at anytime.

2. Other areas within HMUs. While not requiring the same level of intense management for clusters and recruitment stands, the quality of foraging and replacement stands should be maintained by a prescribed burning program sufficient to control hardwood growth and ground fuel buildup and to eliminate dense midstory. Improving the quality of foraging habitat will reduce the quantity (acreage) required to maintain the installation RCW population.

3. Midstory control. Prescribed burning is normally the most effective means of midstory control and is recommended as the best means of maintaining a healthy ecosystem. Prescribed burning will be conducted at least every three years in longleaf, loblolly, slash pine, and shortleaf pine systems. Burning must be conducted in accordance with applicable Federal, state, and local air quality laws and regulations. With the agreement of the FWS, the burn interval may be increased to no more than five years after the hardwood midstory has been brought under control. Mechanical and chemical alternatives should only be used when burning is not feasible or is insufficient to control a well advanced hardwood midstory. Application of herbicide must be consistent with applicable Federal, state, and local laws and

regulations. Cavity trees will be protected from fire damage during burning. Burning should normally be conducted in the growing season since the full benefits of fire are not achieved from non-growing season burns. Winter burns may be appropriate to reduce high fuel loads. Use of fire plows in clusters will be used only in emergency situations.

4. Erosion control. Installations will control excessive erosion and sedimentation in all HMUs. Erosion control measures within clusters will be given priority over other areas within HMUs.

5. Impact/danger and direct fire areas.

a. Impact/danger areas.

(1) Impact/danger areas that contain or likely contain unexploded ordnance or other immediate hazardous materials (radiological or toxic chemicals) can pose danger to personnel. Natural resources conservation benefits to be gained by intensive management in high risk areas generally are not justified.

(2) Designation of impact/danger areas, safety restrictions on human access to impact/danger areas, range operations in impact/danger areas, and the associated effects of these actions on RCW management activities may adversely affect the RCW and other federally listed species within impact/danger areas, including the possibility of incidental take. Installations are responsible for consulting with the FWS on these potential effects.

(3) To the degree practicable, clusters and surrounding foraging area should be designated as "no fire areas" to protect clusters from projectile damage.

b. Direct fire areas.

(1) Direct fire, non-dud producing impact areas that do not contain unexploded ordnance or other immediate hazardous materials may be included within HMUs, subject to the guidelines set forth below.

(2) In HMUs which are not impacted upon by weapons firing, RCW management will be the same as for HMUs outside of impact areas. In HMUs where there is a significant risk of projectile damage to foraging or nesting habitat, the following guidelines apply:

(a) Range layout will be modified/shielded to protect HMUs from projectile damage, if practicable. Protective measures that will be considered include

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reorienting the direction of weapons fire, shifting target arrays, establishing "no fire areas" around RCW clusters or HMUs, revising maneuver lanes, constructing berms, etc.

(b) Installations should develop alternate HMUs near existing HMUs but outside the affected range complex. Augmentation and translocation should be considered as a means of removing RCWs from high risk areas.

F. *Timber Harvesting and Management in HMUs.*

1. Timber harvesting in HMUs will be permitted if consistent with the conservation of the RCW. If permitted, a harvest method will be implemented that maintains or regenerates the historical pine ecosystem. In most ecosystems inhabited by the RCW, historical conditions are characterized by old-growth longleaf pines in an uneven-age forest, with small (1/4 to 5 acres) even-age patches varying in size. Timber harvesting methods must be carefully designed to achieve and maintain historical conditions through emulation of natural processes.

2. Longleaf sites will not be regenerated to other pine species. Where other species have either replaced longleaf pine (due to fire suppression) or been artificially established on sites historically forested with longleaf, forest management will be directed toward regeneration back to longleaf by natural or artificial methods.

3. At a minimum, sufficient old-growth pine stands will be maintained by: lengthening rotations to 120 years for longleaf pine and 100 years for other species of pine; indefinitely retaining snags, six to ten relict and/or residual trees per acre when doing a clearcut, seedtree cut, or shelterwood cut; and indefinitely retaining snags, all relicts, and residuals in thinning cuts. No rotation age will be established for cluster sites or replacement stands. The above rotation ages and retention rates do not apply to off-site stands of sand pine, loblolly pine, or slash pine that will be converted back to longleaf.

G. *Pine Straw Harvesting within HMUs.* Sufficient pine straw must be left in HMUs to allow for effective burning and to maintain soils and herbaceous vegetation. Areas within HMUs will not be raked more than once every three to six years. Baling machinery will not be used or parked within clusters.

H. *Restoration and Construction of Cavities.*

1. *Restoration.* Active and inactive cavities found to be in poor condition during periodic inspections will be repaired whenever feasible to prolong their use. Cavity restrictors can be installed on enlarged RCW cavity entrance holes (greater than

two inches in diameter) to optimize the availability of suitable cavities. They also may be installed to protect properly-sized cavities where suitable cavities are limited, the threat of enlargement is great, or where another species is occupying a cavity. Priorities for the installation of restrictors, in descending order, will be: (a) active single tree clusters; (b) single bird groups, (c) clusters with less than four suitable cavities, and (d) others. Restrictors will be installed according to scientific procedures accepted by the FWS. Restrictors will be closely monitored, especially in active clusters. Adjustments to the positioning of the restrictors will be made to ensure competitors are excluded and RCW access is unimpeded.

2. Construction. Artificial cavities will be constructed in areas designated for recruitment or translocation and in active clusters where the number of suitable cavities is limiting. The objective is to provide at least four suitable cavities per active cluster and two cavities plus three advanced starts for each recruitment stand. Priorities for installation of artificial cavities in descending order will be: (a) single cavity tree active clusters, (b) active clusters with insufficient cavities to support a breeding group, (c) inactive clusters designated as and managed for replacement or recruitment stands with an insufficient number of usable cavities within one mile of an active cluster, (d) new replacement/recruitment stands within one mile of an active cluster, (e) inactive clusters designated as and managed for replacement or recruitment stands within three miles of an active cluster, (f) recruitment or potential habitat within three miles of an active cluster, (g) inactive clusters and (h) replacement/recruitment stands beyond three miles of an active cluster. Cavity construction may be by either the drilling or insert techniques. Construction must be according to scientific procedures accepted by the FWS and accomplished by fully trained personnel.

I. Protection of Clusters.

1. Markings. The following uniform marking guidance for RCW clusters will supersede the marking guidance issued by the Directorate of Environmental Programs, dated 8 Jan 1993.

a. Cavity and cavity-start trees. These trees will be marked with two white bands, approximately four to six inches wide and one foot apart. The bands will be centered approximately four to six feet from the base of the tree. A uniquely numbered small metal tag will be affixed to the cavity tree for monitoring and identification purposes.

b. Clusters. Buffer trees on the outer perimeter of clusters will be marked with a one to two foot-wide white band four to six feet from the base of the tree. Warning signs (c

below) will be posted at reasonable intervals facing to the outside of clusters and along roads, trails, firebreaks, and other likely entry points into clusters.

c. Warning sign. Signs posted at clusters will be constructed of durable material, ten inches square (oriented as a diamond), white or yellow in color, and of the design in Figure 1. The RCW graphic and the lettering "Endangered Species Site" and "Red-cockaded Woodpecker" will be printed in black. The lettering "Do Not Disturb" and "Restricted Activity" will be printed in red. All lettering will be 3/8 inches in height.

d. Installations will conform to the uniform markings guidelines in a through c above by 1 Jan 1997. Signs erected and markings made after the effective date of these guidelines will conform to the standards in a through c above.

e. Training on non-Army lands. Installations conducting long-term training on private, state, or other federal lands with RCW habitat will attempt to obtain agreement from the landowners on compliance with these markings guidelines. If a landowner does not agree to compliance with these guidelines, even with the installation paying the costs associated with compliance, installations will educate troops training on such lands to recognize the markings used by the landowner.

2. Training within RCW clusters.

a. The training guidelines in this section apply within clusters, as defined in paragraph IV above. RCW-related training restrictions do not apply to recruitment and replacement stands and foraging areas.

b. Standard training guidelines within clusters.

(1) Military training is limited to dismounted training of a transient nature.

(2) No bivouacs.

(3) No digging or cutting of vegetation, except for hardwoods used as camouflage.

(4) Use of CS gas, smoke, flares, incendiary devices, artillery, artillery simulators, mortars, or similar devices is prohibited within clusters. Elsewhere on the installation, units will coordinate with both the installation natural resources office and range control prior to using CS gas and smoke, other than smoke grenades. Use of blanks in M16 rifles and handguns is permitted.

(5) Vehicle travel through clusters is limited to designated and maintained roads, trails, and firebreaks identified on official installation maps used for this purpose. Installations must consult with FWS prior to the establishment of new trails, roads, or firebreaks in or through RCW clusters.

(6) With FWS approval through informal consultation, off-road through-traffic by wheeled vehicles, 5 tons or less, travelling at least 100 feet away from cavity trees may be permitted on an infrequent basis for specific exercises. The effects of this off-road vehicular traffic will be monitored and documented to determine long-term trends.

c. Expanded training guidelines within clusters.

(1) In consultation with the FWS, the installation may designate clusters, not to exceed 10 percent of the RCW clusters on the installation, that will be subject to expanded training guidelines. In these designated clusters, the standard training guidelines in 2b.above apply, except that the following additional activities, with stated restrictions, are allowed:

(a) Bivouacs and battalion-level and below command posts are allowed, providing they remain at least 200 feet away from cavity trees. Digging is prohibited. These fixed activities will be limited in duration to 18 consecutive hours or less from 1 August through 31 March and to 6 consecutive hours or less from 1 April through 31 July.

(b) Use of blanks in individual and crew-served (M60 MG and below) weapons is permitted.

(c) Wheeled vehicles are permitted to travel and remain in clusters so long as soil erosion levels remain within tolerance limits for that soil series under Soil Conservation Service standards. Vehicles will remain at least 200 feet from all cavity trees at all times except as allowed under the standard training guidelines in 2b(5) above.

(2) Installations will implement a monitoring plan, approved by the FWS, to record the effects of the expanded training activities and to identify any potential adverse impacts on the RCW. In the event potential adverse impacts are identified, the installation will suspend the expanded training guidelines and implement the standard training guidelines in 2b(5) above and will consult the FWS.

d. Training guidelines will be actively enforced through installation training and natural resources enforcement programs, prescribed in chapters 1 and 11, AR 420-74, and installation range regulations.

