2019 Revision

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

MISSISSIPPI ARMY NATIONAL GUARD
CAMP SHELBY JOINT FORCES TRAINING CENTER

Prepared for:

HEADQUARTERS
MISSISSIPPI ARMY NATIONAL GUARD

Prepared by:
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March 2019

EXECUTIVE SUMMARY

The purpose of this Integrated Natural Resources Management Plan (INRMP) is to update, review, and implement plans for the natural resource programs at Camp Shelby Joint Forces Training Center (CSJFTC) that is consistent with military training and uses. The plan includes CSJFTC operations from 2012 through 2017 and provides a solid foundation on which to build the program beyond the year 2017.

The plan ensures the MSARNG achieves its goals to ensure the sustainability of desired military training areas and maintenance of ecosystem viability. This INRMP will allow CSJFTC to achieve its goals to ensure the sustainability of desired military training area conditions and maintain ecosystem viability. In addition, this INRMP will ensure that natural resources conservation measures and Army activities on MSARNG lands are integrated and are consistent with federal stewardship requirements.

The original INRMP established plans to manage natural resources on CSJFTC training sites from 2001 through 2006. The revised INRMP provides assessments and revisions of management plans and goals established by the original documents.

This INRMP has been prepared pursuant to the Sikes Act Improvement Act (SAIA), 21 Mar 97 US Army policy entitled *Army Goals and Implementing Guidance for Natural Resources Planning Level Surveys (PLS) and Integrated Natural Resources Management Plan (INRMP) ("Army INRMP Policy*"); Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*; 32 Code of Federal Regulations (CFR) 651; Defense (DoD) Directive 4700.1, *Natural Resources Management Programs*; and Department of Defense Instruction (DoDI) 4715.3, *Environmental Conservation Program*; and National Guard Bureau (NGB) policy.

Updated guidance regarding INRMP reviews was issued 01 November 2004 by the DoD. DoD policy emphasizes that INRMP review is intended to determine whether existing INRMPs are being implemented to meet the requirements of the SAIA and contribute to the conservation and rehabilitation of natural resources on military installations. DoD policy also requires installations to review INRMPs annually in cooperation with the other cooperative parties to the INRMP (USFWS and State Fish and Wildlife Agency). As required by the SAIA, this INRMP has been developed in cooperation with the United States Fish and Wildlife Service (USFWS) and the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) no less frequently than every five (5) years; all cooperative parties (MSARNG, NGB, USFWS, and MDWFP) must complete a review.

Currently, the following natural resources programs are being implemented at CSJFTC:

- Forest and Fire Management
- Fish and Wildlife Management
- Land and Water Management (including Storm Water and Water Quality Control; Floodplain and Riparian Zone Management; Wetland and Aquatic Habitat Management; Invasive and Exotic Species and Noxious Weeds; Integrated Pest Management; Threatened and Endangered Species; Grounds Maintenance, Landscaping, and Urban Forestry; and Erosion Control and Soil Conservation)
- Outdoor Recreation and Public Access
- Land Use, Land Planning, and Natural Resources Management

SIGNATURE PAGE

Integrated Natural Resources Management Plan
Camp Shelby Joint Forces Training Center
Forrest and Perry Counties, Mississippi

March 2019

This updated Integrated Natural Resources Management Plan (INRMP), with National Environmental Policy Act review (Record of Environmental Consideration) meets the requirements for INRMPs as specified in the Sikes Act Improvement Act (SAIA) (16 USC §670a *et seq.*). It has set appropriate and adequate guidelines for conserving and protecting the natural resources of the Camp Shelby Joint Forces Training Center.

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Annual Review and Coordination Signature Page

Updated Integrated Natural Resources Management Plan
and
Record of Environmental Consideration
Camp Shelby Joint Forces Training Center
Forrest and Perry Counties, Mississippi

In accordance with Army National Guard Integrated Natural Resources Template format and content as identified in Title 32, Code of Federal Regulations, Part 190, this attached signature page will be utilized to record the signatures of the Supervisor, United States Fish and Wildlife Service, and the Mississippi Department of Wildlife, Fisheries, and Parks. Signatures are to be recorded on a yearly basis, after annual review and comment is completed by the agencies identified within the table.

REVIEWED BY:	REVIEWED BY:	REVIEWED BY:
Mississippi Army National Guard	U.S. Fish and Wildlife Service	Mississippi Department of Wildlife, Fisheries, and Parks
Date	Date	Date
REVIEWED BY:	REVIEWED BY:	REVIEWED BY:
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1.0 Camp Shelby

1.1 Historic Overview

Camp Shelby was first established in 1917 and served as a training center during World War I. National Guard Troops from Indiana, Kentucky, and West Virginia moved to Camp Shelby to form the nucleus of the 38th Army Division. During World War I there were about 36,000 troops stationed at Camp Shelby training center. Camp Shelby was deactivated following World War I and the government military land was sold to Mr. Ralph Jackson who had plans to subdivide the property. However, the 1929 depression created a vacuum in real estate and his plans to subdivide the property did not occur. He was left with extensive property and a heavy tax load.

