United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
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In Reply Refer To:
02ETAR00-2015-F-0339

June 30, 2015

Mr. Brian L. Dosa
Directorate of Public Works
Department of the Army
U.S. Army Installation Management Command
Headquarters, U.S. Army Garrison, Fort Hood
Fort Hood, Texas 76544-5000

Dear Mr. Dosa:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion on the U.S. Department of Army's (Army) ongoing and proposed military training activities, Military Training Improvement Projects (MTIPs), prescribed burning, and wildfire events occurring on Fort Hood Military Installation, Fort Hood, Texas, and its effects on the federally listed golden-cheeked warbler (*Setophaga chrysoparia*)(GCWA) and black-capped vireo (*Vireo atricapilla*)(BCVI). This biological opinion addresses military and other activities occurring at Fort Hood over the next five years. The Army's letter requesting consultation was received on February 19, 2015.

This biological opinion has been prepared in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C 1531 et seq.)(Act). It is based on the Biological Assessment included with your letter initiating consultation, information provided by Fort Hood Natural Resource Management Branch (NRMB) staff, and other sources of information. A complete administrative record of this consultation is on file at the Service's Arlington, Texas, Ecological Services Field Office.

This biological opinion adds additional flexibility through an adaptive management approach which gives the Army the ability to manage project parameters within the guidelines set forth in the Incidental Take Statement. This document supersedes the prior biological opinions issued by the Service on December 1, 2010 and January 26, 2015.

Consultation History

December 1, 2010 The Service issued a non-jeopardy biological opinion (Service consultation number 21420-2010-F-0369) regarding ongoing activities and revisions to the Endangered Species Management Plan. Its 5-year term would expire December 1, 2015.

August 6, 2014 Service staff visited Fort Hood to discuss future coordination with NRMB staff regarding various needs, including potential reinitiation of consultation prior to the expiration of the 2010 biological opinion.

August 28, 2014 The Service received a request for and accepted reinitiation of formal consultation regarding potential effects to the GCWA resulting from the proposed reassignment of incidental take for wildfire events at Fort Hood within the December 1, 2010 biological opinion.

October – November 2014
Fort Hood requested additional take reassignment for infantry thinning projects in Land Group 1 from Land Groups 2-6. Exact figures were provided in November. Because of this additional request, a 30-day extension to complete the biological opinion was mutually agreed upon.

December 10, 2014 Service staff met with NRMB staff at Fort Hood to discuss ongoing reinitiation of consultation. Also discussed were potential contents of a new biological opinion to update the expiring 2010 biological opinion.

December 17, 2014 Draft biological opinion (21420-2010-F-0369-R001, for take reassignments) provided to Fort Hood.

January 6, 2015 NRMB staff met with Service staff at the Service's Arlington, Texas Ecological Services Field Office to discuss the contents of a biological assessment to initiate consultation to update the expiring December 2010 biological opinion.

January 26, 2015 Final biological opinion (reinitiation for take reassignments) provided to Fort Hood.

February 19, 2015 The Service received and accepted a request to initiate formal consultation and an accompanying biological assessment regarding ongoing military training activities, MTIPs, and potential wildfire events occurring on the Fort Hood Military Installation to update the expiring December 2010 biological opinion. Under the 135-day regulatory deadline, the Service would provide a final biological opinion no later than July 4, 2015.

May 6, 2015	Service staff met with NRMB staff at Fort Hood to discuss ongoing development of the biological opinion. Service staff also toured GCWA and BCVI habitats in the field at Fort Hood.
May 21, 2015	Service submitted draft biological opinion to the Army for review and comment.
June 9, 2015	Fort Hood responded to draft biological opinion; comments and suggestions to clarify and strengthen the document were incorporated into this final biological opinion.

BIOLOGICAL OPINION

Background

Fort Hood Military Installation (hereafter, Fort Hood) provides resources and training facilities for active and reserve units in support of the Army's mission. Fort Hood maintains facilities to support approximately 50,000 Soldiers. Following the discovery of the BCVI and GCWA at Fort Hood, the Army has consulted with the Service to address training impacts on the species from various projects. Since the first consultation in 1993, some areas of endangered species habitat have had training restrictions to minimize effects on the species. As research and conservation efforts have been implemented, and the estimated populations of the GCWA and BCVI have continued to grow, the area (known as "Core Habitat") has been reduced to allow additional flexibility. In 2005, the Core Habitat was reduced from 19,063 hectares (ha)(47,106 acres (ac)) to 3,861 ha (9,541 ac). Due to the success of endangered species management at Fort Hood, the Army has in coordination with the Service, eliminated the Core Habitat from the current Biological Assessment.

Summary of proposed actions

The action area of the proposed and ongoing actions is limited to the boundaries of Fort Hood. Training activities conducted at Fort Hood include maneuver exercises for units up to brigade level, live weapons firing, and aviation training. The proposed action consists of ongoing military training and other activities, land management, range improvements, and other associated activities to support the military mission, including endangered species management. Additionally, this opinion includes a section on adaptive management. Incorporating an adaptive management framework is intended to provide additional flexibility to the Army, and improve upon management and minimization techniques to endangered species.

Fort Hood's actions that may result in adverse effects to federally listed species considered in this biological opinion include: A. Military Training Improvement Projects (MTIP); B. Wildfire Events; C. Minimization and Conservation Measures; and D. Other Activities. Detailed descriptions of ongoing training activities can be found in Appendix A and examples of anticipated military training scenarios in Appendix C. The life of this biological opinion is five years from the date of signature.

I. Description of Proposed Action

A. Military Training Improvement Projects (MTIP)

Tank Trail and Hillside Access Trail (HAT) Improvements

Habitat modification for tank and hillside access trail (a.k.a. HAT) improvements will provide access and road conditions for wheeled and heavy tracked vehicles. Habitat modification will include vegetation removal associated with tank trail and roadbed improvements and erosion control. It is anticipated that habitat loss associated with tank trail improvements will be long-term; however, permanent loss is dependent upon the type of habitat impacted and the continued use or maintenance. Both tank and hillside access trails will require regular maintenance activities which may include vegetation trimming, erosion control, and ground stabilization.

Live-Fire Range Improvements

Habitat modification in live-fire ranges will include vegetation clearing for target arrays and associated facilities and to maintain weapon lines-of-site in proximity to target arrays. These improvement projects will typically result in long-term loss of habitat as long as the range facilities are in use or maintained. Human activity in proximity to modified habitat will consist of infrequent visits by range maintenance personnel to maintain desired vegetation conditions and to repair and replace targets and associated range facilities.

Habitat Thinning for Dismounted Soldier Access

Habitat thinning (a.k.a. tunneling) is an action that improves Soldier access and training opportunities specifically in habitat that contains a thick vegetative understory. This action is typically accomplished through the partial thinning and pruning of understory vegetation including Ashe juniper (*Juniperus ashei*) with machine driven tools (e.g., Bobcat, skid steer, or other types of cutting heads) or hand tools (e.g., chainsaws, loppers, etc.). Thinning and pruning will typically remove the lower limbs of the overstory vegetation up to a height of 3 meters (9.8 feet) and some rooted stems less than 12.7-centimeter (5.0 inches) diameter at breast height (DBH). Junipers up to a 25.4-centimeter (10.0 inches) DBH may be removed on a case-by-case basis following the review and approval of NRMB staff. Pruning according to this method will be used to create an intertwining network of openings (i.e., tunnels) through which human traffic can pass on foot, while retaining overhead and horizontal vegetation for concealment. Between tunnels, junipers less than 12.7-centimeter (5.0 inches) DBH will remain intact to ensure future stand (overstory) replacement and a mixed age class within GCWA habitat. Thinning and pruning widths will vary in size; however, they typically will not exceed 3 meters (9.8 feet). Widths less than 3 meters (9.8 feet) are used to deter access for wheeled or tracked vehicles. No canopy cover above 3 meters (9.8 feet) will be removed. Canopy cover should not be reduced more than 10% of pre-alteration conditions. No pushing with blades, dozers, or any heavy equipment that creates intentional ground disturbance will be allowed.

Tactical Low-water Crossings

Hardened low-water crossings for military vehicle passage are required to reduce erosion potential, avoid vehicle damage, and maintain water quality. Fort Hood anticipates that tactical low-water crossing construction and maintenance during the 2015 to 2020 time period may require vegetative clearing in endangered species habitat. It is anticipated this habitat modification is a long-term impact and is irreversible as long as the tactical low-water crossing structure is in place.

Heavy Brigade Combat Team (HBCT) Maneuver Corridors

As outlined in the Army Training Guidelines (TC-25-1), “missionscapes” provide the structure and distribution of vegetative features that support required training mission activities. For mechanized units, the emphasis is on creating adequate transit space for maneuver across the landscape and freedom of use of weapons systems. Enhancement of maneuver corridors on the west side training ranges on Fort Hood will require clearing of woody vegetation sufficient to allow passage of a minimum of 2-4 vehicles to Heavy Brigade Combat Teams up to 150 vehicles in formations prescribed under current Army tactical doctrine. The purpose of these lanes is to provide free passage of vehicles, weapon lines-of-sight, and free movement of weapons systems (e.g., full 360º rotation of M1A2 tank gun turret systems).

Habitat modification will include clearing or widening of transit lanes of all woody vegetation to an approximate width of 12.19 meters (40 feet). This clearing may include both GCWA and BCVI habitat. Lanes will be created predominantly on level to moderate slopes. Steep slope habitats on the west side would not be suitable for off-road mechanized maneuver so transit lanes typically would not be created through habitat on these steep slopes. It is anticipated that some level of continued vegetation maintenance will be required over time to maintain these maneuver lanes free of woody vegetation. However, vehicle transit itself will also serve to maintain these lanes. Regeneration of BCVI and GCWA habitat will be dependent on intensity of mechanized vehicle use and vegetation maintenance activities. It is anticipated that shrubby edges of lanes will be suitable for some level of BCVI occupancy; however, the anticipated extent of occupancy is unknown.

Fort Hood anticipates that overall mechanized training intensity on west side ranges will not significantly increase above historical levels. However, habitat modification for HBCT maneuver corridors will allow training activity to be more broadly distributed across the landscape. This will likely result in a net increase in training frequency at some locations and a net decrease at other locations.

To fulfill critical military mission objectives, modifications of proposed MTIPs may be required; and therefore, an adaptive management approach (discussed below) will be implemented when necessary.

B. Wildfire Events

Wildfire events addressed in this biological opinion refer to human-induced fires originating from training-related activities and/or other authorized activities on Fort Hood. This does not include natural (e.g., lightning strikes), illegal (e.g., arson), or criminally negligent sources of fire. Wildfire events can be frequent on Fort Hood, largely due to live-fire training exercises. In order to quantify a prediction of anticipated wildfire events that may occur on Fort Hood for the time period from 2015 through 2020, a review was conducted by NRMB staff of the historical annual averages of wildfires that occurred in GCWA and BCVI habitats across the installation from 1996 to present. Even though the intensity and severity of wildfires are difficult to predict, Fort Hood employs minimization measures to combat the occurrence of such events (discussed below in the Minimization and Conservation Measures section). Prescribed fire is a tool used both to improve habitat quality for wildlife at Fort Hood and to reduce fuel load to prevent large-scale wildfires. Prescribed fire has an overall beneficial effect to the BCVI and GCWA, it helps protect habitat from wildfires, and it is not expected to result in any permanent habitat loss. Fort Hood will document and report annually to the Service the total area and spatial configuration of any impacts to endangered species habitat following a planned (prescribed fire) or wildfire event.

C. Minimization and Conservation Measures

Conservation measures are actions that benefit or promote the recovery of a listed species. These actions will be taken by Fort Hood and serve to avoid and minimize project effects on listed species. Fort Hood commits to the following avoidance and minimization measures to reduce impacts to the GCWA and BCVI:

<u>Site Selection for Habitat Modification</u>

Army training needs are identified and approved by III Corps G3, Garrison Commander, and/or Directorate of Plans, Training, Mobilization, and Security (DPTMS) and executed by DPTMS. Once the needs have been identified, DPTMS staff will coordinate with Fort Hood NRMB staff to determine required MTIPs and to select sites that best suit requirements of the training mission while minimizing impacts to endangered species habitat. This approach seeks to meet mission training objectives and maintain high quality GCWA and BCVI habitat by prioritizing habitat modification projects in lower-quality habitats or non-endangered species habitat whenever possible.

During the project planning phase, conservation measures will be included in the project description. These measures will serve as guidelines for avoidance and/or minimization of impacts and best management practices during the project implementation phase. Adherence to the measures described below may avoid and/or minimize potential effects identified in this biological opinion.

1) Habitat disturbance and project implementation will be scheduled from August 15 to March 15 in GCWA and BCVI habitats when these species are not actively nesting in the action area.

2) To reduce unnecessary negative environmental impacts, projects that involve habitat modification shall consider and adopt the least invasive technique(s) that can feasibly provide the desired project objective while meeting mission requirements, available funding, and time constraints.

3) All construction trails, equipment storage areas, and equipment staging areas associated with project implementation will be located in non-endangered species habitat areas, when possible. If not practical, then the impacts will be considered part of the MTIP take category.

4) To prevent the spread of oak wilt disease (*Ceratocystis fagacearum*), damage to Spanish oak (*Quercus buckleyi*) and plateau live-oak (*Q. fusiformis*) trees should be minimized. When possible, hand-cutting techniques will be used rather than machine-cutting techniques during the winter months and extended hot periods in mid- to late summer.

5) No borrow areas will be constructed in GCWA or BCVI habitats.

6) Fort Hood will continue to implement the monitoring and research program for the GCWA and BCVI including:

    a. Documenting population trends and assessing population status of the GCWA and BCVI.
    b. Evaluating the relationship between habitat quality and GCWA and BCVI abundance and productivity.
    c. The integrity of data collected from existing GCWA and BCVI productivity, predation, and population trend studies will be maintained.
    d. Continuing to generate color sequences for range-wide color banding of GCWA and BCVI through cooperation with the United States Geological Survey (USGS).

7) Fort Hood will manage vegetation clearing projects to minimize fire hazard from slash and avoid impacts to residual stands or endangered species habitat.

    a. Mulching slash piles onsite is currently the preferred method of vegetation clearing; however, slash materials can be removed from the project area and either mulched in non-endangered species habitat, burned, or transported to the Fort Hood landfill. However, alternative disposal techniques and programs will be explored as they become available. All generated slash materials must be removed or mulched within one year of the commencement of the project. If slash material is relocated, it must be placed a minimum distance of approximately 46 meters (50 yards) from GCWA or BCVI habitat and any existing firebreaks. The mulching, burning, or removal of slash will reduce the danger of ladder fuels in the event of wildfire, will return nutrients to the soil and reduce erosion (if mulched in place), and will reduce the habitat niche for Texas rat snakes (*Pantherophis lindheimeri*), a major predator of GCWA and BCVI nests which thrive in slash piles. On Fort Hood, it has been observed that the Texas rat snake, along with a variety of other snakes, will inhabit a slash pile within 48 hours of its creation (Sperry and Weatherhead 2010). All burning of slash piles will occur only under the direct supervision of Directorate of Emergency Services (DES) Fire and Emergency Services.

b. Preventative measures that minimize soil loss after vegetation removal will be incorporated into the design of each project. Examples of these measures include seeding with native herbaceous species, placement of water bars on slopes, and using waste material in gullies, if appropriate and where applicable.
c. All MTIPs will include the approval of the Garrison Commander and will be reviewed and coordinated with the NRMB for execution. Early project coordination will help ensure avoidance or minimization to GCWA and BCVI habitats. This action supports the overall objectives of the Integrated Natural Resources Management Plan, FY14-18 (III Corps and Fort Hood 2014)(INRMP), of which the Endangered Species Management Plan, FY11-16 (Hammer and Hayden 2011)(ESMP) is a part.