J. *Augmentation and Translocation.*

1. Augmentation can be a useful tool to expand and disperse the RCW population into designated HMUs. Augmentation also provides a means to maintain genetic viability in populations with less than 250 effective breeding pairs. Installation plans will provide for the augmentation of single-bird groups. Clusters will be made suitable in accordance with the requirements/procedures outlined in paragraph V.H. above before augmentation is attempted.

2. In exceptional situations, installations may translocate RCWs from active clusters to inactive clusters or recruitment/replacement stands where cavities have been artificially constructed. For example, translocation could be used to move RCWs from live fire areas where there is a significant risk of harm to the birds. The current scientific literature indicates serious limitations in successfully translocating adult RCWs, in particular, adult territorial males. Translocation will be accompanied by an intensive monitoring program.

3. In areas to receive RCW, habitat designation and improvement work ensuring that nesting and foraging habitat meet the standards established by these guidelines (V.E.1.b and c, V.E.2, V.D.2.d) must be completed before augmentation or translocation is attempted.

4. Neither augmentation nor translocation will be undertaken without the approval of and close coordination with the FWS. Installations must obtain an ESA section 10 permit (scientific purposes) or an incidental take statement under ESA section 7 and all applicable marking, banding, and handling permits prior to moving any RCW through augmentation or translocation.

Appendix B: Questions and Answers of MG Richard E. Davis to the Committee on Environment and Public Works (Senator John H. Chaffee).

Questions and Answers of MG Richard E. Davis to the Committee on Environment and Public Works (Senator John H. Chaffee) by letter dated 19 April 1995.

ANSWERS TO QUESTIONS OF SENATOR CHAFEE

1. Q: Does the Department of the Army feel that the mission at Fort Bragg has been, and continues to be, so compromised that it requires an exemption from the Endangered Species Act to accomplish its prescribed goals?

A: Fort Bragg does not currently require a total exemption from the Endangered Species Act. Restrictions imposed by recent FWS biological opinions have, however, seriously impaired training. Consequently, amending the ESA may be the only way to provide relief from these restrictions.

Fort Bragg has tried to balance its mission and conservation requirements effectively. Each subsequent listing of an endangered species has, however, imposed additional protective requirements which further degrade available training land and training. Given the number of candidate species found on Fort Bragg, future listing of any of them could jeopardize Fort Bragg's ability to execute its national security mission.

In 1994, the FWS agreed to speed up the listing process for endangered species. However, Fort Bragg currently has a much needed range project, which has been delayed for six months pending completion of a survey for the most recently listed endangered species (the Saint Francis' Satyr butterfly).

Fort Bragg has made every effort, often at great cost, to fulfill its obligations under the ESA. Easing or lifting the restrictions resulting from biological opinions would significantly enhance the training of our nation's contingency response forces.

Other measures short of a total exemption include the following:

The ESA should be amended to take into account the cost and impact on readiness of protecting endangered species. The ESA currently requires Fort Bragg to protect all endangered species and their habitat no matter what the cost or impact on readiness.

The decision whether or not to list a species should be based not only on biological considerations, but other factors such as the cost of protecting the species and the impact on readiness. Furthermore, if the FWS proposes to list a species, the FWS should give Fort Bragg the opportunity to comment on such things as training impacts and resource estimates to manage the additional species.

The FWS has publicly stated that Fort Bragg--the only Federal agency in the North Carolina Sandhills Region with suitable RCW habitat--is solely responsible for achieving RCW recovery. This is a significant issue between Fort Bragg and the FWS. The FWS should recognize that Fort Bragg, alone, cannot shoulder the entire responsibility for endangered species recovery in the North Carolina Sandhills Region. This should be a responsibility shared among the State of North Carolina, private landowners, and Fort Bragg.

Fort Bragg recognizes its responsibility to participate in a regional recovery effort, and has taken the lead in the North Carolina Sandhills Regions in conserving endangered species. Fort Bragg will continue to work with the FWS to establish legally enforceable management agreements, conservation easements, and other permanent arrangements to protect endangered species habitat on private lands. The national security mission assigned to XVIII Airborne Corps and other combat units, however, must be considered. The responsibility commanders have to preserve the lives of soldiers entrusted to their care must take precedence over conserving endangered species.

Fort Bragg should be exempted from protecting any additional endangered species. Fort Bragg currently has five endangered species--three plants (Michaux's sumac, the rough leaved loosestrife, and the American chaffseed) and two animals (the red-cockaded woodpecker and the Saint Francis' satyr butterfly). There are 104 species at Fort Bragg that potentially could be listed as endangered. If only a small number of those species were listed, and if only a small percentage of that number required the resource investment and

training limitations of the RCW, meaningful combat training at Fort Bragg would cease.

Fort Bragg should be exempted from managing endangered species in danger/impact areas. These areas are extremely hazardous and pose a significant threat to human life. Entrance to these areas is severely restricted by Army regulation. Endangered species management does not justify the risk of harm to or loss of human life.

2. Q: Is the military mission at Fort Bragg inherently inconsistent with conservation requirements imposed by the Endangered Species Act?

A: No. It is important to both training and endangered species to preserve Fort Bragg's natural resources and ensure the long term availability of training land for tomorrow's troops. Destruction of training land not only impacts endangered species but will eventually destroy the landscape realism needed for training.

3. Q: Have the biological opinions issued by the U.S. Fish and Wildlife Service prevented the Department of the Army from fulfilling its mission and meeting its responsibility to provide trained and ready forces for protecting our national security interests?

A: The biological opinions have not prevented the Department of the Army from protecting our national security interests. They have, however, had a deleterious impact on the training of our contingency response forces, particularly at battalion and brigade level. The 1990 jeopardy biological opinion has reduced available training land at Fort Bragg and imposed unrealistic restrictions on training that force commanders to adopt tactics inconsistent with Army doctrine. These restrictions have caused vital projects to be redesigned or shifted, and large sums of money to be spent funding mitigation efforts in danger/impact areas. These restrictions have also mandated monitoring and management efforts in danger/impact areas.

The FWS's December 8, 1994, jeopardy biological opinion outlines six specific elements relating to danger/impact areas that the FWS considers necessary components of the Fort Bragg Endangered Species Management

Plan. These elements, if incorporated, would require people and equipment to regularly enter vegetated areas concealing large quantities of unexploded ordnance and munitions. There is very little to gain by surveying endangered plant sites in impact areas that are subject to severe disturbance by artillery fire. Endangered species management does not justify the potential loss of human life.

In addition, the FWS has publicly stated that Fort Bragg--the only Federal agency in the North Carolina Sandhills Regional with suitable RCW habitat--is solely responsible for achieving RCW recovery. This is a significant issue between Fort Bragg and the FWS. The FWS should recognize that Fort Bragg, alone, cannot shoulder the entire responsibility for endangered species recovery in the North Carolina Sandhills Region. This should be a responsibility shared among the State of North Carolina, private landowners, and Fort Bragg.

4. Q: Has the readiness of the combat units at Fort Bragg been diminished or compromised by compliance with the Endangered Species Act?

A: Yes. During the period from October 1991 through August 1992, Fort Bragg units reported reduced readiness. This was primarily due to the closure of key training facilities, such as our multi-purpose and aerial gunnery ranges.

Fort Bragg has closed or postponed the modernization of eight ranges, or portions thereof, representing a total investment of \$28.7 million, for extended periods of time. During the closures, units had to travel to other installations to conduct their normal training at a cost of approximately \$632,000.

Fort Bragg has spent \$650,000 constructing barriers and berms on its ranges to minimize the impacts to endangered species. In toto, Fort Bragg has spent \$6,774,000 on Endangered Species Act compliance since fiscal year 1989.

In response to the FWS's 1990 jeopardy biological opinion, Fort Bragg limited training activities in cluster sites to transient foot traffic, restricted all vehicular traffic to pre-existing trails and roads, and prohibited troops from constructing obstacles, cutting pine trees, employing smoke, or digging in cluster sites or endangered species habitat.

These training restrictions degrade realism. Artificial considerations enter the combat leader's decisionmaking process in trying to avoid red-cockaded woodpecker (RCW) cluster sites. Soldiers begin to adopt training tactics inconsistent with Army doctrine. Maneuver is restricted and units are artificially channeled to existing trails and road. Engineer units' earth moving training is constrained.

5. Q: Is it true that training as maneuver battalions and brigades is no longer possible at Fort Bragg as a result of restrictions required in order to comply with the Endangered Species Act?

A: Training of maneuver battalions and brigades has been severely restricted by compliance with the FWS's 1990 biological opinion.

Fort Bragg currently has 430 RCW cluster sites. Each square kilometer of maneuver land contains approximately one cluster site.

A unit trying to maneuver and replicate the fast-flowing tempo of the modern battlefield must slow or stop its movement, align itself with the existing road or firebreak network in the cluster site, or maneuver around the cluster where it will very likely encounter another cluster site. This obviously disrupts doctrinal combat formations, channelizes troops and vehicles, and violates every precept of fire, maneuver, and dispersion.

Some cluster sites can be incorporated into the battle as minefields or contaminated areas; however, normal combat operations to negotiate these obstacles cannot be conducted in cluster sites.

The profusion of cluster sites present unrealistic obstacle or barrier play. Night operations are even more difficult as even the best night vision devices have limited capability to detect painted bands on cluster trees. Training these units requires large parcels of restriction-free training land in order to meet doctrinal requirements. It has become extremely difficult to incorporate mechanized and engineer units in training scenarios, thereby hampering combined arms training. Training with battalion and brigade size elements

will become even more difficult if additional species are listed.