In 1934, the State of Mississippi acquired a portion of Mr. Jackson's holdings (approximately 15,000 acres) for use as a summer camp by the National Guard. Today, a large portion of the State owned lands comprise what is now identified as the Camp Shelby Cantonment Area, with the remainder being in the Paul B. Johnson State Park. During this same time period, the Clarke-McNary Amendment to the 1911 Weeks Law made possible for the first time for the USDA-FS to purchase land for growing timber and watershed protection. Soon after the Clarke-McNary Act became Law, the Chief of the USDA-FS made an extensive survey for possible sites to establish National Forest Purchase Units. In Mississippi, there were large tracts of land that had been cutover and in desperate need of restoration and reforestation. These conditions lead to the establishment of several National Forest Purchase Units in Mississippi and the establishment of the National Forests in Mississippi. The largest National Forest Purchase Unit in Mississippi was the Leaf River Purchase Unit. This Unit included privately held lands that were previously utilized by Camp Shelby during World War I. The Leaf River Purchase Unit was approved by the National Forest Reservation Commission on 30 August 1933. Land in Forrest, Perry, Greene, and George Counties were included within the original Leaf River Purchase Unit boundaries. The Purchase Unit included Mr. Ralph Jackson's property (land formally owned by the government and utilized by Camp Shelby during the World War I era). The National Forest Reservation Commission purchased the remaining portion of Mr. Jackson's property that was not included in the 1934, State of Mississippi, land acquisition for Camp Shelby. In 1935, pursuant to a special Act of Congress, the Secretary of Agriculture sold to the State of Mississippi several thousand acres for use by the National Guard.

The De Soto National Forest and Camp Shelby (National Guard) Training Site were both established at about the same time on lands that have historically been utilized for military training purposes. Because of this common land heritage, they share a common tradition of providing for the military training needs of our Nation that dates back to the mid-1930's and continues today. Beginning in 1938 land on the De Soto National Forest adjacent to Camp Shelby was utilized for maneuver training. In September 1940, Camp Shelby was commissioned back into federal service as the Nation geared up for World War II. In 1940, as part of the military buildup, Congress again authorized the Secretary of Agriculture to transfer about 64,000 acres of National Forest land (portions of the Leaf River Purchase Unit) in Forrest and Perry Counties to the War Assets Administration. These two transactions together with about 15,000 acres of State and private owned land became known as Camp Shelby.

During World War II Camp Shelby contained approximately 360,000 acres and an additional approximate 400,000 acres were leased for maneuver space. During World War II nearly all of the De Soto National Forest was utilized for military training activities. At one time the population exceeded 100,000 troops, making Camp Shelby one of the largest training centers in the world. After the war, however, the post again closed and the War Assets Administration sold the federally-owned property. In 1946, the National Forest land title was returned to the USDA FS. The first transfer of approximately 5,500 acres purchased by the State of Mississippi is still owned and operated by the MSNG. During the Korean Conflict, Camp Shelby was again called upon to provide military training support to the Nation. Camp Shelby was developed as an Emergency Railhead Facility. In 1958, the Continental Army Command designated Camp Shelby as a Permanent Training Site, directed by the Third Army Headquarters. The 199th Light Infantry Brigade trained at Camp Shelby in 1966 prior to their overseas deployment to Vietnam. During Operation Desert Shield/Desert Storm, in 1990-1991, Camp Shelby served as a Mobilization Station. Camp Shelby had selected units, not previously designated in the partial mobilization package, to mobilize at Camp Shelby as part of its role for Operation Desert Shield. Camp Shelby's mission during Operation Desert Shield was to receive, house, support, train, and prepare for deployment of twelve units. All twelve of these were National Guard and Reserve units. Over 4,300 personnel were mobilized at Camp Shelby for Operation Desert Shield. During the final stages of Operation Desert Storm, Camp Shelby's mission was to demobilize the 155th Armored Brigade upon their return to Camp Shelby.

1.2 Location and Size

The CSJFTC is located in southeastern Mississippi (MS) less than 10 miles south of Hattiesburg, a regional center for government services and business in South Mississippi. Approximately 132,195 acres: 7,927 acres of CSJFTC are owned/managed by the state of Mississippi, 7,268 acres are owned by the DOD, and the USFS has jurisdiction over roughly 117, 000 acres (Figure 1, Camp Shelby Property Ownership Map). This INRMP addresses integrative management on all DOD and State lands. Cooperative management initiatives between the USFS and MSARNG are also addressed.

The area surrounding CSJFTC is predominately rural, and approximately 90% are classified as woodland. This is primarily due to the U.S. Forest Service and the DeSoto National Forest. There are approximately 15 small communities including the towns of New Augusta, Beaumont, and McLaurin. Hattiesburg is approximately 10 miles northwest of CSJFTC. Most of the development follows US Highway 59 to the west and US 98 to the north of the installation. Hattiesburg is the County Seat of Forrest County, and New Augusta is the County Seat of Perry County.

CSJFTC is located within the historic range of the longleaf pine-bluestem ecosystem of the East Gulf Coastal Plain. Uplands of this area are dominated by well-drained, sandy soils. Early naturalists, such as William Bartram, reported a preponderance of open, park like forests of longleaf pine with grass-forb dominated ground cover in the 1700's and 1800's. Interspersed in open longleaf pine forests were hardwood forests of stream and river floodplains and wetlands and seepages dominated by a diversity of orchids, pitcher plants, and aromatic shrubs (The

Nature Conservancy 2001). The pre-European settlement longleaf pine forests were maintained by naturally-occurring and human-set fires (Smith 1996). Surveys conducted in 1993-1995 estimated that over 70% of the forested lands at CSJFTC were comprised of longleaf pine and longleaf pine-hardwood forest. Today, longleaf pine forests and the associated ecosystems are of great importance from an ecosystem management perspective due to the rarity of these ecosystems in the state and the high number of indigenous protected and rare species.