8) Prescribed burning will be used to protect and maintain GCWA and BCVI habitat and support ecosystem management principles.

a. Prescribed burning will occur under the supervision of the DES Fire and Emergency Services. All prescribed burns should be in line with and support the overall objectives of the INRMP. The DES Fire and Emergency Services Fire Chief ensures that all personnel acting as wildland firefighters are trained to National Wildland Coordinating Group standards and maintains records of all personnel qualifications.
b. Prescribed fire will be used to the maximum extent possible to reduce fuel loads near critical or sensitive areas.
c. Prescribed fire will be used to maintain prairie sites and to inhibit the development of pure Ashe juniper stands.
d. Fire is considered to be a low-cost, non-invasive option to maintain the desired state of an ecosystem.
e. If fuel loads allow, limited use of prescribed fire may be utilized within BCVI habitats outside the nesting season to maintain early successional stage of growth necessary to the species.

9) Fort Hood will continue to monitor the quality and quantity of endangered species habitat by conducting the following:

a. Use helicopter over-flights, when available, to monitor endangered species habitat, oak wilt centers, and assess the distribution or disturbances of feral hogs (*Sus scrofa*).
b. Change detection imagery will be used to evaluate habitat trends every five years or when available. Annual mapping and ground truth efforts will be completed in order to enhance and update endangered species information available on the installation. DPTMS staff will coordinate with the Fort Hood NRMB staff to determine required MTIPs and to select sites that best suit requirements of the training mission while minimizing impact to endangered species habitat.
c. Maintaining adequate natural resources law enforcement presence to effectively monitor land use and enforce recreational off-road vehicle restrictions.
d. Developing and maintaining a current map that identifies and prioritizes oak wilt centers, emphasizing locations within endangered species habitat.

e. Investigating the effects of oak wilt on GCWA habitat.

10) Fort Hood will continue to incorporate preventative measures to reduce the risk of wildfire events. Fire prevention and response efforts will be increased by:

a. Coordinating the decision to approve/disapprove Range Condition Red waivers between the DES Fire Department, DPW-NRMB and DPTMS Range.
b. Maintaining and upgrading fire-fighting capabilities including ground and aerial support, subject to the availability of funds.

11) Fort Hood will continue to restrict the use of motorized off-road recreational vehicles in endangered species habitat.

12) Fort Hood will document and report annually to the Service the total area and spatial configuration of any impacts to GCWA and BCVI habitat, including the adaptive management provisions.

Adaptive Management

To fulfill critical military mission objectives, modifications of proposed MTIPs, wildfire response, and training activities may be required. Any modifications are likely to be infrequent and would not result in any additional effects not addressed in this opinion, or result in incidental take not authorized in this opinion. In order to adjust to uncertainties in project planning which can arise from a variety of factors, such as a change in Army mission objectives, control of management actions, errors in measurement and sampling, flux in available resources, environmental variability, or limited understanding of the ecosystem itself, adaptive management should be used as a iterative process that can enhance understanding and management over time (Williams et al. 2007). Simply put, adaptive management is an on-going cyclic approach that can improve resource management by learning while doing (Figure 1). When utilizing this method several alternative management approaches can be designed, implemented, and tested. Often this is a multiple iteration process that can strengthen the understanding of the resources and ecological processes thus enhancing the management and the adaptive process itself. Any work that follows this method should be formulated to work within the allotted endangered species incidental take authorized within this biological opinion. Any activities that may result in incidental take beyond what is indicated in this biological opinion or that could result in effects to listed species not considered in this opinion will be discussed with the Service, prior to the action, to determine if reinitiation of consultation is necessary. When these activities occur they will be documented and reported to the Service within the required annual report or directed otherwise.

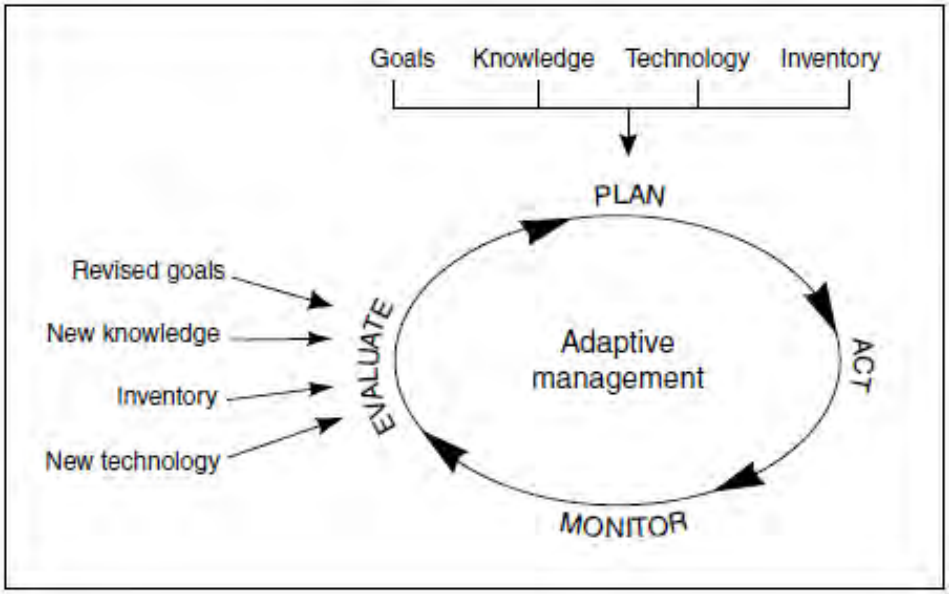

Figure 1. The adaptive management cycle (Stankey et al. 2005).

D. Other Activities

Prescribed Fire

Fire plays an important role in management of endangered species habitat on Fort Hood. During extremely hot and dry conditions in late February 1996, approximately 2,728 ha (6,741 ac) of endangered species habitat were burned by wildfires on Fort Hood. This included about 620 ha (1,532 ac) of BCVI habitat and 2,108 ha (5,209 ac) of GCWA habitat. New fire protection policies have been implemented on Fort Hood as a result of the 1996 fires and consultation with the Service (Service 2005). Most prescribed burning activities focus on GCWA habitat protection (reduction of fuels and ignition paths around habitat). Reduction of fuel loads mitigates the threat of crown-fire damage in GCWA habitat. Prescribed burning activities provide direct support for the military training mission because units are able to fire weapon systems without interruption (i.e., reduction of "cease fire" orders due to wildfire ignition). Prescribed burns are managed through the Fort Hood NRMB. Fire break maintenance is performed on 135 kilometers (84 miles) of line. Fire breaks are designed to protect GCWA habitat and facilitate fire suppression in the event of wildfire. Other objectives of the installation's prescribed fire program are to reduce encroachment of Ashe juniper in all range sites and maneuver training sites and grasslands, to improve vegetation composition, maintain essential early vegetative succession stage in BCVI habitats, and to improve wildlife habitats.

Brush piles have been left on Fort Hood from previous land management activities conducted by Range Operations, Integrated Training Area Management program (ITAM), the Directorate of Public Works, and other entities. These piles are flammable and constitute a fire hazard near GCWA habitat because they provide ladder fuels for fire to move into habitat crowns, and they are a firebrand source during wildfires. Brush piles can be managed either by mulching them in place or removing them from endangered species habitat and mulched or burned.

Juniper Management

On Fort Hood, Ashe juniper management outside of GCWA habitat is carried out in several ways. Woody species encroachment into grasslands used for military maneuver is primarily controlled with prescribed burning or cutting. In some training areas juniper has been hand-cut under a contract with the Natural Resources Conservation Service. Juniper removal to enhance maneuver capabilities is conducted under the ITAM Land Sustainment Management Plan dated April 2009. In some locations, juniper encroachment into BCVI habitat has been treated with tree shears. Unlike past efforts where non-GCWA habitat areas were cleared using heavy equipment (i.e., bulldozers), current efforts are focused on the use of less invasive techniques. All control efforts and contracts are coordinated through the Fort Hood NRMB to avoid impact on GCWA habitat. Juniper Management does not refer to training-related manipulation of juniper, such as habitat thinning for dismounted soldier access.

Cattle Grazing

Cattle grazing is permitted on Fort Hood under a lease agreement with the Central Texas Cattlemen's Association. Stocking rate is set at 2,000 animal units for the 5-year term of the lease. Grazing is deferred or stocking rate is reduced where forage production fails to meet thresholds that allow for training impacts and land management practices such as prescribed burning. The lease agreement requires the lessee not to impact endangered species, historical, archaeological, architectural, or other cultural features on the installation, and requires compliance with local, state, and Federal water pollution regulations.

Cowbird Management

Brown-headed cowbird removal is conducted to reduce the incidence of nest parasitism on endangered songbirds (Cornelius et al. 2007). The objective of the control program is to maintain the incidence of cowbird parasitism of BCVI nests below 10 % annually, averaged over five-year periods. This program implements trapping and shooting activities that target feeding concentrations of cowbirds throughout the installation and cowbird individuals in endangered species nesting habitat. Summers and Norman (2004) provide details on the implementation of the control program.

Recreation

The post is open to public hunting and fishing. Access is regulated by Range Operations and managed by the Directorate of Family and Morale, Welfare and Recreation and the NRMB. Over 80,500 ha (198,920 ac) are managed for fish and wildlife, including 100 surface ha (247 surface ac) of lakes and ponds, 88.5 kilometers (55 miles) of rivers and permanent streams, and 85.3 kilometers (53 miles) of shoreline access to Belton Lake. In recent years, the installation has provided 90,000 fisherman-days and 45,000 hunter-days annually. White-tailed deer, wild turkey, migratory waterfowl, northern bobwhite, and mourning dove are hunted during designated times throughout the year. Deer and turkey hunts are carefully controlled. Small game hunting with shotgun is available in accordance with State of Texas seasons and bag limits.

Various low-impact outdoor recreation activities take place at the Belton Lake Outdoor Recreation Area located adjacent to TA 36. These include a swimming beach, camping, boating, trail bicycling, and cottage use. Boy Scout Camps are located in TA 36. Hiking and nature observation activities are also allowed on many parts of the installation and are coordinated through Range Operations. Mountain bike riding is restricted to a designated trail system at Belton Lake Outdoor Recreation Area. Off-road recreational vehicles such as trucks, sand-rails, dune buggies, etc. are not permitted anywhere on the installation; however, all-terrain vehicles (ATV) such as quad-runners, three wheelers, and motorcycles can be used in the ATV designated area west of TA111.

Population Monitoring and Research Programs

Populations and habitats of the GCWA and BCVI on Fort Hood are monitored and managed according to the INRMP and ESMP developed by III Corps and Fort Hood. These plans are currently being updated. The goal of these action plans is to implement endangered species conservation actions to ensure survival of the species on Fort Hood while maintaining Army mission readiness in a manner consistent with Army and Federal environmental regulations. GCWA and BCVI population inventory and monitoring and habitat management and protection have been conducted on Fort Hood since the species were listed as endangered (Pekins 2006).

As a part of the endangered species population monitoring program, Fort Hood employs the use of helicopter over-flights to observe the effects of training activity in endangered species habitat, control feral hogs, and monitor the presence and spread of oak wilt. Fort Hood's use of helicopter surveillance is an effective means of monitoring the available habitat, as well as providing aerial support for fighting fires that threaten habitat.

II. Status of the Species

The current list of federally threatened, endangered, and candidate species that are known to occur, or have been documented in Bell and Coryell Counties is presented in Table 1.

Table 1. Federally listed species known to occur in Bell and Coryell Counties, Texas.

Common Name	Scientific Name	Status	County
black-capped vireo	*Vireo atricapilla*	Endangered	Bell, Coryell
golden-cheeked warbler	*Setophaga chrysoparia*	Endangered	Bell, Coryell
whooping crane	*Grus americana*	Endangered	Bell, Coryell
Salado salamander	*Eurycea chisholmensis*	Threatened	Bell
Texas fawnsfoot	*Truncilla macrodon*	Candidate	Bell, Coryell
smooth pimpleback	*Quadrula houstonensis*	Candidate	Bell, Coryell

Currently, there are no known populations of the Salado salamander on Fort Hood. Additionally, habitat for this species does not occur within the action area.

Whooping cranes are transient on Fort Hood with documented occurrences along the shoreline and flood plain of Belton Lake. The last sighting of whooping cranes was in March 2010, when three adult cranes were observed foraging in a wetland area on the installation. In the event that this species is observed on the installation, DPTMS, Range Operations Branch will be notified and training activities will be suspended in proximity to whooping cranes until they have departed installation lands.

Candidate species are not afforded protection under the Act. However, we recommend they be considered during project planning. Recommendations to address the status and distribution of the Texas fawnsfoot and smooth pimpleback at Fort Hood are included within the Conservation Recommendations section.

Under the proposed action, the current protection and reporting policies for these species would remain in effect. For these reasons, it is anticipated that the proposed action is likely to have "no effect" on the Salado salamander, or whooping crane, and therefore these species are not considered further in this biological opinion.

Two federally listed endangered species that do occur in the action area and that may be affected by the proposed action are the BCVI and GCWA.

Black-capped Vireo

For more specific information regarding the BCVI, please refer to the *Black-capped Vireo Recovery Plan* (Service 1991) and *Black-capped Vireo (Vireo atricapilla) 5-year Review: Summary and Evaluation* (Service 2007).

Species Description and Life History

The BCVI was federally listed as endangered on October 6, 1987 (52 FR 37420-37423). No critical habitat is designated for this species. The BCVI is a 11.4 centimeter (4.5 inch) long, insectivorous songbird. Mature males are olive green above and white below with faint greenish-yellow flanks. The crown and upper half of the head are black with a conspicuous white eye-ring. The iris is brownish-red and the bill is black. Mature females are generally duller in color than males, and have a dark slate gray head (Service 1991).

Although BCVI habitat throughout Texas is quite variable with respect to plant species, soils, and rainfall, habitat types generally have a similar overall appearance. BCVIs typically inhabit patchy shrublands and open woodlands with a distinctive patchy structure. The shrub vegetation generally extends from the ground to about 1.8 meters (six feet) above ground and covers about 30 to 60% of the total area. In the Edwards Plateau, common plants in BCVI habitat include Texas oak (*Quercus texana*), shin oak (*Q. sinuata*), live oak (*Q. virginiana* & *Q. fusiformis*), mountain laurel (*Sophora secundiflora*), sumac (*Rhus*. sp), redbud (*Cercis canadensis* var. *texana*), Texas persimmon (*Diospyros texana*), mesquite (*Prosopis glandulosa*), and agarita (*Mahonia trifoliata*). In the Edwards Plateau, suitable habitat for the BCVI is early successional scrub/shrub created by fire or woodland clearing. BCVIs are opportunistic foragers; however, they prefer insect larvae and seeds (Grzybowski 1995).