6. Q: Is it true that helicopter shooting, and "table eight" firing are currently prohibited as a result of Endangered Species Act restrictions?
A: Helicopter gunnery and "table eight" firing are not currently prohibited as a result of Endangered Species Act restrictions. Ranges 78 and 79, the modern qualification ranges, were closed for 11 months in 1991 due to reinitiation of consultation with the FWS. This was the same period during which Range 63, the multi-purpose range complex, was closed. Helicopter units fire and qualify while observing the training restrictions imposed by the various FWS opinions.
7. Q: Has the Department of Defense ever asked for a waiver from the Endangered Species Act under the national security exemption provision?
A: No.
8. Q: Is the Department of Defense recommendation on base closure accurate when it states that activities from Fort Pickett, Virginia can be "conducted easily at other installations in the region, including Fort Bragg..."?
A: Fort Bragg would be able to accommodate only a small portion of active and reserve component unit training conducted at Fort Pickett. Fort Bragg has the heaviest training density of any Army installation, and over a 100,000-acre training land shortfall.
9. This question should be addressed to Headquarters, Department of the Army.
10. Q: Has the Forestry Program at Fort Bragg had a negative impact on the Red-Cockaded Woodpecker?
A: Early forestry management, practiced throughout the RCW's range, was geared toward fiber production--not RCW habitat. These practices were a major cause of the RCW's decline. Prior to the 1950s and a scientific forestry program on Fort Bragg, large forested areas were clearcut by the Army-Navy Lumber Agency for the establishment of impact areas and drop zones to

support military training. These activities obviously impacted upon nesting and forage habitat of the RCW.

Regulated timber management began about 1955 with the establishment of a forest management program on the installation. The objective of this program was to support training by keeping the woodlands in a healthy condition. This was a volume-regulated program that ensured volumes of timber removed did not exceed forest growth. No direct consideration was given to habitat development of the RCW; however, fire protection, reforestation initiatives, and forest insect and disease control provided some limited positive effects on overall RCW habitat in general. Some RCW cavity trees may have been removed during this period and forage levels may have been lowered in some areas causing impacts on certain RCW clans. Until the 1970s, there were no specific guidelines available pertaining to forest management activities associated with the RCW.

In 1980, Fort Bragg entered formal consultation with the FWS on the effects of timber management activities on the RCW. As a result, forest practices were changed to provide adequate nesting and foraging habitat for the RCW. Current forest management at Fort Bragg is designed to enhance RCW habitat, as stated in the 1993 Fort Bragg Forest Management Plan.

Appendix C: Proposed revision to the 1994 "Management Guidelines for the Red-cockaded Woodpecker on Army Installations"

1996

**“Management Guidelines
for the Red-cockaded Woodpecker
on Army Installations”**

**Management Guidelines
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I. General.

A. Purpose. The purpose of these guidelines is to provide standard RCW management guidance to Army installations for developing installation endangered species management plans (ESMPs) for the Red-cockaded Woodpecker (RCW). Installation RCW ESMPs will be prepared according to these guidelines and chapter 11, AR 200-3, Natural Resources - Land, Forest, and Wildlife Management. These guidelines establish the baseline standards for Army installations in managing the RCW and its habitat. Installation RCW ESMPs will supplement these guidelines with detailed measures to meet installation-specific RCW conservation needs. The requirements in RCW ESMPs will apply to all activities on the installation.

B. Applicability. The guidelines are applicable to Army installations where the RCW is present and to installations with inactive clusters that the installation, in consultation with the U.S. Fish and Wildlife Service (FWS), continues to manage in an effort to promote reactivation.

C. Revision. These guidelines will be revised as necessary to be consistent with the latest RCW recovery plan and to incorporate the latest and best scientific data available.

D. Goal. The Army's goal is to implement management guidelines which will allow the Army to train for assigned combat and other missions while concurrently developing and implementing methods to assist in the recovery and delisting of the RCW.

E. Existing Biological Opinions. Installations will continue to comply with the requirements of existing biological opinions until RCW ESMPs are prepared in accordance with these management guidelines and chapter 11, AR 200-3 and are approved through consultation with the FWS. RCW ESMPs should be drafted to incorporate the requirements of existing biological opinions, as modified to conform to these management guidelines through consultation with the FWS.

II. Consultation.

A. In preparing RCW ESMPs and taking action that may affect the RCW, installations will comply with the consultation requirements of section 7 of the Endangered Species Act (ESA); the implementing FWS regulations at 50 CFR part 402; and chapter 11, AR 200-3.

B. Early entry into informal consultation with the FWS is key to resolving potential problems and establishing the foundation to address issues in a proactive and positive manner. If, through informal consultation, the FWS concurs in writing that the RCW ESMP or other action is not likely to adversely affect any endangered or threatened species, formal consultation

is not required. Issue resolution through informal consultation is the preferred method of consultation.

C. When consulting with the FWS on RCW ESMPs and other actions that may affect the RCW, the opinions of the FWS will normally be consistent with these guidelines. In exceptional cases, however, FWS opinions may require installations to take measures inconsistent with these guidelines. After every effort has been made at the installation and MACOM levels to resolve inconsistencies, installations will report, through MACOM channels, to the Office of the Director of Environmental Programs (ODEP), Headquarters, Department of the Army, FWS opinions that are not consistent with these guidelines. ODEP will expeditiously review these reports and determine if HQDA-level action is necessary. If feasible, installations should delay implementation of measures recommended by the FWS that are inconsistent with these guidelines until after the ODEP review is completed.

III. Army Policies Applicable to RCW Management.

A. *Conservation.* Implementation of RCW ESMPs, prepared in accordance with these guidelines, will meet the Army's responsibility under the ESA to assist in conservation of the RCW. Conservation, as defined by the ESA, means the use of all methods and procedures which are necessary for endangered and threatened species survival and to bring such species to the point of recovery where measures provided by the ESA are no longer necessary.

B. *Mission Requirements.* Installation and tenant unit mission requirements do not justify violating the ESA. Mission considerations are necessary in determining the installation management and recovery goals. The keys to successfully balancing mission and conservation requirements are long-term planning and effective RCW management to prevent conflicts between these interests. In consultations with the FWS, installations will preserve the ability to maintain training readiness, while meeting ESA conservation requirements.

C. *Cooperation with U.S. Fish and Wildlife Service.* The Army will work closely and cooperatively with the FWS on RCW conservation. Installations should routinely engage in informal consultation with the FWS to ensure that proposed actions are consistent with the ESA requirements.

D. *Ecosystem Management.* Conservation of the RCW and other species is part of a broader goal to conserve biological diversity on Army lands consistent with the Army's mission. Biological diversity and the long-term survival of individual species, such as the RCW, ultimately depend upon the health of the sustaining ecosystem. Therefore, RCW ESMPs should promote ecosystem integrity. Maintenance of ecosystem integrity and health also benefit the Army by preserving and restoring training lands for long-term use.

E. *Staffing and Funding.* Installation commanders are responsible for ensuring that adequate professional personnel and funds are provided for the conservation measures prescribed by these guidelines and RCW ESMPs. Commanders are responsible for accurately identifying the funding needed to meet the requirements of these guidelines. RCW conservation projects are funded through environmental channels and will be identified in the Environmental, Pollution Prevention, Control and Abatement Report (RCS 1383).

F. *Conservation on Adjacent Lands.* Necessary habitat for the RCW includes nesting and foraging areas. Both of these RCW habitat components may be located entirely on installation lands. There may be instances, however, where one of these components is located on installation land, while a portion of the other is located on adjacent or nearby non-Army land. The FWS and installations should initiate cooperative management efforts with these landowners, if such efforts would compliment installation RCW conservation initiatives.

G. *Regional Conservation.* The interests of the Army and the RCW are best served by encouraging conservation measures in areas off the installation. The FWS and installations should participate in promoting cooperative RCW conservation plans, solutions, and efforts with other federal, state, and private landowners in the surrounding area.

H. *Management Strategy.* These guidelines require installations to adopt a long-term approach to RCW management consistent with the military mission and the Endangered Species Act. First, installations are required to establish installation RCW population goals in consultation with the FWS using the methodology described in para V.B below. Once established, the installation must designate sufficient nesting and foraging habitat to attain and sustain the goals. The goals will also dictate the required management intensity level. Next, installations must develop an ESMP to attain and sustain the installation RCW population goals in accordance with chapter 11, AR 200-3. Fourth, installations are required to ensure that all units and personnel that conduct training and other activities at the installation comply with the requirements of the installation RCW ESMP.

IV. Definitions.

Augmentation - Relocation of an RCW, normally a juvenile female, from one active cluster to another active cluster.

Basal area (BA) - The cross-sectional area (in square feet) of trees per acre measured at approximately four and one-half feet from the ground.

Biological diversity - The variety of life and its processes. It includes the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.

Buffer zone - The zone extending outward 200 feet from a cavity tree or cavity start tree in an active or primary recruitment cluster.

Cavity - An excavation in a tree made, or artificially created, for roosting and nesting by RCWs.

Cavity restrictor - A metal plate that is placed around an RCW cavity to prevent access by larger species. A restrictor also prevents a cavity from being enlarged, or if already enlarged, shrinks the cavity entrance diameter to a size that prevents access by larger competing species.

Cavity start - An incomplete cavity excavated by, or artificially created for, RCWs.

Cavity tree - A tree containing one or more active or inactive RCW cavities or cavity starts.

Cluster - (formerly called "colony") - The aggregate area encompassing cavity trees occupied or formerly occupied by an RCW group plus a 200 foot buffer area.

Effective breeding pairs - Groups that successfully fledge young.

Group - (formerly called "clan") - A social unit of one or more RCWs that inhabits a cluster. A group may include a solitary, territorial male; a mated pair; or a pair with helpers (offspring from previous years).

Habitat Management Unit (HMU) - Designated area(s) managed for RCW nesting and foraging, including clusters and areas determined to be appropriate for recruitment and replacement stands.

Impact areas - The ground within the training complex used to contain fired or launched ammunition or explosives and the resulting fragments, debris, and components from various weapons systems.

Population - A RCW population is the aggregate of groups which are close enough together so that the dispersal of individuals maintains genetic diversity and all the groups are capable of genetic interchange. Population delineations should be made irrespective of land ownership.

Population goals - A desired RCW population. For purposes of these guidelines, terms for three types of population goals may be relevant to developing an installation's ESMP:

1. Recovery population goal - The number of groups required in a physiographic region to ensure recovery of the RCW in that region.

2. Installation Regional Recovery Goal - The number of groups which FWS identifies as the installation's potential contribution toward meeting the recovery population goal.

3. Installation Mission Compatible Goal - The number of training-restricted clusters which the installation identifies as currently compatible with the installation's on-going operations, suitable habitat, and missions considering its conservation responsibilities.