CSJFTC is composed of property belonging in four different categories; DOD, State, United States Forest Service (USFS) and Private Land (Figure 1). The DOD and state lands are managed by the MSARNG in support of the military mission. Private land is leased to MSARNG from the landowners for military use, which in most cases includes low impact training in those areas. The main part of CSJFTC's training area belongs to the USFS and is operated under a Special Use Permit from the USFS granted in 2007 for 20 years. In 2007, the Final Environmental Impact Statement for Renewal of Special Use Permit on the DeSoto National Forest and Implementation of Installation Mission Support Activities at Camp Shelby, Mississippi was completed to allow military training to continue on National Forest Lands. The USFS still is the land manager for these lands. The MSARNG has a long-term partnership with the USFS at CSJFTC assists both agencies in meeting the training, natural, and multiple use missions of each agency. This partnership includes areas of natural resources to assist both agencies in meeting regulatory requirements and management goals. This should also enhance the overall ecosystem management at CSJFTC.

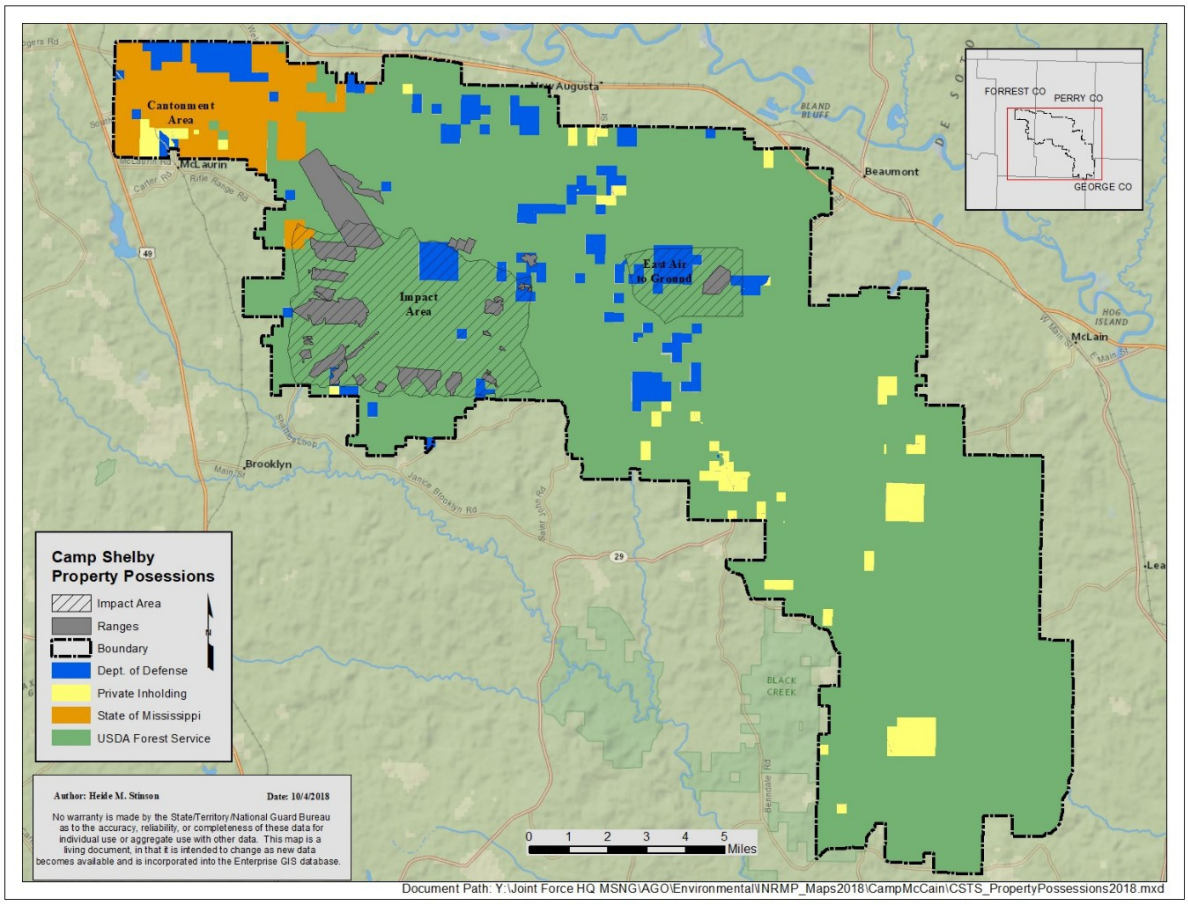

Figure 1. Camp Shelby Property Possessions

1.3 Transportation and Access

Camp Shelby's road system consist of approximately 160 miles of paved roads near the reservation, 360 miles of well-established gravel roads, and an extensive network of tank trails, unimproved dirt roads and trail ways. In addition to the roads, CSJFTC has two railway systems and two airfields. The Southern Railroad, under the Amtrak system, connects Hattiesburg with Meridian MS, providing east/west service. The Mid-South Railroad runs through the Cantonment Area, providing north/south connections to Jackson, MS and Mobile, AL. A spur connects this railroad to the Camp Shelby Railhead. The installation's Hagler Army Airfield has 32 hard-surfaced helicopter landing pads, a control tower that is operational during AT, maintenance shops, two hangars, fire equipment, and a 5,000' paved runway capable of handling a C-130 cargo aircraft. Hagler Airfield is currently used as a training facility for the Unmaned Aerial Systems (UAS). The Camp Shelby C-17 Assault Airstrip consists of a 3,500-foot x 90-foot hard surface, marked and lighted runway with 600-foot x 90-foot overruns, associated taxiway and parking ramp for 2 aircraft, and an approximate 8,000 square foot building. The C-17 Assault Airstrip is currently capable of handling the C-130 cargo aircraft as well. A dirt airstrip located in the Drop Zone (DOD Block 11) is restricted to UAS traffic. A paved airstrip in DOD Block 18 is utilized as a training facility for UAS as well. A grass airstrip at Barron is open to fixed-wing aircraft and helicopters. 0ff-post aviation facilities include the following:

1. The Hattiesburg/Laurel Regional Airport north of Hattiesburg has a 6,500' lighted runway, and provides 24-hour commercial air service to the area.
2. Bobby Chain Municipal Airport has a 6,200' asphalt runway with a 60,000 lb. capacity that is operational during daylight hours.
3. Richton Airport with a 3,000' runway and limited facilities.
4. Griffen Memorial Airport at Wiggins with a 3,000' paved runway and limited facilities.