Male BCVIs arrive in central Texas in late March and begin to establish breeding territories, which they defend against other males by singing. Females arrive a few days later, but are more difficult to detect in the dense brushy habitat. Three to four eggs are generally incubated in April, and unless there is a second nesting attempt, nestlings fledge in May to early June. By mid-September, BCVIs have generally migrated south, beginning with females and young and followed by adult males (Graber 1957, Oberholser 1974). BCVIs breed from Oklahoma south through central Texas to the Edwards Plateau, then south and west to central Coahuila, Nuevo Leon, and southwestern Tamaulipas, Mexico and they winter on the Pacific slope of Mexico.

Historical and Current Distribution

The historical breeding distribution of the BCVI included an area stretching from Kansas southward through central Oklahoma and through west-central Texas, with a southern limit in central Coahuila, Mexico. In 1987, the known breeding population was distributed across 21 counties in Texas, four counties in Oklahoma and in Coahuila, Mexico. Survey efforts since 2005 have confirmed that there are occupied breeding habitats in 35 counties in Texas and three counties in Oklahoma (Service, unpublished). Current information from Mexico is lacking. Since listing, cumulatively, breeding populations have been documented in 49 Texas counties, six Oklahoma counties and three Mexican states. According to surveys, approximately 62% of the known population in the breeding range is found on four well-surveyed areas– Fort Hood Military Reservation (Texas), Kerr Wildlife Management Area (Texas), Wichita Mountains Wildlife Refuge (Oklahoma), and Fort Sill Military Reservation (Oklahoma) (Service, unpublished). Together, these facilities cover approximately 162,000 ha (400,000 ac) – an area representing only 1% of the total area of rangeland in the Texas/Oklahoma range of the species (Wilkins et al. 2006). The action area, Fort Hood, currently contains the largest known population of the species.

The current BCVI breeding range no longer appears to extend northward past central Oklahoma, and the species has not been documented in Kansas since the 1950s. The current section 7 range for the BCVI includes eight counties in Oklahoma and 67 counties in Texas. The discovery of breeding populations of the BCVI in southern Coahuila, Nuevo Leon, and Tamaulipas significantly extends their breeding range farther south than was known at the time of listing.

Reasons for Decline and Threats to Survival

At the time of listing, the identified major threats to the BCVI included habitat loss through land use conversion, grazing and browsing by domestic and wild herbivores, and brood parasitism by brown-headed cowbirds. The threat of vegetative succession, originally considered minor, appears to have been underestimated at the time of listing, although the extent of the effects on the BCVI is not known. Historically, naturally occurring wildfires probably maintained a mosaic of suitable habitat throughout the BCVI's range. The threat of predation, also originally considered minor, appears to be of more importance than originally anticipated. Depredation rates of monitored nests at Fort Hood rose steadily between 1997 and 2005 then stabilized slightly above 50% afterward (Cimprich and Comolli 2009). At Fort Hood, brown-headed cowbird removal shows a strong negative correlation with overall parasitism rate. In 2010, Fort Hood had an overall parasitism rate of approximately 12%, up from a low of 2% in 2003

(Cimprich and Comolli 2010). Following the cessation of cowbird trapping on the west range of Fort Hood in 2006, parasitism has increased by more than 4 times the original rate (Cimprich and Comolli 2009), but then decreased to less than three times the original rate in 2010 (Cimprich and Comolli 2010). During this same time, parasitism on the east range, where trapping still occurs, has remained stable. On average, cattle densities throughout the BCVI's Texas range have shown moderate decreases since 1997, while several areas currently supporting large bird populations, such as Coryell, Edwards, and Mason Counties, show moderate increases in cattle densities (Wilkins et al. 2006, USDA 2009). On average, goat densities throughout the BCVI's Texas range have been steadily decreasing since the BCVI was listed in 1987 (Wilkins et al. 2006, USDA 2009). While the relative importance of individual threats appears to have changed since listing, these remain the primary threats to the species.

Range-wide Survival and Recovery Needs

The *Black-capped Vireo Recovery Plan* (Service 1991) provides preliminary criteria that would meet the interim objective of downlisting the species to threatened status. One of these criteria requires at least one viable BCVI population in four Texas regions and one each in Oklahoma and Mexico (Service 1991, Service 2013). The Service's 5-year status review of the BCVI found the Recovery Plan to be in need of revision and recommended the species be downlisted to threatened status (Service 2007).

Protection and management of occupied habitat and minimization of further degradation, development, or environmental modification of unoccupied habitat are necessary to provide for the survival of the species. Habitat protection must include elements of both breeding and non-breeding habitat (i.e., associated uplands and migration corridors). As habitat is created through silviculture practices and military use and existing habitat is protected the BCVI's ability to expand its distribution and numbers will enhance. Efforts to increase numbers of existing viable populations are critical to the survival and recovery of this species, particularly when rapidly expanding urbanization continues to result in the loss of prime breeding habitat. Due to the nature of early successional shrub growth preferred by BCVIs, fire should be used to manage, enhance, and create BCVI breeding habitat, as appropriate. Continued efforts to control cowbirds are necessary in areas where parasitism rates are shown to be excessive (> 30%)(Smith et al. 2013).

Golden-cheeked Warbler

For more specific information regarding the GCWA, please refer to the *Golden-cheeked warbler Recovery Plan* (Service 1992) and *Golden-cheeked warbler (Setophaga chrysoparia) 5-year Review: Summary and Evaluation* (Service 2014).

Species Description and Life History

The GCWA was emergency listed as endangered on May 4, 1990 (55 FR 18844). The final rule listing the species was published on December 27, 1990 (55 FR 53160). No critical habitat is designated for this species.

The GCWA is a small, insectivorous songbird, 11.4 centimeters (4.5 inches) to 12.7 centimeters (5 inches) long with a wingspan of approximately 20 centimeters (8 inches)(Pulich 1965 and 1976, Oberholser 1974). GCWAs breed exclusively in the mixed Ashe juniper/deciduous woodlands of the central Texas Hill Country west and north of the Balcones Fault (Pulich 1976). GCWAs require the shredding bark produced by mature Ashe junipers for nest material. Typical deciduous woody species include Texas oak (*Quercus buckleyi*), Lacey oak (*Q. glaucoides*), live oak (*Q. fusiformis*), Texas ash (*Frazinus texensis*), cedar elm (*Ulmus crassifolia*), hackberry (*Celtis occidentalis*), bigtooth maple (*Acer grandidentatum*), sycamore (*Platanus occidentalis*), Arizona walnut (*Juglans major*), and pecan (*Carya illinoinensis*) (Pulich 1976, Ladd 1985, Wahl et al. 1990). Breeding and nesting GCWAs feed primarily on insects, spiders, and other arthropods found in Ashe junipers and associated deciduous tree species (Pulich 1976).

Male GCWAs arrive in central Texas around March 1st and begin to establish breeding territories, which they defend against other males by singing from visible perches within their territories. Females arrive a few days later, but are more difficult to detect in the dense woodland habitat (Pulich 1976). Three to five eggs are generally incubated in April, and unless there additional nesting attempts, nestlings fledge in May to early June (Pulich 1976). If there is a second nesting attempt, it is typically in mid-May with nestlings fledging in late June to early July (Pulich 1976). By late July, GCWAs begin their migration south (Chapman 1907, Simmons 1924). GCWAs winter in the highland pine-oak woodlands of southern Mexico and northern Central America (Kroll 1980).

Historical and Current Distribution

The GCWA's entire breeding range occurs on the Edwards Plateau and Lampasas Cut Plain of central Texas. GCWAs have been confirmed in 39 counties: Bandera, Bell, Bexar, Blanco, Bosque, Burnet, Comal, Coryell, Dallas, Eastland, Edwards, Erath, Gillespie, Hamilton, Hays, Hill, Hood, Jack, Johnson, Kendall, Kerr, Kimble, Kinney, Lampasas, Llano, Mason, McLennan, Medina, Menard, Palo Pinto, Real, San Saba, Somervell, Stephens, Tom Green, Travis, Uvalde, Williamson, and Young. However, many of the counties where it is known to occur, now or in the past, have only small amounts of suitable habitat (Pulich 1976, Service 1996, Lasley et al. 1997). Diamond (2007) estimated that the amount of suitable GCWA habitat across the species' range was approximately 4.2 million ac (ac), much of this habitat occurring on private lands. As a result, the population status for the GCWA on private lands remains undocumented throughout major portions of the breeding range.

Reasons for Decline and Threats to Survival

Before 1990, the primary reason for GCWA habitat loss was juniper clearing to improve conditions for livestock grazing. Since then, habitat loss has occurred as suburban developments spread into prime GCWA habitat. Groce et al. (2010) summarized the rates of expected human population growth within the range of the GCWA and found by 2030 the growth rate ranges from 17 percent around the Dallas-Fort Worth area to over 164 percent around San Antonio. As the human population continues to increase, so do associated roads, single and multi-family residences, and infrastructure, resulting in continued habitat destruction, fragmentation, and increased edge effects (Groce et al. 2010).

Fragmentation is the reduction of large blocks of habitat into several smaller patches. While GCWAs have been found to be reproductively successful in small patches of habitat (<50 ac), there is an increased likelihood of occupancy and abundance as patch size increases (Coldren 1998, Butcher et al. 2010, DeBoer and Diamond 2006). Increases in pairing and territory success are also correlated with increasing patch size (Arnold et al. 1996, Coldren 1998, Butcher et al. 2010). In addition, while some studies have suggested that small patches that occur close to larger patches are likely to be occupied by GCWAs, the long-term survival and recovery of the GCWA is dependent on maintaining the larger patches (Coldren 1998, Peterson 2001, The Nature Conservancy [TNC] 2002).

As GCWA habitat fragmentation increases the amount of GCWA habitat edge, where two or more different vegetation types meet, also increases. For the GCWA edge is where woodland becomes shrubland, grassland, a subdivision, etc., and depending on the type of edge, it can act as a barrier for dispersal; act as a territory boundary; favor certain predators; increase nest predation; and reduce reproductive output (Johnston 2006, Arnold et al. 1996). Canopy breaks (the distance from the top of one tree to another) as little as 36 feet have been shown to be barriers to GCWA movement (Coldren 1998). Territory boundaries have not only been shown to stop at edges, but GCWAs are more often farther from habitat edges (Beardmore 1994, DeBoer and Diamond 2006, Sperry 2007).

Other threats to GCWAs include the clearing of deciduous oaks upon which the GCWA forage, oak wilt infection in trees, nest parasitism by brown headed cowbirds (Engels and Sexton 1994), drought, fire, stress associated with migration, competition with other avian species, and particularly, loss of habitat from urbanization (Ladd and Gass 1999). Human activities have eliminated GCWA habitat throughout their range, particularly areas associated with the I-35 corridor between the Austin and San Antonio metropolitan areas.

Range-wide Survival and Recovery Needs

The recovery strategy outlined in the *Golden-cheeked Warbler Recovery Plan* (Service 1992), which is being revised, divides the breeding range of the GCWA into eight regions, or units, and calls for the protection of sufficient habitat to support at least one self-sustaining population in each unit. These recovery units were delineated based primarily on watershed, vegetation, and geologic boundaries (Service 1992).

Based on the *Golden-cheeked Warbler Recovery Plan* (Service 1992), and the 2014 Five-Year Review (Service 2014), protection and management of occupied habitat and minimization of degradation, development, or environmental modification of unoccupied habitat necessary for buffering nesting habitat are necessary to provide for the survival of the species. Habitat protection must include elements of both breeding and non-breeding habitat (i.e., associated uplands and migration corridors). Current and future efforts to create new and protect existing habitat will enhance the GCWA's ability to expand in distribution and numbers. Efforts, such as land acquisition and conservation easements, to protect existing viable populations is critical to the survival and recovery of this species, particularly when rapidly expanding urbanization continues to result in the loss of prime breeding habitat.

Several state and federally owned lands occur within the breeding range of the GCWA, but the overriding majority of the species' breeding range occurs on private lands that have been either occasionally or never surveyed. Currently there are five large GCWA populations receiving some degree of protection: those at the Balcones Canyonlands Preserve in Travis County; the nearby Balcones Canyonlands National Wildlife Refuge in Travis, Burnet, and Williamson counties; Camp Bullis Military Installation and TPWD's Government Canyon State Natural Area in Bexar County; and at Fort Hood in Bell and Coryell counties. There are also several conservation banks (CB) whose goal is to protect GCWA habitat (acreages represent the total if the entire bank of credits are sold): Hickory Pass CB (3,003 ac) in Burnet County, Bandera Corridor CB (6,946 ac) in Bandera and Real counties, Clearwater CB (21,305 ac) in Burnet County, and Festina Lente CB (1,147 ac) in Bandera County.

III. Environmental Baseline

A. Description of the action area

Fort Hood encompasses approximately 88,387 ha (218,410 ac) in the Lampasas Cut Plains physiographic region of the Edwards Plateau in Bell and Coryell Counties, Texas. Geologically, the installation is in a karst landscape (Klemt et al. 1975, Reddell 2001) characterized by Cretaceous-age limestone mesas and canyons with rock outcrops, cliffs, sinkholes, caves, springs, and rock shelters. Wide to narrow valleys separate the mesas. Elevation ranges from 180-375 meters (585 to 1218 feet) above sea level. High elevations occur on mesa ridges that span the north-central portion of the installation in a west-east direction and on a remnant mesa on West Fort Hood. Lower elevations occur on rolling uplands and canyons associated with creek watersheds and drainages. Annually, 31-32 inches of rainfall occurs (Bomar 1983, Diggs et al. 1999) mostly during spring and autumn. Short, wet, mild winters and long, hot, dry summers typify the climate of the region.

Fort Hood occurs in the Cross Timbers and Prairies vegetation region (Diggs et al. 1999). Local-scale vegetation systems are heterogeneous and patchy, often intergrading abruptly amongst different types. Woody vegetation is characterized by contiguous, closed-canopy, Ashe juniper-oak forests on mesa slopes, tops, and canyons. Some mesa tops are dominated by open, park-like post oak/blackjack oak (*Q. stellata/Q. marilandica*) forests. Shin oak (*Q. sinuata* var. *breviloba*) shrubland/grassland matrices are found where wildfire has occurred. Expansive, open grasslands occur on some valleys and rolling uplands, and in small patches near and amongst mesa forest/shrubland stands. Grassland/plateau live oak (*Q. fusiformis*) savannahs occur on some rolling uplands. Riparian corridors are characterized by juniper-oak forests and forest belts of southern pecan, walnut (*Juglans* spp.), American sycamore, eastern cottonwood (*Populus deltoides*), bur oak (*Q. macrocarpa*), black willow (*Salix nigra*), and red elm (*Ulmus rubra*) trees.