Provisioning - The artificial construction of cavities or cavity starts.

Recovery population - A total of 250 or more effective breeding pairs annually, for a five year period.

Recruitment - The designation and management of habitat for the purpose of attracting a new breeding group to that habitat.

Recruitment stand - A stand of trees, minimum of 10 acres in size, with sufficient suitable RCW nesting habitat identified to support a new RCW group. Stand and supporting foraging area should be located 3/8 mile to 3/4 mile from a cluster or other recruitment stand.

Recruitment cluster - A cluster site designated and managed for the purpose of attracting a new breeding group to that habitat. Installations may have two types of recruitment clusters:

1. Primary recruitment cluster - A recruitment cluster managed for the purpose of attracting the growth of additional RCW groups toward meeting the Installation Mission Compatible Goal; generally applicable training restrictions will apply to recruitment clusters.

2. Supplemental recruitment cluster - A recruitment cluster managed for the purpose of attracting the growth of additional RCW groups over and above the mission compatible goal needed for the installation to reach the Installation Regional Recovery Goal; training restrictions will never apply to supplemental recruitment clusters.

Relict tree - a pine tree usually more than 100 years old having characteristics making it attractive to the RCW for cavity excavation.

Replacement stand - a stand of trees, minimum of 10 acres in size, identified to provide suitable nesting habitat for colonization when the current cluster becomes unsuitable. The stand should be approximately 20 - 30 years younger than the active cluster. While it is preferable for replacement stands to be contiguous to the active colony, at no time should they be more than 1/4 mile from the cluster, unless there is no suitable alternative.

Stand - an aggregation of trees occupying a specific area and sufficiently uniform in species composition, age, arrangement, and condition so as to be distinguishable from the forest on adjoining areas.

Sub-population - the aggregate of groups which are close enough together to allow for demographic interchange between groups. A sub-population does not have a significant demographic influence on adjacent sub-populations, but there is sufficient genetic interchange between the sub-populations to be considered one population.

Suitable acreage - installation acreage determined to be currently suitable for occupation by RCWs based upon vegetation and dominant land uses and acreage potentially suitable for occupation by RCWs through reasonable and practicable management practices - for example, acreage with severe mid-story encroachment would be considered as potentially suitable acreage and therefore suitable acreage; however, urban-type areas, the cantonment, impact areas, or areas free of vegetation, such as drop-zones, field landing strips, or gun positions, would not be considered suitable or potentially suitable acreage.

Translocation - the relocation of one or more RCWs from an active cluster to an inactive cluster or recruitment stand that contains artificially constructed cavities.

V. Guidelines for Installation RCW ESMPs.

Installations will prepare RCW ESMPs and manage RCW populations according to the following guidelines. Installations will update ESMPs every five years or when circumstances dictate.

A. *RCW ESMP Development Process.*

Preparation of installation RCW ESMPs requires a systematic, step-by-step approach. RCW populations (current and goal), RCW habitat (current and potential), and training and other mission requirements (present and future) must be identified. Detailed analysis of these factors and their interrelated impacts are required as a first step in the development of an ESMP. Installations should use the following or a similar methodology in conducting this analysis:

1. Identify the current RCW population and its distribution on the installation.
2. Identify areas on the installation currently and potentially suitable for RCW nesting and foraging habitat.
3. Establish the installation RCW population goal(s) with the FWS according to the guidance in B below.

4. Identify installation and tenant unit mission requirements. Overlay these requirements on the RCW distribution scheme.
5. Identify mission requirements that are incompatible with the conservation of RCW habitat.
6. Identify areas on the installation where conflicting mission requirements could be relocated to avoid RCW habitat.
7. Identify critical mission areas where activities cannot reasonably be relocated.
8. Identify areas which could support RCW augmentation or translocation.
9. Identify areas suitable for RCW habitat and free of conflicting present and projected mission activities. These are prime areas for designation as recruitment stands.
10. Analyze the information developed above using the guidance contained in these guidelines.
11. Prepare the RCW ESMP to implement the best combination of options, consistent with meeting the established RCW population goals, while minimizing adverse impacts to training readiness and other mission requirements.

B. RCW Population Goals.

1. The first step in RCW management is to determine the Installation Regional Recovery Goal and Installation Mission Compatible Goal in accordance with paragraph V.B.2 below. Once the goals are established, they will be used to designate the amount of land needed for RCW HMUs and the appropriate level of management intensity. Goals should be considered long-term but are subject to change, through consultation with the FWS, based upon changing circumstances, changing missions, or new scientific information. In conjunction with the 5 year review of ESMPs, installations will reexamine population goals to reflect changing conditions.
2. ESMPs must clearly state the installation RCW population goals. The goals will be established through informal or formal consultation with FWS using the following methodology:
 - a. Installation Regional Recovery Goal. Through consultation with FWS determine the installation "share" of the recovery population goal.

(1) Determine the number of active clusters required in the population to achieve recovery.

(2) Count RCW groups on other federal, state or private lands that are demographically functioning as part of the regional population as contributing to the overall regional recovery goal.

(3) Determine the installation's carrying capacity to support RCWs based upon suitable acreage and known ecosystem attributes..

(4) Any deficit between steps (1) and (2), considering the limitations of step (3), will be considered the installation's potential contribution toward the overall recovery goal and will be termed, for ESMP purposes, the Installation Regional Recovery Goal.

b. Installation Mission Compatible Goal. The installation will determine its known capacity to integrate RCW management with on-going and planned mission requirements and dominant land uses. During this process, the installation will seek input from FWS.

(1) Determine suitable acreage.

(2) Determine the installation carrying capacity to support RCWs, the calculation of suitable acreage, known ecosystem attributes, and acreage required as exempt for critical and essential mission requirements. Installations may only exempt acreage as essential for mission requirements when, considering their conservation responsibilities under the Endangered Species Act, they determine that imposing generally applicable training restrictions upon such certain specific lands would unacceptably hinder mission accomplishment. The mission compatible goal should be carefully calculated considering the current and future installation and tenant unit missions, the amount and distribution of suitable habitat on the installation, the quality of the habitat, the distribution of clusters, the configuration of sub-populations, the recovery potential and the RCW Recovery Plan objectives, etc. The Installation Mission Compatible Goal should strike a reasonable balance between the present and future installation and tenant unit missions and the installation's duty to conserve the endangered species.

c. ESMP goals. If the Installation Regional Recovery Goal is less than the Installation Mission Compatible Goal, then the installation will use the Installation Regional Recovery Goal as the ESMP Goal. If the Installation Regional Recovery Goal is greater than the Installation Mission Compatible Goal, then the installation will use both goals in the ESMP. The installation ESMP will include maps for planning and future reference which show the configuration of all active clusters and primary recruitment clusters required to reach the Installation Regional Recovery Goal. These maps will also show the supplemental recruitment

clusters scheduled for management in the 5-year planning period. These maps will be updated during the 5-year revision process. If the number of recruitment sites identified in the initial 5-year plan falls short of the Installation Regional Recovery Goal, the installation will also identify the additional habitat management areas where supplemental recruitment clusters will be added to meet this goal. Installations will identify and manage a minimum of 200 acres of suitable habitat for each identified recruitment cluster.

d. Maintenance of ESMP goals. A population that has achieved the installation regional recovery goal need only be maintained at that level; however, installations should continue to encourage population growth where feasible and compatible with the military mission. A maintenance strategy is also appropriate for populations which have attained the maximum population that can be supported by available suitable habitat, irrespective of population size. Maintenance activities will, however, also vary according to the population size. For example, smaller, nonviable populations may require occasional augmentation, predator control, etc.

3. The population goal established for an installation will dictate the required RCW management intensity level. An installation which has not achieved its population goals requires an active recruitment/augmentation strategy. Annually, the installation will determine the number of recruitment clusters to provision with artificial cavities, cavity restrictors, etc., and concurrently manage those recruitment clusters using the following methodology:

a. Primary recruitment clusters. The installation will annually add recruitment clusters within the limitations of available nesting and foraging habitat of at least the optimum rate of growth of the RCW. The optimum rate of growth of an installation's RCW population will be determined by the installation's population size and population distribution and will be detailed in the installation's ESMP .

b. Supplemental recruitment clusters. If the installation recovery goal is greater than the Installation Mission Compatible Goal, the installation will annually add supplemental recruitment clusters within the limitations of available nesting and foraging habitat. These supplemental will be added over and above the recruitment clusters described in paragraph V.B.3.a above, at the rate of at least one-half of the rate of growth to attain the installation regional recovery goal. The installation will identify and subsequently manage these supplemental recruitment clusters in areas not already selected by the installation as a recruitment cluster in paragraph V.B.3.a above. Installations will manage these supplemental clusters concurrently and in addition to recruitment clusters managed for the purpose of meeting the Installation Mission Compatible Goal.

(1) Management of these supplemental recruitment clusters will be closely coordinated with FWS. FWS will provide incidental take provisions for supplemental recruitment clusters occupied as part of the authorized program to exceed the mission compatible

goal in order to reach the installation regional recovery goal. Training or other land use restrictions will never apply to recruitment clusters managed under this approach; however, this does not authorize installations to engage in non-training related construction activities in occupied supplemental recruitment clusters absent consultation with FWS.

(2) The installation will separately manage and track the supplemental recruitment clusters as contributing to the installation regional recovery goal. As with other recruitment clusters, the supplemental recruitment clusters will be provisioned and managed in woodpecker-suitable habitat. The installation will give priority to adding supplemental recruitment clusters in training area acreage previously exempted from consideration as RCW habitat because of critical or essential mission requirements under paragraph V.B.2.b. Installations may elect to count as either supplemental recruitment clusters or primary recruitment clusters, those clusters where RCWs voluntarily move into a stand which has not been designated previously as a recruitment cluster.

c. During the development of the installation's ESMP, and at the 5-year review, if a cluster or recruitment cluster identified previously as active has no RCW activity for a period of five consecutive years, the installation may cease actively managing that cluster.