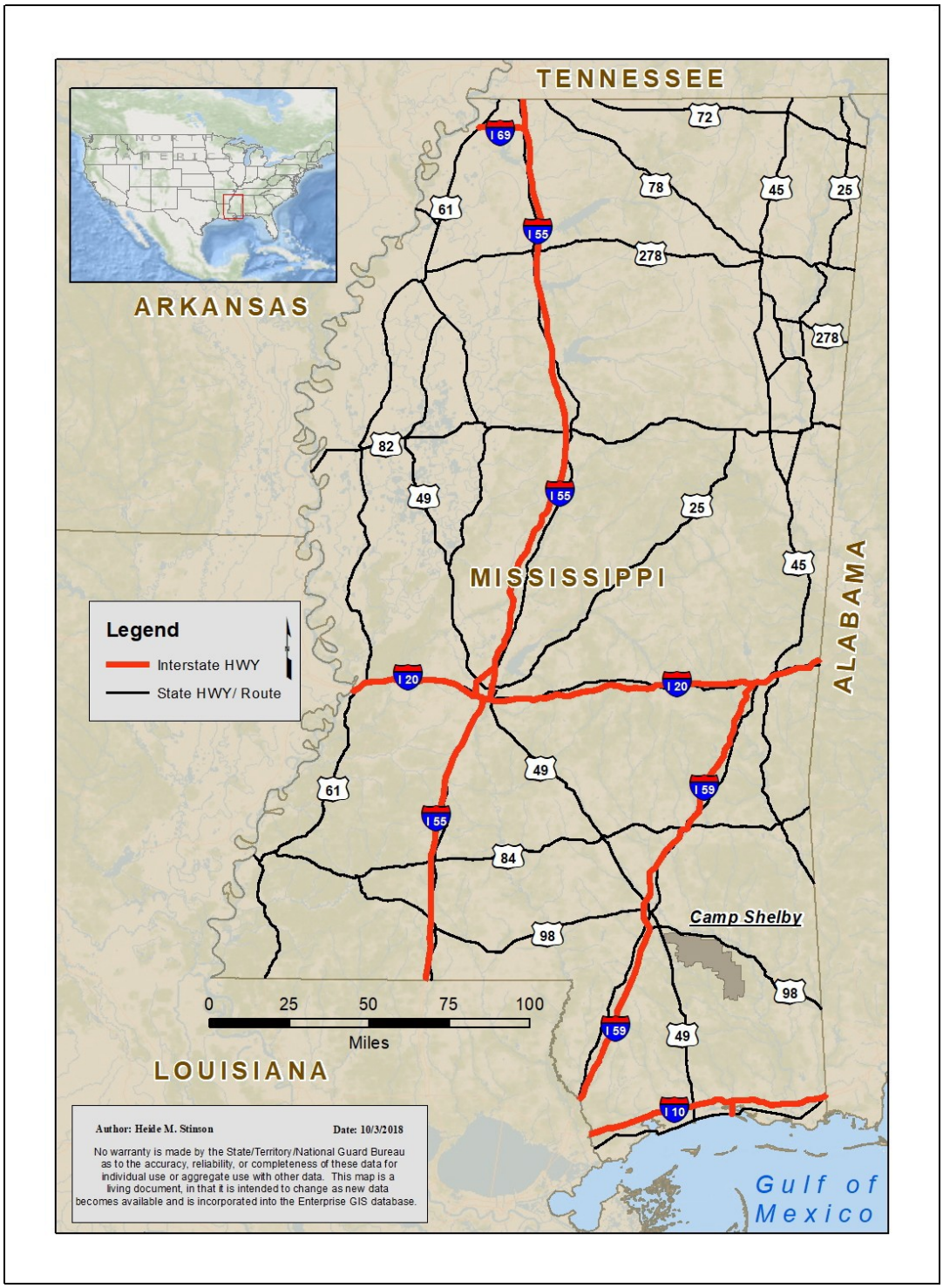

Figure 2. Camp Shelby Vicinity Map

1.4 Military Mission

The CSJFTC is located in southeastern Mississippi (MS) less than 10 miles south of Hattiesburg, a regional center for government services and business in South Mississippi. Armor and Artillery Brigades from three states (Alabama, Mississippi, and Tennessee) primarily train at Camp Shelby. In addition to units from these states, other units from the National Guard, the Army Reserve, the Air National Guard, the Air Force, the Active Army, the Marines, and the Seabees or units from US Territories and others train at Camp Shelby.

The NGB has designated the CSJFTC as a Maneuver Training Center-Heavy (MTC-H), and U.S. Army's Forces Command (FORSCOM) has designated the installation as a Power Support Platform (PSP) in accordance with FORSCOM Regulation 500-3-1, *FORSCOM Mobilization and Deployment Planning System*. The regulation applies to Active Duty, National Guard, Army Reserve units and personnel. The CSJFTC provides administrative, engineering, logistical, training and operational services support to assigned, attached, and transient or tenant units and joint forces activities for up to and including a brigade-sized element. As a mobilization PSP station, the CSJFTC trains and strategically deploys individuals from all services, the civilian force and mobilized reserve components.

In 2009 Camp Shelby was designated by FORSCOM a Power Projection Platform (PPP). By definition PPPs provide Active Component and Reserve Component power projection, combat preparation and sustainment capabilities. PPPs provide the mobilization, life support, training, maintenance and deployment infrastructure to support an additive Brigade-level unit and any required set(s) of equipment. PPPs support Reserve Component Annual Training, Functional, training, mobilization, deployment / redeployment operations with proximate rail and air facilities that meet throughput requirements. The PPPs are capable of hosting Combat Training Center external training events. The significance of becoming a PPP means that units mobilizing at PPPs do not have to go elsewhere (National Training Center or Joint Readiness Training Center) to complete their mobilization training. They can conduct all training at their 1 mobilization center if it is a PPP and deploy from that location.

1.5 Training

Training activities at CSJFTC primarily include troop bivouacking, wheeled vehicle maneuvers, artillery firing exercises, and tank training maneuvers by M-1 Tanks and the Bradley Fighting Vehicle. During periods of tank and artillery fire, approximately 30,000 acres are temporarily closed to public access. Of that, about 13,500 acres are permanently closed to public access due to artillery contamination.

1.6 The Relationship between the Military and Natural Resources