B. Status of the species within the action area

The GCWA and BCVI populations and habitats on Fort Hood are monitored and managed according to the ESMP and INRMP. The goal of these action plans is to implement endangered

species conservation actions such that GCWA and BCVI populations and their habitats are managed to ensure conservation of the species on Fort Hood while maintaining Army mission readiness in a manner consistent with Army and Federal environmental regulations. Population inventory and monitoring and habitat management and protection have been conducted on Fort Hood since the species were listed as endangered (Pekins 2006), resulting in a reliable and robust data trend for these species.

Since 2004, the impacts to GCWA and BCVI habitat caused by wildfire events have been assessed (e.g., severity) and monitored. While the 1996 wildfire significantly impacted endangered species habitat across the installation, especially in GCWA habitat, this wildfire highlighted the need for additional wildfire prevention steps. These steps help ensure protection of endangered species habitat and enable Fort Hood to combat unplanned fire events. Since 2004, the annual average wildfire impacts in endangered species habitat have been 299 ha (739 ac) for BCVI and 113 ha (279 ac) for GCWA.

Approximately 3,861 ha (9,541 ac) of GCWA habitat are categorized as "Core Habitat" on the eastern portion of the installation. The Core Habitat is subject to training restrictions year round, with additional restrictions applicable to the breeding season. The implementation of restrictions in Core Habitat was previously included as a Conservation Measure in the previous consultation. Due in large part to the successful endangered species management at Fort Hood, this biological opinion does not include the previous Core Habitat area as a Conservation Measure.

Golden-cheeked Warbler

Fort Hood Habitat

Fort Hood occurs in GCWA Recovery Unit 3 (Service 1992). There are approximately 20,463 ha (50,565 ac) of suitable GCWA habitat on Fort Hood. This total represents approximately 23% of the total Fort Hood landmass. GCWA habitat on Fort Hood can be divided into four regions: live-fire – 4,556 ha (11,258 ac), West – 4,198 ha (10,373 ac), East – 10,361 ha (25,603 ac), and West Fort Hood – 1,348 ha (3,331 ac). The live-fire area contains approximately 18% of GCWA habitat, which includes numerous disjunct parcels varying in size with large expansive grassland openings in between suitable GCWA habitat. This region receives the highest frequency of disturbance as a result of military training and wildfires. The West region includes approximately 15% of GCWA habitat to include parcels that vary in size with rolling uplands and canyons adjacent to House Creek, Table Rock Creek, and Cowhouse Creek. Open grasslands and intermittent forest fill the gaps between suitable GCWA habitats. The East region includes approximately 65% of mostly contiguous GCWA habitat, with two interconnected systems, that follows mesa ridges on both the north and south side of Belton Lake in an east-west direction. This region contains the highest quality and prime GCWA habitat that can be found on Fort Hood. West Fort Hood is the smallest region and includes approximately 23% of GCWA habitat that varies in size and is fragmented throughout the region. Within habitat, there are many water sources such as creeks, tributaries, springs, and upland depressions/tank trail mudholes.

Fort Hood Population Status

Fort Hood has a long history of GCWA monitoring and research dating to 1992 (Pekins 2006), much of which relates to Priorities 1 and 2 of the Recovery Plan (Service 1992). GCWAs have been observed in all training areas with suitable habitat. As many as four sites have been intensively studied to quantify demographic variables (pairing success, return rate, age structure, territory size/density, and nest survival). Currently, there is one intensive study site (Macey and Grigsby 2014a) and 428 points along 31 point count routes (Macey and Grigsby 2014b) for the GCWA on Fort Hood. Population trends on Fort Hood have been studied for many years using point count survey methodology (Ralph et al. 1995). The status of the species as well as habitat impacts are described in the Fort's annual reports under their 2010 biological opinion.

Generalized linear models were used with detection probability as an offset term to predict density as a function of forest type, forest cover, and forest edge density and to calculate an estimate of GCWA density. The density estimate for the sampling frame was 0.39 singing males ha-1 (95% CI = 0.24–0.45), corresponding to an estimated 7,557 singing males (95% CI = 6581–8678; Peak and Thompson 2013). Analyses of point count data (index of abundance) suggest that GCWA abundance on Fort Hood increased from 1992 to 2014 and has stabilized and increased slightly from 2000 (Macey and Grigsby 2014b). Mean number of detections observed per point significantly increased during this period. However, data from 2000-2009 suggests the mean number of detections may be stabilizing at one bird detected per point. In 2014, observed density on intensive study plots was 0.29 territories per hectare (Macey and Grigsby 2014a), which when extrapolated to all suitable GCWA habitat on Fort Hood, would produce an estimated 7,981 territories. As reported by Macey and Grigsby (2014a), the daily nest survival rate for 2014 was 0.96 (95% CI=0.94-0.98), with a period survival rate of 0.38 (95% CI=0.24-0.47); territory density for 2014 was 0.29 per ha; percentage of territorial males producing ≥1 fledgling was 72.73% (95% CI = 61.99- 83.47%); return rate was 59.49% (95% CI = 48.23-70.75%); percent of second-year males was 20.55% (95% CI = 11.28-29.82%).

Black-capped Vireo

Fort Hood Habitat

Currently there are approximately 8,971 ha (22,168 ac) of suitable BCVI habitat on Fort Hood. This total represents approximately 10.1% of the Fort Hood landmass. Most BCVI habitats on Fort Hood are patchily distributed, disturbed shrublands resulting from fire, mechanical disturbance from training activity, or are edge habitats along roads and other habitat discontinuities. Habitats occur primarily on steep mesa slopes and mesa tops. Transient training activity is allowed in all BCVI habitats occurring on the installation. BCVI occupancy has been documented in all Fort Hood Land Groups including the live-fire area.

Fort Hood Population Status

Fort Hood's BCVI monitoring and research activities begin prior to the 1987 listing of the BCVI as endangered. Four sites are intensively studied to quantify demographic variables (pairing success, return rate, age structure, territory size/density, productivity, and nest survival) and these study areas represent 3% of the known BCVI habitat available on Fort Hood. Population trends on Fort Hood are studied using distance sampling at point transects (Buckland et al. 2001). Point counts were conducted at 653 points in 2013 (Cimprich and Heimbuch 2013) and 414 points in 2014 (Cimprich and Cimprich 2014). Estimated abundance from point counts in 2013 was 5488–6626 male BCVIs and significantly increased to 6523–8573 in 2014. Overall, the BCVI population on Fort Hood appears stable (Cimprich and Cimprich 2014).

Fort Hood biologists and staff located and monitored 204 nests of which 63% failed in 2014 (Cimprich and Cimprich 2014). Nest parasitism within the intensive study sites by brown-headed cowbirds was 2.5%, one of the lowest levels recorded over 18 years of monitoring. Depredation accounted for 73% of all nest failures. Nest depredation rates showed an increasing trend over the period from 1997 to 2005, but have remained stable since. Following the 2014 monitoring season, nest depredation rate was similar to the long-term average reported for Fort Hood. The daily probability of nest survival during the egg-laying period (0.907) was lower than that of the incubation (0.974) and nestling period (0.954). Also, the daily survival probability of nests in the nestling period was lower than those in the incubation period. The probability of nest survival from the beginning of egg-laying to the end of the nestling period was 34.7% in 2014. No single trend has been detected in nest success from 1997 to 2014, although nest survival often varies year to year. Upwards of four nesting attempts by males were documented during 2014 with a mean number of attempts of 2.18. Fifty nine percent of territorial males succeeded in producing ≥1 fledgling in 2014. Most males (99%) studied obtained a mate and attempted to nest during the 2014 breeding season. The mean number of fledglings produced per territorial male was 1.98 in 2014. Thirteen percent of territorial males succeeded in fledging two broods of young in 2014. Recruitment, as measured by the percentage of territorial males that were age second year, in 2014 was 22%. The return rate for adult male BCVIs was 35% in 2014.

Several factors of BCVI biology and habitat preference may minimize the potential effects of disturbance from military activity in habitats. Preliminary physiological and behavioral data collected on Fort Hood suggests BCVIs may be relatively tolerant of human presence. In 2001 and 2002, physiological stress was assessed in white-eyed vireo (*Vireo griseus*) populations in BCVI habitat with restricted access and in unprotected habitat. White-eyed vireos are a closely related congeneric to BCVIs, have similar nesting characteristics, and are locally sympatric with BCVI territories. Measures of corticosterone, the indicator stress hormone in birds, was not significantly different between individuals sampled in protected versus unprotected habitats in 2001 and 2002, suggesting that this species is not chronically stressed in unprotected habitats above levels observed in protected habitats (T. Hayden, unpublished).

IV. Effects of the Action

Under section 7(a)(2) "effects of the action" refers to the direct and indirect effects of an action on a species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action. The effects of the proposed action are added to the environmental baseline to determine the future baseline that serves as the basis for the determination in this biological opinion. The impacts discussed below are the Service's evaluation of the direct and indirect effects of the proposed action. Indirect effects are those caused by the proposed action that occur later in time, but are still reasonably certain to occur (50 CFR 402.02).

Direct and indirect effects on the species may vary depending on many factors (e.g., duration and intensity of use, magnitude of impact, level of maintenance), but can generally be described as short-term or long-term. Short-term effects involve actions for which there is a level of understanding of the nature of effects that can be reasonably predicted (e.g., fire effects in BCVI habitat). These effects are largely based on vegetation recovery and succession or duration of training exercises and may be self-mitigating if habitat is restored or allowed to recover to pre-disturbance conditions. Long-term effects are associated with actions that may continue indefinitely as part of the training mission. These effects are not easily evaluated because the duration is not easily predicted (e.g., vegetation impacts to GCWA habitat). Generally, effects to habitat (habitat loss and/or degradation) under the proposed actions will have the greatest effect on Fort Hood's endangered avian populations. Current research suggests that GCWA and BCVI populations are relatively resilient to direct harassment effects from human activity (Hayden 2010). Direct effects resulting in adult mortality and nest destruction may be limited by minimization and conservation measures that avoid habitat modifications during the breeding season. Anticipated effects during the five-year life of the project are discussed below. The aforementioned adaptive management section will be used to address uncertainty within the effects evaluated. Monitoring of the action's effects is expected to inform the adaptive management process to improve upon the minimization of adverse effects to the species.

A. Military Training Improvement Projects (MTIPs)

MTIPs consist of those activities that involve vegetation removal within or adjacent to GCWA and BCVI habitats. These actions are expected to directly remove habitat or degrade habitat, and may result in increased edge habitat and fragmentation. In some instances, habitat for the BCVI may be improved through selective removal of invasive vegetation. These impacts may be short or long-term depending on the duration of training and the degree to which habitat is modified. However, management of each site will be determined at the project planning stage, which may include long-term restoration depending on mission changes. Restored habitats may be incorporated into the environmental baseline annually, provided they are occupied by the species at densities consistent with habitats of comparable quality. The primary effect of these actions would be the temporary to long-term loss of habitat and reduction of the installation's population carrying capacity (population potential of suitable habitats).

Habitat loss is a primary threat to both species. Both species specialize in their respective habitats (see Species Description and Life History sections), from which woody vegetation

provides the shelter, food, and nesting substrate and materials. The mechanical removal of woody vegetation from these habitats reduces the necessary components to support the species' essential life history needs. Depending on the extent of vegetation removal, such actions would limit the available resources for the species, may result in reduced fitness, and may result in extirpation of the species from the affected area. The ultimate result of adverse effects to individuals may be impossible to calculate, but it is very likely that the effects would result in "take" to individuals in some capacity (e.g., reduced fitness, territory abandonment, increased predation) due to modification and/or degradation of habitat previously utilized by the species. That is, the removal of vegetation or degradation of vegetation essential to the species life history needs is expected to adversely affect the species, to the level of take, depending on the size and duration of the impacts.

Habitat modification occurring during the breeding season, especially during active nesting (typically early March to early June), will likely result in direct take of nests or direct take by harassment (prevention of territory establishment/defense, pair bond formation, and nest abandonment). Persistent harassment may cause pairs to abandon the area in favor of areas with fewer stressors. Alternatively, pairs may stay in the area and experience reduced nest success and fledgling survival. Direct exposure to development/maintenance activities will be avoided if the activities take place outside of the breeding season.

Implementation of Conservation Measures and regeneration of BCVI and GCWA habitat will be dependent on intensity of training use and vegetation maintenance activities. It is anticipated that shrubby edges of lanes will be suitable for BCVI occupancy. The extent of occupancy is unknown, but research at Fort Hood has shown that BCVI prefer to nest in the shrubby edge habitat that is present throughout the installation as a result of mechanized training and/or past clearing activities (Cimprich, pers. comm. March 2009). Because the west side ranges have seen limited use over the last ten years due to deployment schedules, Fort Hood anticipates that overall mechanized training intensity on west side ranges will increase as deployment decreases.

Endangered Species Habitat Impacts from MTIPs

Fort Hood has anticipated undertaking a number of MTIPs under the five-year term of this opinion. While efforts will be made to avoid or minimize impacts to BCVI and GCWA habitat, both short-term and long-term impacts are anticipated. Table 2 provides estimated habitat losses resulting from the proposed actions. These values were generated based on evaluation of identified potential projects from 2015 through 2020 (Appendix B). Although construction and maintenance projects have been combined into a single MTIP category, Fort Hood will document and report annually to the Service the total area and spatial configuration of any impacts to endangered species habitat following the completion of each project and/or the completion of each phase of a project. These projects are anticipated to result in the take of 1,903 ha (4,702 ac) of GCWA habitat (9% of currently available habitat) and 3,285 ha (8,117 ac) of BCVI habitat (37% of the currently available habitat) during the life of this biological opinion.

B. Wildfire Events

Wildfire events occur within the live-fire area at Fort Hood under a "let burn" policy for Green and Amber fire conditions (Cornelius et al. 2007). Because occupied habitat for both species occurs in the live-fire area, wildfire has varying levels of affect on the species depending largely on the timing and intensity of the fire. Fire is a necessary component for maintaining BCVI habitat in most parts of its range. Fires of low to moderate intensity would be expected to burn some nesting shrub mottes while leaving some mottes unburned within a habitat patch. High intensity fires may completely burn habitat patches leaving the area unsuitable in subsequent breeding seasons. Burning of BCVI habitats is expected to be short-term, resulting in unsuitability for occupancy for a period of one to five years. Habitat regeneration following catastrophic wildfires may take decades to recover for GCWAs.

It is anticipated that burned areas will regenerate as BCVI habitat within five years of the fire (Reemts and Hansen 2008). However, for purposes of evaluating population-level effects, burned areas will be treated as a net loss of BCVI habitat on Fort Hood until monitoring of the affected area indicates it has recovered and is occupied by the species at a density to similar quality habitats. Low to moderate intensity fires outside the breeding season are expected to have minimal short-term effects to GCWA habitat (i.e., fires that do not affect tree canopy). High intensity fires or crown fires in GCWA habitat would be expected to destroy the habitat, although not permanently, but long term (Baccus et al. 2007). GCWA habitat typically is not located within or adjacent to heavily impacted target areas, since these areas are subject to frequent fires. Fires that occur under the proposed let burn policy within GCWA habitat are expected to be relatively low intensity, since the habitat at Fort Hood typically does not carry fire well under conditions of Green and Amber. Current fire management and suppression requirements would remain in effect under danger rating Red, which would reduce the possibility of uncontrolled wildfires in endangered species habitats. This includes the use of an on-call helicopter as a first responder for fire suppression during fire condition Red.