C. Surveys, Inspections, Monitoring and Reporting Programs.

1. Installations will conduct the following surveys and monitoring programs.

a. Five-Year installation-wide RCW surveys. Effective management of the RCW requires an accurate survey of installation land for RCW cavity and cavity-start trees. The survey must document the location of RCW cavity and cavity-start trees as accurately and precisely as possible (using Global Positioning System and Geographic Information System, if available) and the activity within all clusters. An installation-wide survey will be conducted every five years. Installations may conduct the survey over the five year period, annually surveying one-fifth of the installation.

b. Project surveys. Prior to any timber harvesting operations, construction, or other significant land-disturbing activities, excluding burning, a 100-percent survey of the affected area will be conducted by natural resources personnel trained and experienced in RCW survey techniques and supervised by a RCW biologist, if such survey has not occurred within the preceding year. Installations will conduct project surveys in accordance with the survey guidance in V. Henry, Guidelines for Preparation of Biological Assessments and Evaluations for the Red-cockaded Woodpecker, U.S. Fish and Wildlife Service, Southeast Region, Atlanta, Georgia (September 1989). When conducting project assessments, installations may, through informal consultation with FWS, reduce the forage habitat requirements from the Henry guidelines by one-third, or as specified in paragraph V.D.2.d below. In the case of range

construction, the survey will also include the surface danger zone for the weapons to be used on that range except for new ranges which use existing dedicated impact areas.

c. Inspections. Active clusters that have not been deleted from management in accordance with paragraph V.D.2.b below must be inspected annually. Recruitment clusters must be inspected twice per year (fall and pre-breeding dispersal periods) to document RCWs occupancy; once occupied, use monitoring criteria in paragraph V.C.1.e. These are prescriptive inspections, used to develop treatments and modifications of treatments to maintain suitable nesting habitat. At a minimum, installations will inspect and record data for:

- (1) density and height of hardwood encroachment;
- (2) height of RCW cavities;
- (3) condition of cavity trees and cavities;
- (4) a description of damage from training (to include: damage to cavity and cavity start trees requiring remedial measures if any, soil disturbance adjacent to cavity and cavity start trees requiring remedial measures if any, and general condition of the forage habitat of the cluster being monitored if impacted by training activities), fires (prescribed or wild), etc.; and
- (5) evidence of RCW activity for each cavity tree (includes each cavity in the tree) within the cluster. See 2a below for guidance on the maintenance of survey and monitoring records.

d. Ten-year forest survey. In addition to the RCW survey required in 1a above, installations will conduct, as required by AR 200-3, an installation-wide forest survey at least every ten years. In conducting the forest survey, data will be gathered to determine accurately the quantity and quality of available foraging and nesting habitat for the RCW. Alternately, installations may survey over the 10 year period, e.g., ten percent of the installation annually. Forest surveys will be conducted using a recognized plot sampling technique, such as the random line plot cruise, the random point sample cruise, or the line strip cruise method. Forest surveys in impact areas may be conducted using scientifically accepted, aerial photography interpretation methods.

e. Monitoring. Installations will conduct monitoring programs to scientifically determine demographic trends within the population as a whole. Sample sizes will be determined by the number of clusters and their dispersion on the installation by habitat category (e.g., longleaf pine/scrub oak, pine flatwoods, pine mixed hardwoods) and by category of use (e.g., non-dud producing ranges, mounted and dismounted training areas, cantonment areas, bivouac areas, etc.). Sample sizes will be of sufficient size to have statistical validity and

to ensure that population trends and important biological information can be determined for the entire installation. Monitoring activities will be done annually to acquire data to determine the number of adults and fledglings per site, sex of birds, number of breeding groups, number of nests, and number of cavity trees. Monitoring will include color banding of birds. Installations will coordinate with FWS to determine if additional monitoring, in other than impact areas, may be required to address installation specific issues, e.g., fragmented populations or on-going translocation programs.

(1) Active Clusters. Installations with 25 active clusters or fewer will monitor all sites annually. Installations with more than 25 active clusters will annually monitor sample sizes based on the following: 25 percent of the RCW active clusters located in each habitat and usage category on the installation, with a minimum of three RCW clusters per habitat type or a total of 25 clusters, whichever is greater.

(2) Recruitment Clusters. Installations with recruitment clusters designed to attain either the mission compatible goal or the installation regional recovery goal will conduct additional monitoring and reporting of monitoring results. Installations will monitor all recruitment clusters for at least five years after occupation. In addition to the monitoring in paragraph V.C.1.e, installations with supplemental recruitment clusters will monitor and record the following information of military training and activities occurring within all training areas containing recruitment clusters: a) type of training that took place, b) duration of training, c) date of training, d) units and approximate numbers of soldiers involved in the training, e) approximate number and types of vehicles and equipment involved in the training, and f) other relevant information that would contribute to an understanding of the effects of military training upon RCW habitat.

2. Results from surveys and monitoring will be recorded and reported as follows:

a. Survey/monitoring records. Survey and monitoring results for all clusters will be recorded and retained permanently allowing for trend analysis.

b. Research on compatibility of military training with RCWs. ODEP will ensure that monitoring of population data gathered from all installations with primary recruitment clusters and supplemental recruitment clusters is evaluated for trend analysis and will share this analysis with FWS. Research data will be analyzed at least once every five years for population trends. In consultation with FWS, trend analysis from paragraphs a and b above, and other outside 5 year research programs, will dictate the revision, continuation, or cancellation of military training restrictions for all clusters considered part of the mission compatible goal. Trend analysis will not effect supplemental recruitment clusters.

c. Annual Reporting. Installations will annually report RCW population data to FWS. Along with the population data, installations will report all actions taken to recruit

RCWs or improve RCW habitat (see Appendix 2 for content and format of report). A copy of this report will be furnished through command channels to ODEP. The Army will host an annual meeting with FWS and the installations to discuss installation RCW population data. During these meetings, if it becomes clear that an installation is accomplishing less than 50% of its ESMP growth goals over a period of several years, then the installation will informally consult with the FWS to determine if reinitiating formal consultation is desirable.

d. Notification. The installation will immediately notify FWS and their MACOM in the event of incidental take. The installation will notify FWS and their MACOM, and reinitiate consultation with FWS, within 30 days of discovering a 5% population decrease. MACOMs will report either of these occurrences to ODEP. In the event of an incidental take, the installation will also comply with AR 200-3, paragraph 11-9. Upon discovery of a 5% population decrease, the installation will continue to abide by these guidelines and will conduct a systematic review of available data including regional trends to determine the cause of the decrease within 90 days. If the cause is training related, within 150 days the installation in consultation with FWS will develop and implement a plan to prevent further population decline.

e. RCW maps. Survey data will be used to generate installation RCW maps accurately depicting the location of RCW clusters, RCW-related training restricted areas, HMUs, cavity trees, etc. A copy of these maps will be included in the ESMP. The initial ESMP produced according to these guidelines will identify the clusters where the area subject to training restrictions have changed as a result of implementation of these guidelines as opposed to the 21 June 1994 guidelines. Relevant maps will be widely distributed for use by those conducting land use activities on the installation, including military training, construction projects, range maintenance, etc. Maps will be updated at least every five years to coincide with the installation-wide RCW survey or when a 20 percent change in the number of clusters occurs, whichever is sooner.

D. RCW Habitat Management Units.

1. Designation of habitat management units (HMUs). Installation RCW ESMPs will provide for the designation of nesting and foraging areas within HMUs sufficient to attain and sustain the installation RCW population goals. Determination of the installation's population goals is a prerequisite to HMU designation. HMU delineation is an important step in the planning process because it defines the future geographic configuration of the installation RCW population. Areas designated as HMUs for all active and recruitment clusters must be managed according to these guidelines.

2. Areas included within HMUs.

a. HMUs will encompass all clusters, areas designated for recruitment and replacement, and adequate foraging areas as specified in d below.

b. During the development of the installation's ESMP, and at the 5-year review, in consultation with the FWS, clusters that have been documented as continuously inactive for a period of five consecutive years or more may be deleted from HMUs. Designated recruitment clusters that have not been occupied for a period of five consecutive years may also be deleted from HMUs. Once deletion of a cluster from management is approved by the FWS, existing cavities may be covered to discourage reactivation.

c. In designating HMUs, fragmentation of nesting habitat will be avoided. Installations will attempt to link HMUs with HMU corridors, allowing for demographic interchange throughout the installation population.

d. Adequate foraging habitat, in size, quality, and location, must be provided within HMUs. The foraging habitat needed to support active clusters will be calculated and designated according to the range-wide guidelines in V. Henry, Guidelines for Preparation of Biological Assessments and Evaluations for the Red-cockaded Woodpecker, U.S. Fish and Wildlife Service, Southeast Region, Atlanta, Georgia (September 1989) or other physiographic-specific guidelines approved by the FWS. While the Henry guidelines are used to establish minimum forage acreage requirements, some installations may have data to support forage habitat minima below the Henry standard. If installations can provide data to support forage habitat requirements different from the Henry guidelines, the installation, in consultation with FWS, may establish installation specific forage minima for recruitment sites, project assessments, and habitat management. These forage requirements will apply to all active sites and recruitment sites identified for management in the ESMP. Recruitment sites identified to meet long-term population goals will be evaluated with the same criteria used in the goal setting procedure. A minimum of 200 acres of potential/suitable habitat will be identified and managed for recruitment sites to meet the Installation Mission Compatible Goal and the Installation Regional Recovery Goal. The underlying strategy is to identify and actively manage RCW habitat in the short to mid-term with the long-term population goal always in sight. Adhering strictly to the Henry guidelines, or applying forage habitat requirements to areas presently lacking RCW groups, may preclude long-term habitat management. This could increase the time required to reach installation RCW population goals.

3. Minimization of RCW management impacts on the installation's mission. To the extent consistent with RCW biological opinions, HMUs should be located where there will be a minimum impact upon current and planned installation missions/operations and should be consistent with land usage requirements in the Real Property Master Plan.

4. Demographic and genetic interchange. Installations should delineate HMUs to maximize the linkage between sub-populations on and off the installations and with populations off the installation. Where fragmentation exists, installations should develop plans to link sub-populations on the installation by designating habitat corridors where practical.

E. *HMU Management Practices*. All HMU management activities and practices will be consistent with the conservation of other candidate and federally listed species.