Ongoing military operations performed in support of the mission at Camp Shelby alter the effected environment and condition of the natural resources. For example, construction of force protection berms, ditches, foxholes, and roads result in vegetation loss and inversion, compaction, and erosion of the soils. Although short-term changes in the effected environment may still provide for relatively realistic training opportunities, the absence of long-term management measures to properly conserve and restore natural resources might impede Camp

Shelby's ability to continue to adequately train soldiers. It is the goal of this plan to ensure that there is no net loss of capability at Camp Shelby to support the military mission. In addition to the impacts mentioned above, environmental damage can also place other artificial constraints on training, such as the following:

- Loss of training acreage
- Decreased tactical maneuverability
- Increased land and natural resource maintenance costs
- Increased safety hazards

The trainers and soldiers who use CSJFTC are being trained to be aware of the environmental effects of training and recognize that their actions in the field directly affect the long-term sustainability of the training lands and their ability to continue training. Training the leaders and soldiers to understand their environmental stewardship responsibilities can help to prevent environmental degradation during training activities. Implementing appropriate management measures, as well as considering alternatives to these measures as they are developed, limits the potential for serious alteration to the natural resources that are critical to providing a realistic training environment. In addition, such measures likely result in a more effective long-term approach to natural resource protection and conservation.

The primary mission of CSJFTC is to train U.S. Army soldiers (National Guard and Reserve) for combat and combat-related missions. Environmental initiatives are important but should be managed so as not to inhibit meeting military requirements. However, it is important to consider limitations due to the presence of naturally occurring resources that cannot be altered, as well as those limitations resulting from natural resources that have already been affected.

Existing natural resources on Camp Shelby lands might influence the manner in which the CSJFTC mission is executed. Although natural resources provide a realistic training environment for training mission requirements, their existence also has the potential to limit the conditions under which certain training activities are conducted. For example, topographic features of the land or the presence of wetlands or threatened and endangered species may prevent military activities, such as construction, digging, maintenance, and force protection, from occurring due to the potential for adverse impacts on those sensitive resources. In addition, any permanent degradation of natural resources as a result of ongoing military use would, in turn, ultimately lead to further training impairment should realistic training conditions no longer be available. Therefore, not only is the proper management of natural resources and their use by the military a sound environmental practice, but it also directly supports Camp Shelby's mission to provide a realistic training environment.