For both species, habitat lost from wildfire would reduce the reproductive capacity of the species in subsequent breeding seasons, regardless of the time of year the fire occurred. That is, because the birds have a strong fidelity to breeding sites and most habitats on Fort Hood are occupied, it is anticipated that habitats made unsuitable by wildfire would not be used by the birds thus resulting in less productivity until the habitats have fully recovered. Additional effects are anticipated when wildfire occurs during the breeding season in occupied habitats. Such effects include the direct loss of territories, destruction of nests and eggs, and mortality of nestlings consumed during the fire. These effects are expected to be more prevalent to BCVI since its habitat burns more readily, but may extend to the GCWA depending on the severity of the fire.

<u>Endangered Species Habitat Impacts from Wildfire Events</u>

The extent of wildfire events is generally unpredictable. While preventative measures are in place on Fort Hood to minimize wildfire impacts, they are anticipated to occur. Fort Hood will document and report annually to the Service the total area and spatial configuration of any impacts to endangered species habitat following a prescribed fire or unplanned wildfire event. It is estimated that 1,012 ha (2,500 ac) of GCWA habitat may be burned by wildfire events during

the 5 year duration of this opinion (Table 2). Likewise, it is estimated that a maximum of 2,023 ha (5,000 ac) of BCVI habitat may be burned by wildfires or during prescribed burns. The exact location will be determined through the adaptive management process and reported to the Service in annual reports. These are likely overestimates, particularly in BCVI habitat, considering the short-term impacts and ecological needs of this species. Fort Hood's NRMB staff will assess and monitor each wildfire event in order to determine actual impacts and report them to the Service annually.

Table 2. Anticipated habitat take (ac) from project actions and wildfire events loss from 2015 – 2020 on Fort Hood, Texas

Project Type	**GCWA**	**BCVI**
MTIPs	4,702	8,117
Wildfire Events	2,500	5,000
Total Anticipated Habitat Take	**7,202**	**13,117**

C. Training Activities

Direct and indirect effects to the BCVI and GCWA as a result of military and other activities at Fort Hood are anticipated, since these activities occur within and adjacent to endangered species habitat in the action area. These anticipated effects include habitat loss, disruption of breeding behavior such that productivity is affected, and loss of nests and/or young. Potential effects related to human disturbance on avian populations have been reviewed and reported in several studies (e.g., Wilcove 1988, Riffell et al. 1996, Gutzwiller and Hayden 1997, Gutzwiller et al. 1998). During training events there will be intense noise during any hour of any month. The level of intensity will vary according to unit size (e.g., platoon and squad-sized elements may be less intense than company-sized elements) and type of unit. Some training events may be short (i.e., several hours) while other events may be longer (i.e., several days). Some sites may be used once and remain unused for several weeks or months while other sites may be used continuously (i.e., daily, weekly, bi-weekly, or monthly). It is anticipated that disturbances will be generated by machine-gun fire (individual weapons to crew served weapons), smoke grenades, riot control grenades, percussion grenades, artillery blast and flash simulators, IED blast simulators, pyrotechnics such as flares, tracked and wheeled vehicle noise from nearby non-habitat areas, humans yelling, rapid foot traffic of large numbers of Soldiers, bright lights, low-flying rotary wing aircraft, and vehicle/aircraft noise from nearby insertion areas (pre-existing roads and openings). Additionally, in some areas there may be wheeled and tracked vehicles and rotary-wing aircraft utilizing drop off points and clearings in close proximity to the altered habitat. A summary of the potential effects of training activities are discussed below.

Training-related Impacts to Black-capped Vireo

Maneuver training activities are anticipated to affect the BCVI where its habitat occurs in the action area. Military training would be infrequent in BCVI habitat that occurs on steep slopes due to limited access. However, BCVI habitat located on flat areas is accessible to vehicles and personnel and provides a degree of tactical cover that is desirable in training scenarios. Black-capped vireo nests are susceptible to direct destruction and abandonment due to their proximity to the ground and shrub substrate. Off-road vehicle use and military bivouacs (e.g., tactical operations centers) may be located in BCVI habitats. Effects to nesting birds due to training would include harassment, abandonment of nests and/or territories, nest destruction and mortality of eggs or nestlings. These effects may occur from a variety of activities (e.g., Soldiers bivouacking adjacent to nest, vehicle running over nest shrub). Depending on the persistence of the activity, nesting pairs in proximity may exhibit increased nest vigilance, chronic stress, and lower nesting success. Persistent daytime activity may interfere with the ability to broadcast courtship and territorial defense songs. Habitat disturbance due to off-road vehicle activity has been observed in the form of crushed or damaged shrubs. However, observed direct and indirect effects on BCVI in intensively monitored habitats have been minimal.

Training activity at any particular site is relatively infrequent and typically of short duration. It is expected that BCVIs at any specific locality would have infrequent exposure to military activity of limited duration. A limited number of sites on Fort Hood are known to have a higher probability of military activity relative to the installation as a whole.

Harassment of breeding BCVIs from disturbance due to training activity is most likely to occur from fixed activities within habitat. Fixed activities include establishment of artillery firing points, tactical operation centers, or other field support facilities. Tactical doctrine dictates that artillery units should limit their exposure at any one location. In most cases these units would perform their mission function at the site and depart the location within a few hours to generally no more than 48 hours. Tactical operation centers and field support facilities operate in conjunction with field training exercises that typically run for no more than a two week period. Duration of these field facilities at any one site is typically limited to a few days.

Black-capped vireos have low incidence (<20% of territories) of double brooding on Fort Hood and there are no records of triple brooding. Impacts to nests and disruption of breeding behavior may affect BCVI productivity depending on the timing of impacts within the breeding season. For example, females that may have been capable of double brooding may have only one successful brood if an impact to the first nesting attempt occurs at a point in the season so as to not allow for subsequent broods. Alternatively, the loss of a nest or nesting attempt early in the season may not result in an overall loss of productivity due to the species' ability to re-nest if necessary.

It should also be noted that extensive areas of habitat at Fort Hood are apparently maintained due to mechanical disturbance by training activity. Due to the early successional character of BCVI habitat at Fort Hood, regeneration after physical disturbance is quite rapid, meaning positive impacts to the habitat are likely after a short-term impact. In most cases, only excessive erosion

would potentially preclude regeneration after temporary disturbance. Black-capped vireo habitats on Fort Hood that are most likely to be disturbed are predominantly flat with limited erosion potential.

Training-related Impacts to Golden-cheeked Warbler

Studies of non-military activities have documented potential effects of human-related activities on the GCWA. Several studies have documented adverse impacts on GCWAs due to urbanization attributed to increased habitat fragmentation, edge, and avian predators (e.g., Sexton 1991, Coldren 1998, Fink 1996, Arnold et al. 1996, Engels 1995). These studies indicate that GCWAs select against habitat edge and reproductive success is reduced in proximity to edges. Studies at Fort Hood in 1995-96 indicated that mating success was lower in more fragmented habitats on the installation (Maas-Burleigh 1998). GCWAs have also shown reduced nest success with increased edge density at Fort Hood (Peak 2007). Similar results are expected to occur during the five-year life of the opinion.

Golden-cheeked warbler habitat may be directly impacted by off-road vehicle traffic through the destruction or damage of trees. These impacts are likely small in size (limited to individual trees) and localized for the following reasons: Off-road vehicle traffic is largely precluded in GCWA habitat either by topography (steep slopes) and/or density of the associated vegetation. Wheeled vehicles would be unable to traverse through most GCWA habitat. Tracked vehicle transit through habitat is uncommon due to potential damage to the vehicles. Also, transit through vegetation that leaves obvious tracks does not conform to tactical doctrine, which dictates that such activity would increase detection by opposing forces and is therefore inadvisable.

Fixed activities associated with field training exercises are also uncommon in GCWA habitat due to topography and vegetation density. Examples of fixed activities include artillery firing points, tactical operations centers, communications centers and field medical units. Facilities associated with these activities include personnel, vehicles and trailers, tent facilities, and electrical generator use. The area occupied by these activities is typically < 10 ha (25 ac). GCWA habitat is not suitable for these field training facilities which require some degree of open space that is not characteristic of the species' habitat.

In the short term, it is expected that GCWAs will continue to use sites thinned of juniper for infantry access. This is largely due to the strong site fidelity of GCWAs, which often return to occupy previous breeding areas every spring. Thus, direct exposure to training activities at the project site is highly likely to occur. In GCWA habitats thinned of juniper, Soldiers would have greater access to move through habitat and potentially disrupt birds still breeding in the area or adjacent areas. However, exposure severity will be variable depending upon the timing, duration, and type of military training activities. For example, during the breeding season- silent, nighttime, dismounted infantry movement through modified habitat will likely have low effects, especially if they are non-persistent (e.g., occur [bi-] monthly) and short-duration (e.g., used < 4 hrs); however, noisy, nighttime dismounted infantry movement through modified habitat will likely have higher effects, especially if they are persistent (e.g., occur over the course of many continuous nights) and long duration (e.g., used all night). Under either of the preceding

scenarios, pairs nesting in the area may exhibit increased nest vigilance, chronic stress, and lower nesting success. In addition to lowered nest success, persistent daytime use may interfere with the ability of male GCWAs to broadcast courtship and territorial defense songs, an important component of GCWA life history (Pulich 1976, Service 1992, Ladd and Gass 1999). On Fort Hood, experimental exposure of adult GCWAs to human foot-traffic during the day did not stimulate a strong stress hormone response (Hayden et al. 2007). However, the experiment did not examine the combined effect of degraded habitat concurrent with simulated military training. Further, different forms of military activity (i.e., blasts and machine gun fire) and human activity at night could be perceived much differently by GCWAs and could cause acute and chronic stress. The anticipated activities in the treatment areas are military-unique and not well studied. Based upon this limited information, we anticipate that breeding GCWAs may be subject to these adverse effects at unknown frequency and duration.

Training enhancers (i.e., artillery/IED blast simulators, machine gun firefights, grenade blasts, blast flash simulators, smoke grenades, smoke pots, and vehicle smoke) may be used in modified habitat. This may increase harassment severity, especially if a nest or territorial male GCWA is nearby. Should these activities persist (units training on a daily basis for many weeks), pairs may abandon the area, especially if the exposure is during a critical point in the breeding season. Alternatively, pairs may stay in the area and may experience reduced nest success, reduced fledgling survival, and decreased site fidelity. In at least one study, GCWA nest success was shown to decrease by 50% and male territory sizes were larger in areas with human traffic (mountain biking) than in areas without (Davis and Leslie 2007).

Identifying military training intensity, severity, and duration and directing harmful, stress-inducing activities to less suitable areas within the project footprint (e.g., juniper monocultures, uplands, existing canopy gap areas) will help minimize and possibly avoid direct exposure effects. Training activities occurring outside of the breeding season will have no direct effect on nesting pairs.

There could be an increased danger of wildfire, especially damaging crown fires, if pyrotechnic/battle simulation devices are used in modified habitat during dry spells, droughts, and red flag conditions; however, under other procedures, Fort Hood is already prohibited from using pyrotechnics during these high-risk conditions. Golden-cheeked warbler habitat is structurally complex with vegetation extending from the forest floor to the canopy apex. The habitat also has high fuel loads, many of which are ladder fuels and many of which are dried and cured. The forest floor consists of deep juniper and oak leaf litter, fallen limbs and branches, and herbaceous forbs. From just above the forest floor to the canopy, there are many dead branches which often form a phalanx-like arrangement. As a consequence, surface fires in GCWA habitat often rapidly extend vertically and become a fast-moving crown-fire. Incendiary devices (i.e., smoke grenades, riot control grenades, artillery blast and flash simulators) can ignite a wildfire in GCWA habitat. To reduce the risk of wildfire, Fort Hood has implemented a fire danger rating system to alert trainers when the use of pyrotechnics should be limited or halted.

At the landscape scale, modified habitat configuration and connectivity and increased fragmentation may directly affect GCWAs. Based on maneuver training needs, it is possible that large, contiguous blocks of habitat on Fort Hood may be fragmented and “soft” edge created.

"Soft" edge is identified as areas with cleared understory, degraded canopy, and areas with trail networks. The configuration of maneuver lanes may be sinuous, linear, bisected, or looped. Additionally, there may be supplemental training structures (e.g., mock villages, IED defeat, obstacle course) in or near these lanes. Because it is unrealistic that maneuvering units will stay on established trails within a maneuver lane or attack pathway, there will likely be interrelated actions associated with maneuver lanes, especially if there is freedom of movement in off-trail areas (e.g., cleared understory or vehicle-width distances between trees). These actions may occur in the form of radial, linear-split, expanding loop, cross-hatch, and wheel-and-spoke trail networks (Greene and Nichols 1995), and lateral movements between maneuvering elements. With time, the incipient networks may have long-term impacts and further alter habitat composition and recovery time.

Any development or training site use that creates and/or extends hard and soft edges, or fragments habitat is expected to negatively affect GCWAs. When selecting breeding habitat, GCWAs appear to be influenced by composition at the landscape as well as the local scale (Dearborn and Sanchez 2001). As a result, GCWAs are most likely to use habitats where the landscape composition of mature oak-juniper forests in the surrounding landscape is relatively high. When considering the landscape within 400 meters of a site, Magness et al. (2006) found GCWAs only when the landscape contained greater than 40% composition of mature oak-juniper habitat. Habitat fragmentation (i.e., large, contiguous habitat parcels divided into smaller, non-contiguous parcels) is an important determinant of GCWA nest success. For example, GCWA reproductive success was greater in unfragmented than in fragmented habitat (Maas-Burleigh 1998), and GCWAs do best in large blocks of unfragmented habitat (Service 1992). A similar pattern is expected to continue during the life of the project. Additionally, forest edges (consequence of fragmentation) negatively affect GCWA nest survival by increasing depredation by edge-adapted predators and reducing overall habitat quality (Peak 2007, Reidy 2007). Texas rat snakes, a major GCWA predator, are likely to remain a threat to the species as a result of habitat fragmentation (Sperry et al. 2009).