1. Clusters and recruitment stands within HMUs.

a. Due to RCW biological needs, clusters require a higher management intensity level than other areas within HMUs. Within HMUs, maintenance priority will be given to active clusters over both inactive clusters and recruitment stands.

b. Clusters and recruitment stands will be kept clear of dense midstory. An open, park-like pine stand is optimal. All midstory within 50 feet of cavity trees will be eliminated. Beyond 50 feet, some pine midstory will be retained for regeneration and some selected hardwoods may be retained for foraging by species other than the RCW. Hardwoods will not exceed 10 percent of the area of the canopy cover nor 10 percent of the below canopy cover within the cluster or recruitment stand. Hardwood stocking will be kept below 10 square feet per acre.

c. The priority of forest management in cluster sites and recruitment stands is to maintain and produce potential cavity trees greater than 100 years of age. For this reason, no rotation age shall be set in these areas. In thinning clusters and recruitment stands, dead, dying, or inactive cavity trees will be left for use by competitor species. Thinning should occur only when pine species basal area (BA) exceeds 80 and should not exceed the removal of more than 30 BA to avoid habitat disruption (timber prescriptions within clusters should normally be on a 10 year cycle). Pine species basal areas should be kept within the range of approximately 50 to 80 square feet, maintaining average spacing of 20 to 25 feet between trees, but retaining clumps of trees.

d. Trees within HMUs affected by beetle (e.g., *Ips* beetle, southern pine beetle) infestation should be evaluated and treated appropriately. Treatment options will be developed in consultation with the FWS. Possible treatments include the use of pheromones or cutting and leaving, cutting and removing, or cutting and burning infected trees. Cavity trees may be cut only with the approval of the FWS. Prior to cutting an infected cavity tree, a suitable replacement cavity tree will be identified and provisioned.

e. Timber cutting, pine straw harvesting, and habitat maintenance activities, with the exception of burning activities, will not be conducted in active sites during the nesting season, occurring from April through July depending upon the installation's location. If a biologist, experienced in RCW management practices, determines that habitat maintenance activities, exclusive of timber cutting and pine straw harvesting, will have no effect on nesting activities, they may be conducted at anytime.

2. Other areas within HMUs. While not requiring the same level of intense management for clusters and recruitment stands, the quality of foraging and replacement stands should be maintained by a prescribed burning program sufficient to control hardwood growth and ground fuel buildup and to eliminate dense midstory. Improving the quality of foraging habitat will reduce the quantity (acreage) required to maintain the installation RCW population.

3. Midstory control. Prescribed burning is normally the most effective means of midstory control and is recommended as the best means of maintaining a healthy ecosystem. Prescribed burning will be conducted at least every three years in longleaf, loblolly, slash pine, and shortleaf pine systems. Burning must be conducted in accordance with applicable Federal, state, and local air quality laws and regulations. With the agreement of the FWS, the burn interval may be increased to no more than five years after the hardwood midstory has been brought under control. Mechanical and chemical alternatives should only be used when burning is not feasible or is insufficient to control a well-advanced hardwood midstory. Application of herbicide must be consistent with applicable Federal, state, and local laws and regulations. Cavity trees will be protected from fire damage during burning. Burning should normally be conducted in the growing season since the full benefits of fire are not achieved from non-growing season burns. Winter burns may be appropriate to reduce high fuel loads. Use of fire plows in clusters will be used only in emergency situations.

4. Erosion control. Installations will control excessive erosion and sedimentation in all HMUs. Erosion control measures within clusters will be given priority over other areas within HMUs.

5. Impact and direct fire areas.

a. Impact areas.

(1) Impact areas that contain or likely contain unexploded ordnance or other immediate hazardous materials (radiological or toxic chemicals) can pose danger to personnel. Natural resources conservation benefits to be gained by intensive management in high risk areas generally are not justified. Certain installations may have impact areas or other areas that have been contaminated with improved conventional munitions or submunitions where entry by personnel is forbidden.

(2) Designation of impact areas, safety restrictions on human access to impact areas, range operations in impact areas, and the associated effects of these actions on RCW management activities may adversely affect the RCW and other federally listed species within impact areas. These actions may lead to the possibility and necessity of incidental take. FWS will provide incidental take provisions for impact areas where it is not feasible or economical to either relocate or protect the RCW.

(3) To the degree practicable, clusters and surrounding foraging area should be designated as "no fire areas" to protect clusters from projectile damage.

b. Direct fire areas.

(1) Direct fire, non-dud producing impact areas that do not contain unexploded ordnance or other immediate hazardous materials may be included within HMUs, subject to the guidelines set forth below.

(2) In HMUs which are not impacted upon by weapons firing, RCW management will be the same as for HMUs outside of impact areas. In HMUs where there is a significant risk of projectile damage to foraging or nesting habitat, the following guidelines apply:

(a) Range layout will be modified/shielded where practical and economically feasible to protect HMUs from projectile damage. Protective measures that will be considered include reorienting the direction of weapons fire, shifting target arrays, establishing "no fire areas" around RCW clusters or HMUs, revising maneuver lanes, constructing berms, etc.

(b) Installations should develop alternate HMUs near existing HMUs but outside the affected range complex. Augmentation and translocation should be considered as a means of removing RCWs from high risk areas.

F. Timber Harvesting and Management in HMUs.

1. Timber harvesting in HMUs will be permitted if consistent with the conservation of the RCW. If permitted, a harvest method will be implemented that maintains or regenerates the historical pine ecosystem. In most ecosystems inhabited by the RCW, historical conditions are characterized by old-growth longleaf pines in an uneven-age forest, with small (1/4 to 2 acres) even-age patches varying in size. Timber harvesting methods must be carefully designed to achieve and maintain historical conditions through emulation of natural processes.

2. Longleaf sites will not be regenerated to other pine species. Where other species have either replaced longleaf pine (due to fire suppression) or been artificially established on sites historically forested with longleaf, forest management should be directed toward regeneration back to longleaf by natural or artificial methods.

3. At a minimum, sufficient old-growth pine stands will be maintained by: lengthening rotations to 120 years for longleaf pine and 100 years for other species of pine; indefinitely retaining snags, six to ten relict and/or residual trees per acre when doing a seedtree cut, or shelterwood cut; and indefinitely retaining snags, all relicts, and residuals in thinning cuts.

No rotation age will be established for cluster sites or replacement stands. The above rotation ages and retention rates do not apply to off-site stands of sand pine, loblolly pine, or slash pine that will be converted back to longleaf.

G. *Pine Straw Harvesting within HMUs.* Sufficient pine straw must be left in HMUs to allow for effective burning and to maintain soils and herbaceous vegetation. Areas within HMUs will not be raked more than once every three to six years. Baling machinery will not be used or parked within clusters.

H. *Restoration and Construction of Cavities.*

1. *Restoration.* Active and inactive cavities found to be in poor condition during periodic inspections will be repaired whenever feasible to prolong their use. Cavity restrictors can be installed on enlarged RCW cavity entrance holes (greater than two inches in diameter) to optimize the availability of suitable cavities. They also may be installed to protect properly-sized cavities where suitable cavities are limited, the threat of enlargement is great, or where another species is occupying a cavity. Priorities for the installation of restrictors, in descending order, will be: (a) active single tree clusters, (b) single bird groups, (c) clusters with less than four suitable cavities, and (d) others. Restrictors will be installed according to scientific procedures accepted by the FWS. Restrictors will be closely monitored, especially in active clusters. Adjustments to the positioning of the restrictors will be made to ensure competitors are excluded and RCW access is unimpeded.

2. *Construction.* Artificial cavities will be constructed in areas designated for recruitment or translocation and in active clusters where the number of suitable cavities is limiting. The objective is to provide at least four suitable cavities per active cluster and two cavities plus three advanced starts for each recruitment stand. Priorities for installation of artificial cavities in descending order will be: (a) single cavity tree active clusters, (b) active clusters with insufficient cavities to support a breeding group, (c) inactive clusters designated as and managed for replacement or recruitment stands with an insufficient number of usable cavities within one mile of an active cluster, (d) new replacement/recruitment stands within one mile of an active cluster, (e) inactive clusters designated as and managed for replacement or recruitment stands within three miles of an active cluster, (f) recruitment or potential habitat within three miles of an active cluster, and (g) replacement/recruitment stands beyond three miles of an active cluster. Cavity construction may be by either the drilling or insert techniques. Construction must be according to scientific procedures accepted by the FWS and accomplished by fully trained personnel.

I. *Protection of Clusters.*

1. *Markings.* Installations will implement the following marking guidance by 1 Jan 1998.

a. Cavity and cavity-start trees in active and primary recruitment clusters.

These trees will be marked with two white bands, approximately four to six inches wide and one foot apart. The bands will be centered approximately four to six feet from the base of the tree. Warning signs (e below) may be posted on or immediately adjacent to the cavity and cavity start trees. A uniquely numbered small metal tag will be affixed to the cavity tree for monitoring and identification purposes.

b. Cavity and cavity-start trees in supplemental recruitment clusters.

These trees may be marked with one white band approximately one inch wide. The band will be centered approximately four to six feet from the base of the tree. Warning signs (e below) will not normally be posted. A uniquely numbered small metal tag will be affixed to the cavity tree for monitoring and identification purposes.

c. Buffer zone for cavity and cavity start trees within active clusters and primary recruitment clusters. Warning signs (e below) will be posted at reasonable intervals along the 200 foot perimeter of cavity trees facing to the outside of the buffer zone and along roads, trails, firebreaks, and other likely entry points into the buffer zone.

d. The installation will mark all cavity and cavity start trees in a managed cluster in accordance with paragraph V.I.1.a and b, above. At a minimum, four suitable cavity or cavity start trees will be marked and protected within each cluster (see paragraph V.H.2). Based on the installation biologist's determination, if more than four cavity trees are required to support the cluster, the required number of trees will be protected.

e. Warning sign. Signs will be posted and will be constructed of durable material, ten inches square (oriented as a diamond), white or yellow in color, and of the design in Figure 1. The RCW graphic and the lettering "Endangered Species Site" and "Red-cockaded Woodpecker" will be printed in black. The lettering "Do Not Disturb" and "Restricted Activity" will be printed in red. All lettering will be 3/8 inches in height.

f. Training on non-Army lands. Installations conducting long-term training on private, state, or other federal lands with RCW habitat will attempt to obtain agreement from the landowners on compliance with these markings guidelines. If a landowner does not agree to comply with these guidelines, even with the installation paying the costs associated with compliance, installations will educate troops training on such lands to help them recognize the markings used by the landowner.