1.7 Description of Training Site

1.7.1 Cantonment Area

Camp Shelby consists of three segments, the Military Reservation, Ranges and the Maneuver Areas. The Military Reservation, commonly referred to as the Cantonment Area, is an approximate 7,901-acre developed area containing support facilities and buildings. Located on the western edge of CSJFTC approximately 1.5 miles from U.S. Highway 49, it is owned by the

state of Mississippi. The Cantonment Area includes administration buildings, storage facilities, barracks, Close-In Training Area, gas chamber, Nuclear Biological Chemical training facility, TOW Dragon tracking range, a Mobile Conduct of Fire Trainer for training tank crews, and a Training Set Fire Observation facility for training forward observers for indirect fire weapons.

1.7.2 Maneuver Area

The CSJFTC Range and Maneuver Areas consists of approximately 124,294 acres. The Range Area consists of firing ranges and impact areas. There are three impact areas on CSJFTC. The large impact area to the western edge of the training site, the Air to Ground East Range, and several small ranges, Proficiency courses, maneuver areas, tracked vehicle maneuver areas, and bivouac sites are located in the Maneuver Area. The large range impact area is approximately 4,600 acres. An additional 8,900-acre safety zone, in which the majority of the small firing ranges are located, surrounds the impact area and is closed to the public. The majority of the Range and Maneuver Area is in the DeSoto National Forest, with <1% being leased from private landowners. As governed by the USFS SUP, military training activities will take place on specified portions of the DeSoto National Forest. The USFS and MSARNG work cooperatively to manage natural resources of the Operational Area through requirements of the SUP. The Operational Area is considered to be to the training/maneuver area to include the ranges.

Table 1. Camp Shelby Range Descriptions

Range Descriptions	
3 UAC	Urban Assault Course (UAC) Non-Live Fire Shoot house
3-A LFSH	Live Fire Shoot House
3-B Reflex/Stress	M203 Familiarization Course/Grenadier Range
3-C LFBF	Live Fire Breach Facility
39 MPRC	Stabilized and Un-stabilized Gunnery Table III-XII, Convoy Live Fire, Aerial Gunnery, and Laser
5 Basic 10/25M	25 meter Course C Qualification/Zero, tube-launched, Optically-tracked, wire-guided anti-tank missile (TOW) practice firing
6 HGR	Live Throw/Practice Hand Grenade Range
6-A DEMO	Demolition training with charges up to 320 pounds
8 Basic 10/25M	25 meter Course C Qualification/Zero, Laser range
12 Basic 10/25M	M-18 Claymore Familiarization Course, Non-Lethal Weapons, Mortar Direct Lay, 10-25 Meter Zero Course, Reflex/Stress Fire Range
13 Mortar Range	TOW Target Practice-Training (TP-T), Laser, Mortar Direct Lay

14-A FA Direct Fire	Artillery direct fire
14-B/C Basic 10/25M	Machine Gun Familiarization Range
18 MPTR	Stabilized and Un-stabilized Gunnery Tables III – VI , Laser, MK 19 Qualification 40 mm TP, Sniper
19 ISBC	Infantry Squad Battle Course (ISBC)
40 MPTR	Multipurpose Platoon Live Fire Assault Course
41 MPTR	Stabilized and Un-stabilized Gunnery Table III-VI, Convoy Live Fire, and Laser
42-A CPQC	Combat pistol qualification
42-B ISBC	Infantry Squad Battle Course, Sniper
43-A MPMG	Machine gun transition course for ground mounted
43-B/C/D MPMG	Machine gun mounted and dismounted, 10 meter, Sniper, .50 cal qualification
45 MPTR	Stabilized and Un-stabilized Gunnery Tables III-VI, Laser
46-A LAW/AT-4	Familiarization firing for 66mm, 84mm, 40mm HE/TP
46-B GLR	Grenade Launcher Qualification
47-A MRF	Record fire qualification
47-B Basic 10/25M	10-25 meter Course C Qualification/Zero
48-A MRF	Record fire qualification
48-B Basic 10/25M	25 meter Course C Qualification/Zero
49 MRF	Record fire qualification. 25 Meter Course C Zero/Qualification
50-B CP/MP Firearms QR	25/50 yard Pistol firing line Qualification/Familiarization
50-C KD	25 meter Course C Qualification/Zero. 100 – 400 Yard Known Distance
50-D KD	25 meter Course C Qualification/Zero. 100-600 Yard Known Distance
201W Aerial Gunnery	Helicopter Door Gunnery Course
202E Aerial Bombing	Rotary and Fixed Wing Gunnery and Bombing (Practice Range)

CACTF	Combined Arms Collective Training Facility. Non-Lethal, Simunititons, and Blank Fire MOUT Training Facility
Camp Bobcat	Prisoner of War Detention Training Non-Lethal, Simunitions, and Blank Fire Facility

2.0 Land Use

2.1 Land Use Introduction

Camp Shelby consists of three segments, the Military Reservation, Ranges and the Maneuver Areas. The Military Reservation, commonly referred to as the Cantonment Area, is an approximate 7,901-acre developed area containing support facilities and buildings. Located on the western edge of CSJFTC approximately 1.5 miles from U.S. Highway 49, it is owned by the state of Mississippi. The Cantonment Area includes administration buildings, storage facilities, barracks, Close-In Training Area, gas chamber, Nuclear Biological Chemical training facility, a Mobile Conduct of Fire Trainer for training tank crews, and a Training Set Fire Observation facility for training forward observers for indirect fire weapons.