The thinning of young Ashe juniper trees (<5 inches or 12.7 centimeters in DBH) within GCWA habitat may have both short- and long-term adverse effects to the species, depending on the amount of habitat degraded and the duration of maintenance to suppress juniper growth. Ashe juniper is an essential component of GCWA habitat for cover, nest trees and nesting material. While these functions largely involve the mature juniper trees, young trees within the midstory also function as part of the habitat. Evidence suggests that GCWA are more likely to occur in oak-juniper woodlands possessing a greater density of juniper with a DBH of ≥ 5 inches (12.7 centimeters) and with greater foliage height diversity (Berrios 2004). At Fort Hood, GCWA occupancy was strongly related to habitats with a 4:1 ratio of Ashe juniper to other woody species, especially in the mid- to upper canopy (Emrick et al. 2010). The removal of young juniper (<5 inches or 12.7 centimeters in DBH) in training areas may preclude the development of the preferred density and age class of junipers within habitat. Thinned habitats may also effect predator access and increase cowbird parasitism. Cowbirds may prefer GCWA habitats with less juniper and deciduous non-oak species (Berrios 2004). The long-term effects of continued removal of young juniper from GCWA habitats are unknown, but may result in the alteration of the trees species composition and reduced canopy cover. Continued degradation in

this manner may render portions of habitat unsuitable due to an insufficient percentage of mature Ashe juniper and/or reduced canopy beyond that known to support GCWAs.
There may be landscape-level, indirect effects associated with long-term military use of a site or series of sites (i.e., a convoy route that connects many sites). The effect will largely depend upon how many habitat sites are modified, site locations in habitat blocks, connectivity of modified habitat, training severity/intensity, and duration of use. If there are several frequently/intensely used sites that are spread across the landscape, or if there is a large site spanning several kilometers, then GCWA pairs may slowly abandon these areas, or they may experience a slow decline in nest success. GCWAs exhibit strong site fidelity (Pulich 1976, Ladd and Gass 1999). For example, they were observed defending "phantom" territories in destroyed habitat after the 1996 crown-fire on Fort Hood (Tolle 1998). Thus, GCWAs may persist in marginally suitable habitat for several years before they abandon an area.

Because GCWAs are highly territorial, movement of pairs out of affected areas and into non-affected areas may cause GCWA territory re-shuffling and increased agonistic interactions. This reordering may cause GCWAs to nest in areas beyond resource carrying capacity, thus lowering nesting success and fledgling survival. These responses may be spread across the landscape, or focused into one specific region of Fort Hood. If the effect is focused at a key region GCWAs need for long-term survival on Fort Hood, for example the training areas in the 20s or 30s found on the east side of the installation, then the effect will likely affect the environmental baseline and future population condition on Fort Hood, although the effect may not be immediately noticeable due to time-lagged effects on demography.

Actions which destroy or degrade GCWA habitat may take decades to recover. Ladd and Gass (1999) suggest that at least 25-50 years are needed to regenerate habitat under favorable conditions, longer if oaks and hardwoods are destroyed. Preliminary results of a recent study conducted at Balcones Canyonlands National Wildlife Refuge in plots where overgrazing and post-cutting occurred in the past, indicate that an average of 80 years may be needed for Ashe juniper to grow to a size considered suitable for GCWA habitat. Habitat recovery would be longer (80+ years) if oaks and other hardwoods need regeneration (J. Hatfield, unpublished data). Eleven years after crown fires destroyed 2,108 ha of GCWA habitat on Fort Hood, virtually no Ashe junipers (6 saplings, 0 trees) have been observed in the burned areas along 65 study transects totaling 7,150 meters length (Reemts and Hansen 2008). Although dominant oak species re-sprouted quickly, large tree density remains low. Lack of large trees and Ashe junipers indicate that it may take decades before the burned Fort Hood habitat becomes suitable for GCWA. These findings suggest that even minor alterations may require lengthy recovery periods. Further, recovery may take longer if the site has been severely disturbed or used by vehicles.

D. Other Activities

Prescribed Fire

The prescribed burning program at Fort Hood would help reduce fuel loads in proximity to endangered species habitat. This will have the effect of reducing the potential for wildfire events in endangered species habitats. Fire would also be used to remove encroaching juniper from

BCVI habitat within military training areas. The overall long-term effects of prescribed fire would be beneficial to the BCVI and GCWA. Prescribed fire may be utilized within BCVI habitats outside the nesting season to maintain early successional stage of vegetative growth necessary to the species. Adverse effects, if any, would occur as loss of habitat and likely be short-term.

Juniper Management

Juniper management will not be conducted in GCWA habitat under the proposed action. Juniper cutting to control encroachment in old fields would not affect endangered species populations on Fort Hood. Selective removal of second-growth juniper from BCVI habitat with a tree shear is conducted primarily in the western maneuver area, where mechanical effects of military training, rather than fire, is the primary disturbance mechanism. This technique for habitat management, particularly when coupled with a cool season prescribed burn under mild conditions, is useful for habitat enhancement in areas where a stand replacement fire is not appropriate and will continue to be used as a tool. This selective removal of juniper conducted outside of the breeding season is anticipated to have an overall beneficial effect to the BCVI. Short-term effects to habitat would be insignificant.

Cattle Grazing

Cattle may directly affect BCVI habitat by browsing on preferred nesting shrubs, but these effects are anticipated to be insignificant, and would only be considered where lack of management allowed overgrazing in BCVI habitat (Service 1991, Campbell 1995). The majority of potential effects related to grazing are indirect, involving the relationship of grazing activity and the presence of the brown-headed cowbird (Summers and Norman 2004). Studies at Fort Hood have demonstrated an association of brown-headed cowbird feeding sites with areas of cattle grazing (Koloszar and Horne 2000). Parasitism by brown-headed cowbirds has been shown to significantly reduce nest success and productivity of BCVIs on Fort Hood (Hayden et al. 2000). However, cowbird control efforts on Fort Hood have significantly reduced the effects of cowbird parasitism that might be associated with cattle grazing on Fort Hood (see Cowbird Management below).

Changes in the stocking rate would be based upon current forage inventories and the grazing agreement, which provides adaptive management practices conducive to endangered species habitat management. The indirect effect of cowbird parasitism, while influenced by the grazing program, is greatly minimized through cowbird management. The objective of cowbird management is to maintain an annual parasitism rate for the BCVI below 10 % (averaged over five-year periods). The grazing program is not expected to result in take of endangered species.

Cowbird Management

Cowbird management is likely the single most important factor in the observed increases in BCVI and GCWA populations at Fort Hood. Data from Fort Hood show that without cowbird control, incidence of parasitism of BCVI nests was 90-100% (Tazik et al. 1992). Cowbird management has reduced the incidence of cowbird parasitism, averaging less than 10 % annually

(Hayden et al. 2000, Cimprich 2003). However, during 2009, the five year rolling mean nest parasitism frequency for the BCVI was 11.8% (Summers 2009); the increase was attributed to the trapping cessation study from 2006 to 2009. Due to the conclusion of the trapping cessation study and resumption of installation-wide trapping, it is expected that the annual parasitism rate will average less than 10%. The incidence of cowbird parasitism has a strong negative correlation with BCVI reproductive success (Hayden et al. 2000). Although this relationship is less definitive from the available data for GCWAs, this species is a host to brown-headed cowbirds and likely benefits from reduced cowbird parasitism. Cowbird management has a significant beneficial effect for both BCVIs and GCWAs on Fort Hood.

Recreation

The potential effects of recreation programs on Fort Hood to the BCVI and GCWA are expected to be insignificant. Fishing activities generally are not conducted in endangered species habitats. Effects of hunting generally would be limited to potential harassment where the hunting season overlaps the endangered species breeding season. Turkey and other bird hunting is often conducted in savannah or riparian habitats not typically occupied by endangered species. Deer hunting is conducted during the non-breeding season of endangered species populations and helps control the potential for over-browsing of endangered species habitat.

Mountain biking is restricted to the Belton Lake Outdoor Recreation Area (BLORA), which contains occupied habitat for the GCWA. Studies by A. Graber on Fort Hood and the Austin area in 2002 and 2003 indicated that GCWAs in habitat areas with recreational trail bike riding had lower reproductive success and larger home ranges (Graber, unpublished data). However, studies of GCWA populations at BLORA did not show mountain bike activity to have an adverse impact on the species (Pekins 2002). We anticipate similar low-level impacts during the life of this project.

Population Monitoring and Research Programs

Monitoring and research programs on Fort Hood are designed to support an adaptive management approach for endangered species populations on Fort Hood. These activities will be modified as necessary to determine response of endangered species populations to the proposed actions. These data will allow installation natural resource managers to proactively respond to any observed changes in habitats or populations. This research substantially contributes to our understanding of the species and provides information for rangewide conservation.

E. Cumulative Effects

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Climate change, in combination with drought cycles, is likely to exacerbate existing threats to all species within the Southwestern U.S. At this time, no future state, tribal, local or private actions

are known to be planned within the action area. Because the action area encompasses the entire Fort Hood property, any future actions concerning the area would occur at Fort Hood and thus require a separate consultation.

V. Conclusion

After reviewing the current status of the BCVI and GCWA, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the actions, as proposed, are not likely to jeopardize the continued existence of the BCVI or GCWA. No critical habitat has been designated for these species; therefore, none would be affected.

The regulations implementing the Act define “jeopardize the continued existence of” as “to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species.” An extensive amount of habitat protection and management for the GCWA has occurred on Fort Hood since the species was listed in 1990. Since listing, Fort Hood has managed and monitored the population, which has shown evidence of increasing in population and distribution. The total amount of incidental take anticipated in this opinion would not compromise the population over the five-year period. Approximately 38% of estimated take for the BCVI is fire-related and is expected to be short-term and self-mitigating. The MTIPs projects impacting GCWA habitat (approximately 9%) maybe long-term, but would recover following the conclusion of expected impacts.

The majority of the proposed action is composed of training range improvements and ongoing military training activities. Other minor actions include endangered species management, recreation, cattle grazing, and monitoring and research. Historically, military training activities have resulted in incidental take of the BCVI and GCWA, which has been well documented. It is anticipated that incidental take would continue to occur on Fort Hood at slightly elevated levels due to the proposed permanent and temporary loss of habitat. Even at this elevated level, the years of monitoring and research conducted on Fort Hood indicate that the long-term population viability of the BCVI and GCWA within the action area would be sustained. Most importantly, Fort Hood has committed to continue to monitor and manage their endangered species populations for long-term conservation.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to

listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary and must be undertaken by the Army for the exemption in section 7(o)(2) to apply. The Army has a continuing duty to regulate the activity covered by this Incidental Take Statement. If the Army fails to assume and implement the terms and conditions, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Army must report the progress of the action and its impact on the species to the Service as specified in the Incidental Take Statement. [50 CFR §402.14(i)(3)].

Amount or extent of take anticipated

The Service anticipates that the proposed action would result in the incidental take of BCVIs and GCWAs. Take would be in the form of harm, harassment, wounding, and/or killing. Take, in the form of harm and/or harassment, is difficult to quantify and usually cannot be estimated in terms of numbers of individuals. However, because the area of habitat for both species is known for the action area, the maximum amount of incidental take may be estimated in terms of habitat area. Using habitat as a surrogate for incidental take of individuals is consistent with the Act section 7 implementing regulations at 50 CFR 402.14(i)(1)(i) for the following reasons. Surveys for the GCWA and BCVI provide valuable information for determining the extent of occupation of a given area; however, they do not provide a precise mechanism for predicting the number of individuals that may actually be “taken” by the proposed action. The effectiveness of bird surveys in quantifying the number of birds in an area is somewhat limited. For example, due to their frequent vocalizations, males of these species are more easily detected than females or fledglings during surveys.

In addition, the area of habitat affected by a particular action is a relatively stable metric of take, compared to the number, size, and location of individual birds or bird territories in the area, which may vary from year-to-year. Further, the effects of a given activity may not be fully realized in a single season but rather spread over several seasons or even many years, during which the species’ utilization of a given area may vary quite significantly for reasons unrelated to the action itself. Variability is influenced by species preferences or environmental factors that may include natural year-to-year variations in the precise habitat utilized by individual birds, variations in individual bird behavior that influence detectability, variations in the ability of surveyors to detect and accurately map individual birds, survey methodology, and other factors.

For these reasons, it is not possible to predict the precise number of GCWA and BCVI that may be “taken” over time as a result of the proposed actions covered in this opinion. Therefore, incidental take is provided as loss of habitat in ac under this opinion. Take occurring as a result of ongoing military training activities will not be quantified separately, because take has been

assessed as the loss of function within these areas resulting from MTIPs. Therefore, training-related take is concurrent with MTIP projects and accounted for in habitat area estimates. The amount of potential take is estimated at 2,915 ha (7,202 ac) for the GCWA and 5,308 ha (13,117 ac) for the BCVI (Table 2). The majority of this estimated take represents temporary loss of, or impaired function of, the habitat from anticipated effects discussed above to the species as a result of training, training projects, prescribed burning, and wildfire events within the habitat area.

Effect of the take

In the accompanying biological opinion, the Service determined that the level of anticipated incidental take is not likely to result in jeopardy to the BCVI or GCWA.

Reasonable and Prudent Measures and Terms and Conditions

The Service believes reasonable and prudent measures and terms and conditions are necessary and appropriate to minimize impacts of incidental take of the GCWA and BCVI. In order to be exempt from the prohibitions of section 9 of the Act, Federal agencies must comply with the terms and conditions, which implement the reasonable and prudent measures and required reporting/monitoring requirements. Terms and conditions are non-discretionary. Because the Army has adopted comprehensive Conservation Measures for the proposed action, no additional Reasonable and Prudent Measures are required. The Conservation Measures are adopted as part of the proposed action and supplemented with Terms and Conditions below.

The Service will not refer the incidental take of any migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

1) Continue to implement monitoring and research programs that promote the recovery of the GCWA and BCVI.

a) Document population trends and assess population status of the BCVI and GCWA.

b) Evaluate the relationship between habitat quality and GCWA abundance and productivity.

c) Continue to allow safe access to training and live-fire areas for BCVI and GCWA surveys during the period of 15 March through 31 July to ensure that equivalent data are collected for study areas both in and out of the live-fire area. It is important that the integrity of data collected from existing BCVI and GCWA productivity, predation and population trend studies is maintained.

d) Continue to generate color sequences for range-wide color banding of BCVI and GCWA through cooperation with the USGS.

2) Manage vegetation clearing projects to minimize fire hazard from slash, and avoid impacts to residual stands or endangered species habitat.

a) Habitat disturbance and project implementation will be scheduled between 15 August to 15 March when these species are not actively nesting in the action area.

b) To reduce unnecessary negative environmental impacts, projects that involve habitat modification shall consider the least invasive technique(s) that can feasibly provide the desired project objective while meeting mission requirements, available funding, and time constraints.

c) All MTIPs will include the approval of the Garrison Commander and will be reviewed and coordinated with the NRMB for execution. Early project coordination will help ensure avoidance or minimization to GCWA and BCVI habitats. This action supports the overall objectives of the INRMP, of which the ESMP is a part.

d) During juniper thinning, HBCT, construction of firebreaks, power line right-of-ways, roads, or other brush removal projects generated slash material can be mulched in place, removed from the site and mulched, burned or transported to the Fort Hood Landfill. Slash disposal methods will be included in the scope of proposed projects and will be completed in order for the project to be deemed complete. The method of slash disposal will be based on the overall benefit to the species and its habitat, with preference to mulching on site:

(i) For all projects that involve brush removal or thinning in habitat for the GCWA or BCVI, primary consideration should be given to mulching slash in place to minimize creation of habitat for Texas rat snakes, reduce the incidence and/or intensity of wildfire in habitat, and to reduce erosion. Burning may be used when there is minimal or no difference in benefit to the species between methods.