2. Training within RCW clusters.

a. RCW and RCW habitat will be managed biologically by clusters.

Training restrictions will apply to marked buffer zones around cavity trees.

b. The training restrictions in this section apply to buffer zones within marked active clusters and primary recruitment clusters. RCW-related training restrictions do not apply to supplemental recruitment clusters, inactive clusters and foraging areas.

c. Standard training guidelines within active clusters and primary recruitment clusters:

(1) Military training within marked cavity tree buffer zones is limited to military activities of a transient nature (less than 2 hours occupation). A list of prohibited and permitted training activities within buffer zones is contained at Appendix 1.

(2) Military vehicles are prohibited from occupying a position or traversing within 50 feet of a marked cavity tree, unless on an existing road, trail, or firebreak.

3. Training throughout the installation. Installations will give priority to maintaining and improving the habitat of RCW clusters; however, in addition to the HMU management practices at para. V.E, installations will observe the following measures to maintain and improve potentially suitable habitat for the RCW throughout the installation

a. Military personnel are prohibited from cutting down or intentionally destroying pine trees unless the activity is approved previously by the installation biologist and/or forester and is authorized for tree removal. Hardwoods may be cut and used for camouflage or other military purposes.

b. Units will immediately report to range control known damage to any marked cavity or cavity start tree and/or any known extensive soil disturbance in and around RCW clusters.

c. The installation will immediately (within 48 hours) re-provision a cavity tree if one is destroyed.

d. Installations will as soon as practicable (normally within 72 hours) repair damage to training land within a cluster to prevent degradation of habitat.

e. All digging for military training activities in suitable acreage will be filled within a reasonable time after the completion of training

f. Training guidelines will be actively enforced through installation training and natural resources enforcement programs, prescribed in chapters 1 and 11, AR 200-3, and installation range regulations.

J. Augmentation and Translocation.

1. Augmentation can be a useful tool to expand and disperse the RCW population into designated HMUs. Augmentation also provides a means to maintain genetic viability in populations with fewer than 250 effective breeding pairs. Installation plans will provide for the augmentation of single-bird groups. Clusters will be made suitable in accordance with the requirements/procedures outlined in paragraph V.H. above before augmentation is attempted.

2. In exceptional situations, installations may translocate RCWs from active clusters to inactive clusters or recruitment/replacement stands where cavities have been artificially constructed. For example, translocation could be used to move RCWs from live fire areas where there is a significant risk of harm to the birds. The current scientific literature indicates serious limitations in successfully translocating adult RCWs, in particular, adult territorial males. Translocation will be accompanied by an intensive monitoring program.

3. In areas to receive RCW, habitat designation and improvement work ensuring that nesting and foraging habitat meet the standards established by these guidelines (V.E.1.b and c, V.E.2, V.D.2.d) must be completed before augmentation or translocation is attempted.

4. Neither augmentation nor translocation will be undertaken without the approval of and close coordination with the FWS. Installations must obtain an ESA section 10 permit (scientific purposes) or an incidental take statement under ESA section 7 and all applicable marking, banding, and handling permits prior to moving any RCW through augmentation or translocation.

APPENDIX 1

TRAINING ACTIVITY WITHIN MARKED BUFFER ZONES

MANEUVER AND BIVOAC:

HASTY DEFENSE, LIGHT INFANTRY, HAND DIGGING ONLY, 2 HOURS MAX	YES
HASTY DEFENSE, MECHANIZED INFANTRY/ARMOR 24 HOURS	NO
DELIBERATE DEFENSE, LIGHT INFANTRY 48 HOURS	NO
DELIBERATE DEFENSE, MECHANIZED INFANTRY/ARMOR	NO
ESTABLISH COMMAND POST, LIGHT INFANTRY 36 HOURS	NO
ESTABLISH COMMAND POST, MECHANIZED INFANTRY/ARMOR 36 HOURS	NO
ASSEMBLY AREA OPERATIONS, LIGHT INFANTRY/MECH INFANTRY/ARMOR	NO
ESTABLISH CS/CSS SITES	NO
ESTABLISH SIGNAL SITES	NO
FOOT TRANSIT THRU THE COLONY	YES
WHEELED VEHICLE TRANSIT THRU THE COLONY (1)	YES
ARMORED VEHICLE TRANSIT THRU THE COLONY (1)	YES
CUTTING NATURAL CAMOUFLAGE, HARD WOOD ONLY	YES
ESTABLISH CAMOUFLAGE NETTING	NO
VEHICLE MAINTENANCE FOR NO MORE THAN 2 HOURS	YES

WEAPONS FIRING:

7.62mm AND BELOW BLANK FIRING	YES
.50 CAL BLANK FIRING	YES
ARTILLERY FIRING POINT/POSITION	NO
MLRS FIRING POSITION	NO
ALL OTHERS	NO

NOISE:

GENERATORS	NO
ARTILLERY/HAND GRENADE SIMULATORS	YES
HOFFMAN TYPE DEVICES	YES

PYROTECHNICS/SMOKE:

CS/RIOT AGENTS	NO
SMOKE, HAZE OPERATIONS ONLY, GENERATORS OR POTS (2)	YES
SMOKE GRENADES	YES
INCENDIARY DEVICES TO INCLUDE TRIP FLARES	NO
STAR CLUSTERS/PARACHUTE FLARES	YES
HC SMOKE OF ANY TYPE	NO

DIGGING:

TANK DITCHES	NO
HASTY INDIVIDUAL FIGHTING POSITIONS, HAND DIGGING ONLY, FILLED AFTER USE	YES
DELIBERATE INDIVIDUAL FIGHTING POSITIONS	NO

CREW-SERVED WEAPONS FIGHTING POSITIONS	NO
VEHICLE FIGHTING POSITIONS	NO
OTHER SURVIVABILITY/FORCE PROTECTION POSITIONS	NO
VEHICLE SURVIVABILITY POSITIONS	NO
NOTE:	
YES means that activity may be conducted within 200 feet of a marked cavity tree	
NO means the activity may not be conducted within 200 feet of a marked cavity tree	
NOTE:	
1. Vehicles will not get any closer than 50 feet of a marked cavity tree unless on existing roads, trails or firebreaks.	
2. Smoke generators and smoke pots will not be set up within 200 feet of a marked cavity tree, but the smoke may drift thru the 200 feet circle around a cavity tree.	
NOTE: The above training restrictions apply to RCW cavity trees in training areas but not to cavity trees located in dedicated impact areas.	

APPENDIX 2

Red-Cockaded Woodpecker (RCW) Data Update - FY ____

INSTALLATION: _____ DATE: _____

RCW Population: _____ POC: _____

DSN #: _____

A. RCW Cluster Survey and Inspection Results.

- 1. Number of clusters managed _____
- 2. Number of active clusters _____
 - a. Number of active supplemental recruitment clusters _____
 - b. Number of active clusters with training restrictions _____
- 3. Total acres of suitable acreage _____
- 4. Acres 100% surveyed for "new" RCW clusters in this FY _____
- 5. Number clusters inspected once per year for training impacts _____
 - a. Number of clusters checked with damage to cavity trees _____
 - b. Number of clusters checked with soil disturbance requiring remedial measures _____
 - c. Number of clusters checked with habitat disturbance requiring remedial measures _____
- 6. Number recruitment clusters inspected twice per year for training impacts _____
 - a. Number of clusters checked with damage to cavity trees _____
 - b. Number of clusters checked with soil disturbance requiring remedial measures _____
 - c. Number of clusters checked with other habitat disturbance requiring remedial measures _____

B. Monitoring Results

	<u>Active</u>	<u>Primary Recruitment</u>	<u>Supplemental Recruitment</u>	<u>Total</u>
1. Number of clusters where monitoring was completed	_____	_____	_____	_____
1a. Number found active	_____	_____	_____	_____
1b. Number of breeding groups	_____	_____	_____	_____
1c. Number of nests found	_____	_____	_____	_____
1d. Number of cavity tress	_____	_____	_____	_____

C. Unit Reports

1. Number of unit reports to range control of tree damage	_____
1a. Number of reprovisioning actions taken in response (synopsis enclosed)	_____
2. Number of unit reports of extensive soil disturbance	_____
2a. Number of remedial actions taken in response (synopsis enclosed)	_____

D. Affirmative RCW Habitat Improvement Measures Carried Out This FY

	<u>Active</u>	<u>Primary Recruitment</u>	<u>Supplemental Recruitment</u>	<u>Total</u>
1. Number of clusters sites needing burning this year	_____	_____	_____	_____
1a. Number burned	_____	_____	_____	_____
2. Number of cluster sites needing midstory treatment	_____	_____	_____	_____
2a. Number treated	_____	_____	_____	_____
3. Number of foraging acres needing burned	_____	_____	_____	_____
3a. Number acres burned	_____	_____	_____	_____
4. Number of foraging acres needing midstory treatment	_____	_____	_____	_____
4a. Number acres treated	_____	_____	_____	_____
5. Number of cluster sites needing cavity restrictors	_____	_____	_____	_____

D. Affirmative RCW Habitat Improvement Measures Carried Out This FY (Cont'd)

	<u>Active</u>	<u>Primary Recruitment</u>	<u>Supplemental Recruitment</u>	<u>Total</u>
5a. Number clusters receiving restrictors	_____	_____	_____	_____
5b. Number of cavity trees receiving restrictors	_____	_____	_____	_____
6. Number of cavity trees needing marked	_____	_____	_____	_____
6a. Number marked	_____	_____	_____	_____
7. Number of buffer zones needing marked	_____	_____	<u>0</u>	_____
7a. Number marked	_____	_____	<u>0</u>	_____
8. Number of translocations scheduled	_____	_____	_____	_____
8a. Number of translocations received	_____	_____	_____	_____
9. Number of clusters needing artificial cavities	_____	_____	_____	_____
9a. Number receiving inserts	_____	_____	_____	_____
9b. Number receiving drilled cavities	_____	_____	_____	_____
9c. Number receiving drilled starts	_____	_____	_____	_____
9d. Total number of cavities treated	_____	_____	_____	_____
9e. Number treated cavities with RCW use	_____	_____	_____	_____
(1) ocular sign of use	_____	_____	_____	_____
(2) confirmed roosting	_____	_____	_____	_____
(3) nesting attempted	_____	_____	_____	_____
(4) young fledged	_____	_____	_____	_____