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The area surrounding CSJFTC is predominately rural, and approximately 90% is classified as woodland. This is primarily due to the U.S. Forest Service and the DeSoto National Forest. There are approximately 15 small communities including the towns of New Augusta, Beaumont, and McLaurin. Hattiesburg is approximately 10 miles northwest of CSJFTC. Most of the development follows US Highway 59 to the west and US 98 to the north of the installation. Hattiesburg is the County Seat of Forrest County, and New Augusta is the County Seat of Perry County.

2.2 Ecological Setting

2.2.1 Biologically Noteworthy Areas

Currently, there are 21 areas proposed for protection on CSJFTC. Criteria used to characterize these areas, as well as location, ownership, state and federally-listed plants and animals, and other features are listed in this paragraph. MDWFPP has requested that the MSARNG list these areas on the Mississippi Register of Natural Areas.

These areas are proposed for protection, and protective measures for these areas are site specific, and are dependent on the criteria for listing and the natural community in which it is located. Specific management recommendations for the communities present within the 21 biologically noteworthy areas are included in this paragraph.

Biologically noteworthy areas are characterized by one or more of the following criteria:

1. Viable population of state/federal-listed plants or animals.
2. High quality example of a characteristic natural community or communities. Evaluation factors include diversity, evidence of appropriate management, historyof low impact timber harvest, intact ground cover, few if any roads, and absence of "scars" such as rubbish disposal, excavations, pipelines, power lines, and weedy exotic species.
3. Vegetation association (natural community) not typical to CSJFTC or the Pine Hills Region, and containing distinctive associations of plants and/or listed species.
4. Older or mature timber in relatively undisturbed natural community.
5. Newly detected, endemic, or geographically isolated species to Mississippi that are candidates for federal/state listing.
6. Newly detected or distinct natural communities with distinctive species and/orspecies at their range limits.
7. Rare and/or high quality wetland communities and riparian corridors connecting sensitive wetlands.
8. Areas of ecological fragility that would not support certain types of training and/or logging activity.
9. Corridors connecting larger, biologically-diverse areas.
10. Buffer habitat surrounding sites that support listed species, high qualitynatural communities, physical features, wetlands, or other sensitive areas.
11. Unusual (for south Mississippi) landscape features, soil associations or series, geologic formations, and other unexpected landforms.

The following are areas considered to be biologically noteworthy. These areas exhibit high diversity and unique associations of native flora and fauna. Conservation of these areas requires ecosystem and landscape level management and will be accomplished through cooperative efforts of multiple land owners and managers, including universities, USFS, MDWFP, and MSARNG.

RAGLAND HILLS

Location: CSJFTC Training Area 2; USFS Compartment 110

Ownership: USFS, USM, and Private

Plants: *Carex impressinervia, Carex picta, Stewartia malacodendron, Rhaphidophyllum hystrix, Epigaea repens*

Animals: Red salamander, Gopher tortoise

Other noteworthy features: Deep ravines with mixed pine-hardwood slope forest; high botanical diversity, used for USM research

DENHAM CREEK

Location: CSJFTC Training Area 10, USFS Compartment 76, 77, 92

Ownership: USFS and DOD

Plants: *Dryopteris ludoviciana, Lindera subcoriacea, Peltandra sagittifolia, Juncus gymnocarpus, Melanthium*

virginicum, Stewartia malacodendron, Epigaea repens

Animals: Gopher tortoise

Other noteworthy features: Springs and seepages; old growth bottomland loblolly pine and sweetbay timber

MILKY CREEK RAVINES

Location: CSJFTC Training Area 11; USFS Compartment 75, 76

Ownership: USFS and DOD

Plants: *Schisandra glabra, Rhapidophyllum hystrix, Cornus alternifolia, Stewartia malacodendron, Epigaea repens,* tentative type locality for *Agrimonia microcarpa*

Animals:

Other noteworthy features: Old growth mixed mesophytic hardwoods on steep slopes, deep ravines, old growth shortleaf pine

DICKEY CREEK HEADWATERS

Location: CSJFTC Training Area 13 and Training Area (T-) 28, USFS Compartment 55, 56, 57
Ownership: USFS and DOD

Plants: *Parnassia grandifolia, Melanthium virginicum, Agalinis aphylla, Cleistesiopsis oricamporum, Xyris scabrifolia, Rhynchospora stenophylla, Agrimonia incisa*

Animals: *Fallicambarus gordoni*, Gopher tortoise

Other noteworthy features: Excellent pitcher plant seepages on lower slopes: pitcher plant flats, boggy wetlands

UPPER DAVIS CREEK

Location: CSJFTC Training Area 14, 15, USFS Compartment 112, 108

Ownership: USFS and Private

Plants: *Chamaecyparis thyoides*

Animals: Rafinesque's big-eared bat

Other noteworthy features: Excellent pitcher plant seepages on lower slopes: pitcher plant flats, boggy wetlands

PEARCES CREEK and ASSOCIATED UPLANDS (including wooded area within impact area adjacent to Red Hill Road)

Location: CSJFTC Training Area 24, 30, 31, Impact Area Buffer, USFS Compartment 78, 90, 91