(ii) If slash material is relocated, it must be placed a minimum distance of approximately 46 meters (50 yards) from GCWA or BCVI habitat and any existing firebreaks.

e) As an integral part of project design, maximize the use of preventative measures to minimize soil loss after vegetation removal. Examples include re-seeding with an accepted native herbaceous plant seed mix, deferral of grazing from rehabilitation sites, placement of water bars on slopes, and using waste material in gullies as appropriate.

f) All vegetation clearing projects must include coordination with NRMB from the planning phase forward in order to minimize or avoid impacts to endangered species and their habitat and must support overall objectives of the INRMP. Results of coordination will be included in project specific documentation.

g) Develop a habitat regeneration/enhancement plan that is compatible with endangered species management and mission training requirements.

3) Emphasize the use of prescribed burning to support protection and maintenance of endangered species habitat and support ecosystem management principles.

a) All prescribed burning will occur under the supervision of the DES Fire and Emergency Services. Prescribed burning will support the overall objectives of the INRMP in accordance with the Fort Hood Integrated Wildland Fire Management Plan. All burning will be conducted by qualified individuals whose credentials have been reviewed and approved by the DES Fire and Emergency Services.

b) Identify BCVI habitat areas outside of the nesting season which are suitable for maintenance prescribed burning.

c) Use prescribed fire to the maximum extent possible to reduce fuel loads near endangered species habitat areas.

d) Use prescribed fire to maintain prairie sites and to inhibit development of pure juniper stands. Fire should be considered as a low-cost, non-invasive means of avoiding future need for destructive large-scale mechanical clearing projects.

4) Implement management options to reduce nest losses and habitat degradation.

a) Reinstate feral hog aerial control program on the installation. Control population by utilizing aerial support, trapping, and evaluate effectiveness of control methods.

b) Implement installation-wide brown-headed cowbird management program with a parasitism rate goal $\leq$ 10% over the life of this opinion as determined on average within the BCVI intensive study sites.

5) Monitor the quality and quantity of available endangered species habitat.

a) Continue use of helicopter over-flights as needed to ensure MTIPs compliance and monitor effects of training activity in endangered species habitat.

b) Evaluate habitat trends based on change detection imagery every five years or when available. Ground-truthing can be utilized to evaluate and track GCWA and BCVI habitat trends when current imagery is not available.

c) Maintain adequate natural resource law enforcement presence to effectively monitor land use and off-road vehicle restrictions.

d) Refine mapping efforts to enhance endangered species information management on Fort Hood.

e) Maintain training area development and maintenance actions in a GIS database to more adequately track environmental baseline. As projects are completed, areas

delineated for habitat impacts should be included in the GIS database to track incidental take and environmental baseline.

6) Incorporate preventative measures to reduce the risk of wildfire events.

a) Increase fire prevention and response efforts by:

(i) coordinating with the DES Fire and Emergency Services and NRMB during the decision to approve/disapprove Range Condition Red waivers;

(ii) maintaining and upgrading fire-fighting capabilities including aerial support.

7) Monitor the distribution and spread of oak wilt.

a) Maintain a current map of oak wilt centers with particular emphasis within GCWA habitat.

8) Restrict recreational use in endangered species habitat.

a) Prohibit the use of motorized off-road recreational vehicles in endangered species habitat.

9) Develop management options through the adaptive management process for actions located within endangered species habitat.

a) Management options should be developed to sustain the landscape (e.g., reducing erosion, soil compaction) and be based on the expected intensity and duration of training and the area's contribution to the management goals of the species present.

b) Management options will consider both short- and long-term goals related to recovery of the species. Following MTIP completion, training areas will be monitored to evaluate short- and long-term impacts. Management of training areas should be adjusted based on monitoring to prevent long-term degradation of habitat.

c) Criteria will be established to evaluate habitat impacts to prevent long-term degradation of habitat. Criteria will also be used to determine full recovery of project areas to "pre-disturbance" conditions.

Reporting Requirements

Fort Hood shall provide annual reports to the Service for each action implemented under this biological opinion by January 15. Spatial information (maps) may be submitted in GIS format. The reports should include the following information:

Military Training Improvement Projects (MTIP):

1) the dates the action occurred
2) information concerning the implementation of conservation measures
3) total area and spatial configuration of affected area
4) maps delineating project and species habitats
5) implementation of management actions (in subsequent years of projects)
6) approximate training use impacts on habitat
7) other pertinent information

Wildfire Events:

1) dates, locations, and total area of wildfires
2) maps delineating burned areas
3) estimated impacts to species habitats
4) fire condition (green, amber or red) during wildfire
5) effectiveness of control activities, if any
6) adjustments to environmental baseline due to habitat recovery following wildfire

Other activities:

1) information on species management, abundance, distribution, and other research projects
2) information on cowbird control, feral hog control, and other related activities
3) dates and locations of prescribed fires, including size of areas burned and anticipated results
4) the results of all studies and surveys described in this opinion
5) the use of adaptive management for project planning, development and monitoring.

As projects are completed, Fort Hood will document the total area and spatial configuration of affected GCWA and BCVI habitat for each project. Fort Hood will report to the Service annually the amount of habitat area affected by project, as well as the total habitat area affected by MTIP projects and habitat burned during the previous calendar year. In addition to descriptions and maps in the report, an electronic file of the GIS information will also be submitted.

Review Requirements

The conservation measures and terms and conditions of this opinion are designed to minimize the effects of incidental take resulting from the proposed action. With the implementation of these measures and conditions, the Service believes the anticipated amount of take provided in the incidental take statement would be reduced. This approach and the corresponding reporting requirements will indicate actual levels of incidental take over the five-year period of the action.

This opinion will expire five years from the date of signature. Prior to that time, the Service and the Army will evaluate the environmental baseline at Fort Hood from reporting under this opinion. The information gathered under this opinion, as well as other information, will be used to develop a subsequent biological assessment for consultation.

Conservation Recommendations

Section 7(a)(l) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The following recommendations are provided for consideration by the Army:

1) The Service recommends the Army work cooperatively with state and Federal agencies managing substantial populations of the BCVI and GCWA to exchange ideas and further recovery implementation within their authorities. Such agencies would include, but not be limited to, Texas Parks and Wildlife Department, Balcones Canyonlands National Wildlife Refuge, Fort Sill, and Wichita Mountains Wildlife Refuge.

2) The Service recommends Fort Hood implement a program to control red imported fire ants in endangered species habitat and near important karst features. Fire ant control should use non-toxic methods (e.g., boiling water) to avoid unintended effects.

3) The Service recommends Fort Hood continue to investigate, monitor and manage karst ecosystems occurring on the base. The Fort should continue the mapping and study of karst features with an emphasis on protecting these sensitive areas.

4) The Service recommends Fort Hood develop a mussel monitoring program to address the status and distribution of the Texas fawnsfoot, smooth pimpleback, and other native mussels on the Fort.

Reinitiation Notice

This concludes formal consultation on the actions outlined in the request. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The Service appreciates the cooperation extended by the Army staff during this consultation. If further assistance or information is required, please contact Mr. Sean Edwards or Mr. Omar Bocanegra at the above address or telephone (817) 277-1100.

Sincerely,

Debra T. Bills

Debra Bills
Field Supervisor

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Appendix A

Examples of Ongoing Activities on Fort Hood Military Installation, Fort Hood, Texas

Ongoing activities on Fort Hood consist of military training exercises, prescribed fire, brown-headed cowbird (*Molothrus ater*) control program, juniper (*Juniperus spp.*) control and maintenance program, cattle grazing, recreation programs, feral hog (*Sus scrofa*) control program, management for other sensitive species, and endangered species population monitoring and research. These activities are detailed below.

1) Military Training Exercises

Maneuver Training

Maneuver training exercises are conducted at all unit levels to ensure a combat ready fighting force. Training programs focus on units attaining and maintaining proficiency in collective tasks that support mission essential tasks. Units involved in the training process span all echelons from section to Corps. Ill Corps' primary training focus at Fort Hood is the brigade level and below. Training exercises replicate combat conditions as closely as possible. Combat effects such as smoke, noise, and simulated nuclear, biological, and chemical conditions are integrated into every training event to condition units for operations in a difficult and stressful battlefield environment.

Units train for combat in a task-oriented manner. Combined arms training involves formations that include members of the entire fighting force. Commanders synchronize the activities of these forces within a battlefield framework that includes maneuver and operations within the deep, the close-in, and rear battle areas. Such exercises involve greater depth and rapidity of movement dimensions and, therefore, also incur greater demands for concurrent land use.

Maneuver training areas are located west, east, and southwest of the live-fire area. Maneuver training areas constitute approximately 53,300 ha or 60.1% of the entire installation. The West Range Maneuver Training Areas (Training Areas (TAs) 40-66) constitute approximately 26,781 ha and provide excellent training opportunities for large armored and mechanized infantry forces. The training area averages 7 to 10 kilometers east to west and 30 kilometers north to south. The area features a wide variety of terrain and vegetation characteristics that greatly enhance cross country, combined arms maneuver. Because of its large, contiguous size, this is the only maneuver area on Fort Hood capable of supporting brigade level operations (864 to 3,600 Soldiers).

The Northeast (TAs 10-25) and Southeast Range Maneuver Training Areas (TAs 30-36) are divided by Belton Lake. The northeast sector is heavily vegetated and cross-

compartmentalized by terrain features, providing limited value as a mechanized maneuver area. The southeast sector provides more favorable terrain for mechanized units, but is only 4 to 7 kilometers north to south and 15 kilometers from east to west. Because of limited area, the Northeast and Southeast Range Maneuver Training Areas are best suited for unit assembly and logistical areas, artillery firing points, company and platoon level mounted training and company to brigade level dismounted training. Additionally, these eastern training areas support engineer, combat support, and combat service support training, and provide locations for amphibious and river crossing operations.

The Southwest Maneuver Training Area is not used for heavy maneuver training due to its small size and isolated location. The Southwest Maneuver Training Area (TAs 70-75) is separated from the main cantonment area by U.S. Highway 190. These training areas include many restricted areas, including Robert Gray Army Airfield and the Ammunition Supply Point. The Southwest Maneuver Training Area is used primarily for small mechanized unit and dismounted infantry training and for logistical sites.

Dismounted Infantry Training

Dismounted infantry (i.e., Soldiers on foot with or without support vehicles) training may occur in all training areas at Fort Hood. During dismounted infantry training events, there may be periods of intense noise during any hour of any month. The level of intensity will vary according to unit size (e.g., platoon and squad-sized elements may be less intense than company-sized elements) and type of unit. Some training events may be short (i.e., several hours) while other events may be long (i.e., several days). Some sites may be used once and remain unused for several weeks or months while other sites may be continually used every day, every week, every other week, or every month. It is anticipated that noise will be generated by machine-gun fire (individual weapons to crew served weapons), smoke grenades, riot control grenades, percussion grenades, artillery blast and flash simulators, improvised explosive device (IED) blast simulators, pyrotechnics such as flares, tracked and wheeled vehicle noise from nearby non-habitat areas, humans yelling, rapid foot traffic of large numbers of Soldiers, bright lights, low-flying rotary wing aircraft, and vehicle/aircraft noise from nearby insertion areas (pre-existing roads and openings). Additionally, in some areas there may be wheeled and tracked vehicles and rotary-wing aircraft utilizing drop off points and clearings in close proximity to the altered habitat.

Infantry personnel assignments associated with each training event at any particular thinned site will typically consist of platoon (~36 Soldiers) to company-sized (~144 Soldiers) units. These units may be participating as part of larger-unit exercises at the battalion (432 to 720 Soldiers) or brigade level (864 to 3,600 Soldiers); however, it is highly unlikely that these larger units would be training concurrently at any particular thinned site. The total Infantry BCT (all Infantry, Cavalry, Artillery, Special Troops, and Support battalions) is approximately 5,000 Soldiers. The preceding numbers are for Infantry BCTs only; Heavy BCTs and Corps level personnel assignments are different. For Heavy BCTs, the personnel strength is approximately the same as Infantry BCTs (i.e., ~5,000 Soldiers). However, Heavy BCT mission relies more on armored, mechanized military hardware (Abrams tanks, Bradley vehicles, mobile Artillery) with some infantry Soldiers assigned to the units. Field exercises at the Corps level emphasize Command

and Control functions for logistics and support for several BCTs. These functions characteristically would not be conducted in thinned habitats.

All Soldiers, regardless of their job title, must maintain basic infantry skills proficiency. The maintenance of basic infantry skills will be one use of the thinned habitat areas detailed in the Army's Assessment. The Infantry BCT is organized around battalions of dismounted infantry. Each type of BCT (Light Infantry, Air Assault, or Airborne) has the same basic organization. Infantry BCTs generally consist of two Infantry battalions and one each of Cavalry, Field Artillery, Special Troops, and Support battalions. The Infantry battalions are the main maneuver force and consist of around 650 personnel. Other battalions within the Infantry BCT generally have wheeled and/or tracked vehicles. Detailed below are projections of landscape use on a yearly basis by Infantry BCTs. These projections may change due to evolving combat requirements and situations in war theaters, and they may change due to unit requirements once Infantry BCTs arrive on Fort Hood.

Training Areas 20-25 are anticipated to support 65% platoon-level, 30% company-level, and 5% battalion-level training. Training Areas 30-36 are anticipated to support 20% platoon-level, 45% company-level, 30% battalion level, and 5% brigade-level. Dismounted Infantry missions will consist of 50% day operations and 50% night operations. Combat convoy/logistics patrols (mounted) missions will consist of 80% day operations and 20% night operations. Units will train quarterly on Essential Mission Tasks with training occurring somewhere in TA’s 20-36 thirty-five percent of the time. Training will be conducted year around during all seasons and during all climate conditions. It is anticipated that these areas will be utilized by Infantry BCTs; however, other units from Heavy BCTs, units from Combat Service Support, and National Guard/Reserve units may utilize the developed training landscapes in TA’s 20-36 as well. Examples of expected military training scenarios are provided in Appendix C.

Live- Fire Training

Fort Hood units train with the most modern and sophisticated weapon systems available. Fort Hood uses a Five-Year Range Modernization Program to manage upgrades and expansion of existing facilities and new construction projects to meet future training and evaluation requirements. Live-fire (LF) training is conducted within designated live-fire training areas LF 80-93 and associated permanent dudded (PD areas).

Live-fire Areas and PD94 cover about 24,000 ha in the central portion of the installation, bounded on the east, west, and south by the East Range, West Range, and South Range roads respectively. Direct fire occurs inside these roads, and is directed towards the Artillery Impact Area and other target arrays. Indirect fire from artillery and Multiple Launch Rocket Systems is directed from numerous locations in surrounding maneuver areas. Much of the live-fire area provides a buffer zone for PD94 and has limited impacts from exploding ordnance. The live-fire Areas provide training and evaluation facilities for all individual, crew served, and major weapons systems, up to and including brigade live-fire. These live-fire areas are used by all active units assigned to III Corps and Fort Hood, as well as by attached units from the Army National Guard and the Army Reserve.

Modernized live-fire training facilities require continuous maintenance to maximize range design capability. Sensor devices must be serviced and cleared of concealing vegetation to ensure unimpaired operation. Target arrays must be visible at maximum engagement ranges. A program of range maintenance to routinely clear vegetation from target arrays and sensor devices is a critical component of range operation.