APPENDIX 2a

Recruitment Cluster Inspection, Monitoring & Training Data

Type Recruitment Cluster: _____
(Primary or Supplemental)

Cluster Number: _____

A. Results of inspections and monitoring. Yes/No

Spring inspection and monitoring:

- 1. Visual, from ground, sign of use _____
- 2. Cavity inspected confirmed roosting _____
- 3. Nesting attempted _____
- 4. Fledged young _____
- 5. Habitat assessment/general condition:
 - 5a. Damage to cavity or cavity start tree _____
 - 5b. Soil disturbance requiring remedial measures _____
 - 5c. Other habitat disturbance requiring remedial measures _____
- 6. Number of adults: _____
- 7. Number of fledglings: _____
- 8. Sex of birds: _____

Fall inspection:

- 1. Visual, from ground, sign of use _____
- 2. Cavity inspected confirmed roosting _____
- 3. Nesting attempted _____
- 4. Fledged young _____
- 5. Habitat assessment/general condition:
 - 5a. Damage to cavity or cavity start tree _____
 - 5b. Soil disturbance requiring remedial measures _____
 - 5c. Other habitat disturbance requiring remedial measures _____

B. Training Data:

Number of Unit Training Events _____
(Recorded at Range Control/Conducted at Recruitment Cluster location)

For each training event:

- 1. Date of training

2. Approximate duration of training
3. Type of training
4. Training activities (list activities conducted contained in Appendix 1)
5. Approximate number of soldiers involved
6. Approximate number and type of vehicles involved
7. Misc.

APPENDIX 2b

Active Cluster Inspection, & Monitoring Data

Cluster Number: _____

Results of inspection and monitoring.

Yes/No

- | | |
|-----------------------------------------------------------|-------|
| 1. Visual, from ground, sign of use | _____ |
| 2. Cavity inspected confirmed roosting | _____ |
| 3. Nesting attempted | _____ |
| 4. Fledged young | _____ |
| 5. Habitat assessment/general condition: | |
| 5a. Damage to cavity or cavity start tree | _____ |
| 5b. Soil disturbance requiring remedial measures | _____ |
| 5c. Other habitat disturbance requiring remedial measures | _____ |
| 6. Number of adults: _____ | |
| 7. Number of fledglings: _____ | |
| 8. Sex of birds: _____ | |

Appendix D: Professional biographies of installation and Army biologists contributing data and personnel communications for this biological assessment.

Professional Biographies

The following individuals are Army biologists who participated extensively in meetings between Department of Army and the U.S. Fish and Wildlife Service during development of the proposed revision to the 1994 "Management Guidelines for the RCW on Army Installations" and provided data summaries used in this biological assessment. Many of these individuals also reviewed early drafts of this biological assessment. Other individuals who assisted in preparation of this biological assessment are acknowledged in the Foreward of this assessment.

Michael Barron

Fort Benning, Georgia 1995-1996

Education: B.S., Zoology, Clemson University
 M.S., Wildlife Management, Auburn University

Prior to joining the Fort Benning Staff, Mr. Barron conducted surveys and monitoring of RCWs on Fort Benning for The Nature Conservancy during 1993-95. Currently Mr. Barron is employed by Fort Benning as a Wildlife Biologist responsible for the installation monitoring and banding programs.

Tim Beaty

Fort Stewart, Georgia 1977-96

Education: A.D. Abraham Baldwin Agricultural College
 B.A., Biology, Georgia Southern University

Mr. Beaty has held positions at Fort Stewart of Forest Technician, Biological Technician, and for the past 10 years has been Wildlife Biologist at the installation. In his position as Wildlife Biologist, Mr. Beaty is in charge of the installation endangered species program. He currently supervises two full-time biologists, two technicians, and six interns involved in endangered species management on the installation. Mr. Beaty is a member of the RCW Recovery Team.

Scott Bebb

Fort Bragg, North Carolina 1986-96

Education: B.S., Wildlife Resources, University of Idaho

Mr. Bebb has been employed at two Army installations during the past 10 years working in both endangered species and game management. He has 10 years experience in RCW management on Army lands. Mr. Bebb's other professional experience includes the Idaho Department of Fish and Game and U.S. Forest Service.

Thomas Brooks

Fort Benning, Georgia 1989-96

Education: B.S., Wildlife Science, Auburn University

Mr. Brooks was first employed at Fort Benning as a Biological Technician in 1989. Since 1989, Mr Brooks has been Wildlife Biologist and installation program manager for the red-cockaded woodpecker. As a professional biologist, Mr. Brooks has performed a variety of non-game and endangered species management functions including bird and small mammal surveys.

Timothy J. Hayden

U.S. Army Construction Engineering Research Laboratories 1991-96

Education: B.A., Biology, University of Missouri
B.J., Journalism, University of Missouri
M.A., Biology, University of Missouri

Mr. Hayden is author of this biological assessment. Mr. Hayden has conducted endangered species research for the Army since 1991. Field research activities have focused primarily on two endangered avian species occurring on Fort Hood, Texas. Prior to joining the Army, Mr. Hayden worked as a Research Associate with University of New Mexico on a five-year research study of the effects of a Department of Energy facility on raptor populations in southeastern New Mexico.

Erich L. Hoffman

Fort Bragg, North Carolina 1987-96

Education: B.S., Fisheries and Wildlife Science, North Carolina State University

Mr. Hoffman has 10 years experience managing and studying the RCW on Fort Bragg. He has also been involved in studying and monitoring other endangered species including the Saint Francis Satyr. His current position is Professional Wildlife Biologist with the Fort Bragg Endangered Species Branch.

Stephen D. Parris

Fort Polk, Louisiana 1984-96

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Mr. Parris began his professional career as Assistant Environmental Scientist at Argonne National Laboratory in 1978. From 1978-84, he worked as a biologist with the Army Corps of Engineers Waterways Experiment Station. Mr. Parris has been employed at Fort Polk since 1984 and is responsible for all phases of RCW field work and management on the installation. Mr. Parris is currently Senior Installation Ecologist and Program Manager for Endangered Species.

**Appendix E: RAMAS population analysis of Fort Bragg
reproductive data for the period 1989-90**

RAMAS population analysis of Fort Bragg reproductive data for the period 1989-90

The RCW PVA was run using RAMAS/METAPOP population viability analysis software (Akçakaya 1994). The population was modelled as a metapopulation consisting of two subpopulations, with population "UNA" = "unaffected" and population "AFF" = "affected" by disturbance. The values for the stage transition matrix were based on female survival estimates from the literature, and on fecundity estimates from the data summarized by Mobley, Carter and Clarke (unpublished data) on fledgling production per female in different disturbance regimes on Fort Bragg. This matrix had six stage categories: HY = hatch year females, SYB = second year breeders, SYH = second year helpers at the nest, SYF = second year floaters, ASYB = after-second-year breeders, and ASYF = after-second-year floaters. Sex ratio of fledglings was set at 42% female. The standard deviations of survival rates were set to 0.1 for HY survival and 0.05 for survival of other stage classes, while the standard deviations of the fecundities were set to five percent of the fecundity values of the UNA population. The parameters were calculated based on the assumption of a yearly post-breeding census.

The UNA population had an HY survival rate adjusted such that the dominant eigenvalue of the transition matrix was 1.03, i.e. the UNA population would increase at a rate of three percent per year in the absence of density-dependent population regulation. The AFF population had exactly the same transition matrix as the UNA population, except that the "local catastrophe" option of RAMAS/METAPOP was used to decrease the fecundity values of the AFF matrix to a fraction of the UNA fecundity values. This fraction, or "catastrophe multiplier," was set to 0.7079 to model the effect of Bivouac & Drop Zone disturbance, and to 0.8541 to model the effect of Impact & Danger Zone disturbance, based on the data from Mobley, Carter and Clarke (unpublished data).

It was assumed that there were 250 breeding females among the total 460 active clusters, this ratio being 0.5435. Fort Bragg's share of the maximum number of active clusters was assumed to be 436 clusters. Of these, 355 clusters would be protected under the proposed revision. Therefore the maximum number of unprotected (potentially affected) clusters on Fort Bragg will be $436 - 355 = 81$ clusters.

The proportion of clusters represented in the UNA vs. AFF subpopulations was allowed to vary. The total carrying capacity K_{TOT} of the Fort Bragg metapopulation was set to 436 x

0.5435 = 237 females. The carrying capacities K_{AFF} and K_{UNA} of each subpopulation were set to equal (the proportion of clusters assumed to be in each subpopulation) \times 237. Density dependence was set to the "ceiling" option.

Since there were 252 active clusters recorded on Fort Bragg in 1995, the total starting number of females, N_{TOT} , was set to $252 \times .5435 = 137$ females. The starting number of females in each subpopulation, N_{UNA} and N_{AFF} , were set in proportion to K_{UNA} and K_{AFF} , respectively. The initial stage distributions in each subpopulation were set to equal the values for the stable age distribution of the UNA stage transition matrix.

Dispersal was allowed between the UNA and AFF subpopulations, but only the HY stage class was allowed to disperse. The migration matrix was set such that the proportion of each year's HY females dispersing to a given subpopulation was equal to the proportion of clusters assumed to be in that subpopulation.

Environmental correlations between subpopulations were set to equal one, i.e. the subpopulations were assumed to share the same random fluctuations in environmental conditions. Environmental stochasticity was set to affect both fecundity and survival. Demographic stochasticity was also incorporated in the model.

Model Assumptions

In summary, this analysis makes the following assumptions based on published values or the best scientific information available:

- Growth rate of affected populations of three percent per year.
- Breeding female sex ratio of 0.42.
- Starting population of 137 females.
- Starting age distribution of females in each subpopulation was set to the stable age distribution for the UNA subpopulation
- Total carrying capacity of 237 females.
- Standart deviation of HY survival set at 0.1 for both affected and unaffected

subpopulations.

- Standard deviation of survival of all other age classes set at 0.05 for both affected and unaffected subpopulations.
- Standard deviation of fecundity set to five percent of the fecundity values of the undisturbed subpopulation.
- Dispersal allowed between affected and unaffected populations but only by HY age class.
- Environmental and demographic stochasticity was set equivalent for both affected and unaffected subpopulations.

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