Aviation Training

Fort Hood has one of the largest military aviation commands in the United States. The aircraft, primarily rotary-wing, are some of the most modern and sophisticated in the world. Aviation units on Fort Hood train at all echelons from individual through battalion/squadron.

The training tasks accomplished in the training areas include all tactical maneuvers in accordance with each aircraft's aircrew training manual and the unit's standard operating procedures. This includes nap-of-earth, contour, and low level flight. Altitude of aircraft may be restricted by mission objectives, terrain, vegetation, or man-made features. Fixed-wing aircraft of the Air Force and Air National Guard also conduct training missions in Fort Hood air space and use impact areas on the installation for weapons delivery practice.

Two major airfields are located on Fort Hood. The Hood Army Airfield is a 293 hectare area located at the eastern end of the cantonment area. Hood Army Airfield is the primary airfield for rotary-wing air operations and has a 1,436 meter runway. Robert Gray Army Airfield is an 867 hectare area located at West Fort Hood with a 3,050 meter runway. Several dirt landing strips are located on the installation for tactical air supply and support training.

Aircraft gunnery for AH-64 units is conducted on multi-purpose training ranges and PD94. However, the Crittenberger Range Complex (LF 85-86) is used most often for this training. Hellfire Missile Shots are fired from Blackwell Multi-Use Range into the Impact Area (PD94). Helicopter Door Gunnery is primarily conducted at Dalton Mountain Range (LF 80-82) or Crittenburger Range (LF 85-86) and can be conducted on Browns Creek (LF 83) and Clabber Creek Range (LF 93). National Guard and Army Reserve units use the Dalton-Henson Range Complex for aviation training.

Operational Testing

Fort Hood's large maneuver and live-fire area, coupled with III Corps modernized force, provide excellent conditions for operational testing of various weapons, equipment, and doctrine. The U.S. Army Operational Test Command (OTC) is a tenant activity located at West Fort Hood directly involved in training, doctrine, and combat development of the products that Soldiers use on a daily basis and will use on the future battlefield. Most OTC tests employ "user testing," allowing front-line Soldiers to try out new equipment or concepts. The tests generally encompass activities similar to those described in the sections on maneuver, live-fire, and aviation training.

2) Prescribed Fire

Fire plays an important role in management of endangered species habitat on Fort Hood. Reduction of fuel loads mitigates the threat of crown-fire damage in warbler habitat. Prescribed burning activities provide direct support for the military training mission because units are able to fire weapon systems without interruption (i.e., reduction of "cease fire" orders due to wildfire ignition). Prescribed burns are managed through the Fort Hood NRMB. Fire break maintenance is performed on 135 kilometers (84 miles) of line. Fire breaks are designed to protect warbler habitat and facilitate fire suppression in the event of wildfire. Other objectives of the installation prescribed fire program are to reduce encroachment of Ashe juniper in all range sites and maneuver training sites and grasslands, to improve vegetation composition, and to improve wildlife habitats.

Slash piles have been left on Fort Hood from previous land management activities. These piles are flammable and constitute a fire hazard near warbler habitat because they provide ladder fuels for fire to move into habitat crowns, and they are a firebrand source during wildfires. Piles should be removed either by mulching or by mechanical removal followed by burning.

3) Brown-headed Cowbird Control

Brown-headed cowbird removal is conducted to reduce the incidence of nest parasitism on endangered songbirds (Cornelius et al. 2007). The objective of the control program is to maintain the incidence of cowbird parasitism of vireo nests below 10% annually, averaged over five-year periods. This program implements trapping and shooting activities that target feeding concentrations of cowbirds throughout the installation and cowbird individuals in endangered species nesting habitat. Summers and Norman (2004) provide details on the implementation of the control program. From 2006 to 2009, removal activities were temporarily suspended on the west side of the installation as part of a cessation experiment (Summers 2009). Summers (2014) reports that between March 1 and May 1, 2014, 9,437 cowbirds and 279 non-target birds were captured in cowbird traps. During 2014, the five-year rolling mean nest parasitism observation for vireo nests within cowbird removal regions during 2010–2014 was 6% (n = 1,521; Summers 2014).

4) Juniper Management and Maintenance

On Fort Hood, Ashe juniper management outside of warbler habitat is carried out in several ways. Juniper encroachment into grasslands used for military maneuver is primarily controlled with prescribed burning and woody species management such as juniper cutting. In some locations, juniper encroachment into vireo habitat has been treated with tree shears. These management activities provide benefits to the native flora and fauna species and increase the line-of-sight for military training. In fact, the removal of juniper from vireo habitat could improve the habitat by thinning or removing shrubby species and opening of the mid-story, which is preferred by vireos. Unlike past efforts where non-warbler habitat areas were cleared using heavy equipment (i.e., bulldozers), current efforts are focused on the use of less invasive techniques. Control efforts are allowed up to, but not including, warbler habitat boundaries. All

control efforts and contracts are coordinated through the Fort Hood NRMB to avoid or minimize impacts to warbler habitat.

5) Cattle Grazing

Cattle grazing is permitted on Fort Hood under a lease agreement with the Central Texas Cattlemen's Association. The current lease was signed on April 1, 2015 for a 5-year period. This lease provides grazing opportunities on 80,000 ha of Fort Hood land. The stocking rate is set at 2000 Animal Units for the five-year term of the lease. Grazing is deferred or stocking rate is reduced where forage production fails to meet thresholds that allow for training impacts and land management practices such as prescribed burning. The lease agreement requires the lessee not to impact endangered species, historical, archaeological, architectural, or other cultural features on the installation, and requires compliance with local, state, and Federal water pollution regulations.

6) Recreation

The installation is open to public hunting and fishing. Access is regulated by Range Control and managed by the Directorate of Family and Morale, Welfare and Recreation and the NRMB. Over 80,500 ha are managed for fish and wildlife, including 100 surface ha of lakes and ponds, 88 kilometers of rivers and permanent streams, and 85 kilometers of shoreline access to Belton Lake. In recent years, the installation has provided 90,000 fisherman-days and 45,000 hunter-days annually. White-tailed deer, wild turkey, migratory waterfowl, northern bobwhite, and mourning dove are hunted during restricted seasons. Deer and turkey hunts are carefully controlled. Small game hunting with shotgun is available in accordance with State of Texas seasons and bag limits.

Various low-impact outdoor recreation activities take place at the Belton Lake Outdoor Recreation Area located adjacent to TA 36. These include a swimming beach, camping, boating, trail bicycling, and cottage use. Boy Scout Camps are located in TA 36 and TA 71. Hiking and nature observation activities are also allowed on many parts of the installation and are coordinated through Range Operations. Mountain bike riding is restricted to a designated trail system at Belton Lake Outdoor Recreation Area. No off-road recreational vehicle use is permitted outside of TA111, an area designated for that purpose.

7) Feral hog (*Sus scrofa*) control program

The feral hog program on Fort Hood consists primarily of lethal control methods that include trapping, aerial shooting, and hunting. The most efficient method is aerial shooting. Trapping is also an effective method; however, its success is limited to areas that can be regularly accessed by NRMB staff which excludes live-fire ranges.

8) Management of other Sensitive Species

Fort Hood maintains an active program to monitor, manage, and protect sensitive natural resources and populations occurring on the installation. These include transient occurrences of

endangered whooping cranes and recently de-listed bald eagles, a rare plant *Croton alabamensis*, several species of endemic karst invertebrates, and recently discovered new species of salamander, *Plethodon* sp. The priority for management and protection of other sensitive species on Fort Hood is to minimize factors that could lead to future listing actions for these species. *Croton alabamensis* populations are visited annually to assess population status and monitor potential threats. At this time, these locations are not disturbed by military training activities. Fort Hood has an extensive network of karst features. In the 1990s, extensive faunal surveys identified several endemic karst-associated invertebrates. Fort Hood implemented protective measures, such as gating of caves, to minimize human impacts on these populations. Surveys and mapping of caves are ongoing.

9) Endangered Species Population Monitoring and Research Programs

Populations and habitats of the warbler and vireo on Fort Hood are monitored and managed according to the Endangered Species Management Plan, FY11-16 (Hammer and Hayden 2011) and Integrated Natural Resources Management Plan, FY14-18 (III Corps and Fort Hood 2014). The goal of these action plans is to implement endangered species conservation actions to ensure survival of the species on Fort Hood while maintaining Army mission readiness in manner consistent with Army and Federal environmental regulations. Warbler and vireo population inventory and monitoring and habitat management and protection have been conducted on Fort Hood since the species were listed as endangered.

Appendix B

Examples of Potential Military Training Improvements Projects (MTIPs) 2015-2020 and anticipated take of endangered species habitat expressed in Acres (ac) and Hectares (ha)				
MTIP Projects*	GCWA (ac)	BCVI (ac)	GCWA (ha)	BCVI (ha)
LG1-WSM** Thinning Dismount Lanes	868.7	25.6	351.6	10.4
TA 13 & 14-WSM-Thinning	None anticipated	948.6	None anticipated	383.9
TA 16-WSM-Platoon Battle Run	26.5	None anticipated	10.7	None anticipated
LG2-WSM-Dismount Lanes-Maintenance	79.6	195.6	32.2	79.2
LG 2 & 3-WSM-Thinning	None anticipated	1,792.0	None anticipated	725.2
LG 3-WSM-Dismount Lanes Maintenance	190.1	6.4	76.9	2.6
LG 3-WSM-Thinning	76.6	18.1	31.0	7.3
LG 4-WSM-Thinning	None anticipated	1,574.3	None anticipated	637.1
LG 5/6 WSM-Thinning	464.9	1,133.0	188.2	458.5
LG 7-WSM-Thinning	None anticipated	530.7	None anticipated	214.7
Trail Repairs-Maintenance	195.0	110.6	78.9	44.8
ROW Projects	410.0	200.0	165.9	80.9
3_1 OCAC – Maintenance	None anticipated	3.7	None anticipated	1.5
Hubbard CMPRC Thin Maintenance	250.0	None anticipated	101.2	None anticipated
Crittenberger DMPRC	1,527.0	827.0	618.0	334.7
Blackwell DMPTR	42.0	25.0	17.0	10.1
DAGIR (Areas A,B, & C)	180.0	626.0	72.8	253.3
Henson Mtn DMPTR	41.0	91.0	16.6	36.8
Owl Creek IPBC	40.0	None anticipated	16.2	None anticipated
Wolf Creek ISBC	311.0	8.9	125.9	3.6
Totals	**4,702 ac**	**8,117 ac**	**1,903 ha**	**3,285 ha**

* Many of these MTIPs are in early planning stages and worst-case endangered species habitat take scenarios have been determined. Fort Hood has pledged to make every effort to minimize the adverse effects to the species during the development and planning of each project: moreover, actual take values will be reported to the Service annually.
** WSM = Woody Species Management

Appendix C

Examples of Anticipated Military Training Scenarios

1) Dismounted Infantry Maneuvers.

Units of varying sizes from platoon to brigade will conduct cordon-and-search operations of villages, IED defeat and pursuit of detonator, seek-and destroy operations, attack/ambush operations, high-value target search and retrieval operations, indirect fire (mortars) at targets, hilltop attack/defense, patrols, reconnaissance, and perimeter defense operations using infantry tactics and standards. These operations may entail air or vehicle insertion into nearby areas not part of the training site, but the site will receive mainly Soldiers on foot.

Example: Company size infantry unit conducts air insertion (i.e., use of rotary wing aircraft) into a landing zone at midnight. Unit marches along secondary tank trail to training site, which is a safe house. Unit quietly maneuvers through forest using night vision equipment. Once at the safe house, unit breaks silence to attack enemy and conduct raid to extract high value target. Unit encounters firefights while target is brought to landing zone for extraction.

2) Mounted Infantry Maneuvers.

Units of varying sizes from platoon to brigade will conduct similar operations mentioned for dismounted infantry maneuver. However, the Soldiers will be in wheeled vehicles (HMMWV and Stryker) and tracked vehicles (Abrams tank, Bradley infantry fighting vehicle, and Ml 13 armored personnel carrier) that may be in a convoy or other battle formation. The vehicles will not be in habitat (whether altered or not); they will be in pre-existing tank trails and openings. These pre-existing openings may be pre-planned insertion points and/or ambush points with the actual target or main training event located in the altered habitat. When the training exercise begins and/or elevates, the Soldiers leave the vehicles in pursuit of targets and/or objectives using infantry tactics and standards. The vehicles may or may not be a major part of the exercise (i.e., providing cover and/or suppression fire); however, the exercise will be conducted to meet Army battle doctrine and current theater standards. Units may be part of an Infantry Brigade Combat Team (BCT), Heavy BCT, or Stryker BCT.

Example: Brigade size unit from Infantry BCT conducts daytime cordon-and-search operations in an enemy village that has a major intersection of five roads. The unit must travel to a mesa top from a valley to reach the village. Near the village, infantry troops dismount and search the village while Bradley Infantry Fighting Vehicles (IFVs) and up armored Humvees provide support and security. IEDs detonate at the road intersection and the Soldiers are ambushed and become involved in a firefight. Bradleys and Humvees use weapon systems to provide suppressing fire for infantry troops. Additional mounted infantry units are quickly assembled from a nearby outpost to help neutralize the situation and finish the operation.

3) Mounted combined arms maneuvers.

Units of varying sizes from platoon to brigade will conduct similar operations mentioned for (dis)mounted infantry maneuvers. However, the main mission of the unit is the use of vehicle mounted weapons firing systems and vehicle maneuvers to conduct operations according to Army battle doctrine and current theater standards. Units from different branches (e.g., armor, artillery, aviation, infantry, engineer, and military police) combine and use available assets to conduct operations. Units are part of Heavy BCT or Stryker BCT.

Example: Heavy BCT conducts seek-and-destroy operation at 3 a.m. in a village that has a safe house of 30 enemy combatants. Abrams tanks, Bradley IFV, and up armored Humvees with rotary wing support from Apaches and aerial surveillance from unmanned aerial vehicles maneuver, seeking the safe house. Once identified, they attack safe house with all assets. Some combatants escape and are pursued by dismounted infantry and vehicles; the combatants are eventually destroyed. Aerial medical evacuation is conducted for wounded Soldiers and damaged tank is retrieved using Hercules recovery vehicle.

4) Mounted patrols.

Units of varying sizes from platoon to brigade will conduct convoy operations using wheeled vehicles (HMMWV, fuel HMMT, heavy equipment transporter, Stryker); however, there may be tracked vehicles interspersed. Training sites, such as IED, defeat and reaction, villages, and ambush sites will occur along the convoy route. Units are mostly military police or support elements (signal, military intelligence, transportation, medical, etc.) for BCTs.

Example: At dusk, fuel and transportation units from Brigade Support Battalion are using main supply route that connects two support areas. Mine resistant ambush protected vehicles from escort unit detect and dismantle an IED. One kilometer later, an IED is detonated and the unit is ambushed. Enemy forces are observed fleeing into a valley. The unit calls in artillery and air support. After the valley is softened with ordnance, a quick reaction force from the escort unit conducts final attack and mop-up.