Ownership: USFS and Impact Area Buffer Zone, DOD

Plants: *Isoetes louisianensis, Lindera subcoriacea, Agrimonia incisa, Ilex amelanchier, Melanthium virginicum, Peltandra sagittifolia, Agalinis aphylla, Macranthera flammea, Chrysogonum virginianum, Botrychium alabamense*

Animals: Historic red-cockaded woodpecker colony, Gopher tortoise, Bachman's sparrow

Other noteworthy features: Pitcher plant seepages, high quality longleaf pine communities

REDHILL BRANCH

Location: CSJFTC Training Area 33, USFS Compartment 73, 74

Ownership: USFS

Plants: *Pinguicula primuliflora* (possibly best population in US), *Botrychium alabamense, Utricularia purpurea, Macranthera flammea, Peltandra sagittifolia*

Animals: Historical Red-cockaded woodpecker colony

CYPRESS CREEK

Location: CSJFTC Training Area 28, 34, 39, USFS Compartment 54, 60, 61, 62, 63

Ownership: USFS and DOD

Plants: *Panicum nudicaule, Xyris drummondii, Xyris scabrifolia, Macranthera flammea, Agalinis aphylla, Calopogon barbatus, Platanthera blephariglottis, Platanthera integra, Plantanthera*

cristata, Rhynchospora macra, Rhynchospora stenophylla, Cleistesiopsis oricamporum, Ilex myrtifolia, Ilex amelanchier

Animals: Camp Shelby burrowing Crayfish, historical Red-cockaded woodpecker colony, Black pine snakes, Scarlet snake, Scarlet king snake, Eastern diamondback rattlesnake, Southeastern shrew, Gopher tortoise

Other noteworthy features: Large expanse of pitcher plant flats and shrub lands, good quality longleaf pine communities

GRAPEVINE ROAD SOUTH

Location: CSJFTC Training Area 43, USFS Compartment 114

Ownership: USFS

Plants: *Isoetes louisianensis, Ruellia pinetorum, Sorghastrum apalanchicolense, Cleistesiopsis oricamporum*

Animals: Eastern diamondback rattlesnake

Other noteworthy features: Pitcher plant flats, representative longleaf pine uplands

GOPHER TORTOISE REFUGE

Location: CSJFTC Training Area 44, USFS Compartment 102, 103

Ownership: USFS and DOD

Plants: *Parnassia grandifolia, Agalinis aphylla, Macranthera flammea, Melanthium virginicum*

Animals: Gopher tortoise, Black pine snake, Eastern diamondback rattlesnake, historical Red-cockaded woodpecker colony

Other noteworthy features: large contiguous block of regularly- burned longleaf pine in several community types, hill side seeps and 3 creek drainages with unusual peaty wetlands; site already has a special designation regarding use of tracked vehicles

HOWARD REED BRAKE

Location: CSJFTC Training Area 50, 51, USFS Compartment 70, 69

Ownership: USFS and DOD

Plants: *Lindera subcoricea, Melanthium virginicum, Peltandra sagittifolia, Agalinis aphylla*

Animals: *Fallicambrus gordoni*, historical Red-cockaded woodpecker colony

Other noteworthy features: Pitcher plant flats, bog stream heads

JOES CREEK

Location: CSJFTC Training Area 52, USFS Compartment 40, 120, 32, 41, 31, 29

Ownership: USFS

Plants: *Isoetes louisianensis, Melanthium virginicum, Agrimonia incisa*

Animals: Black pine snake, Rafinesque's big-eared bat, historical Red-cockaded woodpecker colony, Eastern coral snake, Southeastern shrew, Mobile crayfish

Other noteworthy features: High quality bottomland hardwoods

HICKORY FLAT

Location: CSJFTC Training Area 56, USFS Compartment 44, 27

Ownership: USFS

Plants: *Isoetes louisianensis, Nymphoides aquatica, Melanthium virginicum*

Animals: Historical Red-cockaded woodpecker colony, Southeastern shrew, Eastern diamondback rattlesnake, Bachman's sparrow, Scarlet snake

Other noteworthy features: Good quality longleaf pine communities, petrified wood deposits

TAYLOR HILL

Location: CSJFTC Training Area 57, USFS Compartment 18, 27

Ownership: USFS and state (16th section)

Plants: *Isoetes louisianesis, Stewartia malacodendron, Triphora trianthophora*

Animals: Historical Eastern indigo snake

Other noteworthy features: Pitcher plant flats, good quality mixed mesophytic hardwood-pine slopes; high quality bottomland; hardwood-pine forest

FLAT BRANCH

Location: CSJFTC Training Area 57, USFS Compartment 5, 6

Ownership: USFS

Plants: *Isoetes louisianensis, Aristida simpliciflora, Agalinis aphylla, Cleistesiopsis oricamporum*

Other noteworthy features: Pitcher plant seepage

MARS HILL AND DEEP CREEK

Location: CSJFTC Training Area 60, USFS Compartment 226, 227, 228

Ownership: USFS

Plants: *Agrimonia incisa, Gordonia lasianthus, Peltandra sagittifolia, Nymphoides aquatica, Nymphoides cordata, Sagittaria isoetiformis, Cleistesiopsis oricamporum, Platanthera cristata, Stylisma*

pickeringii, Aristida condensata, Bouchetia anomala (new to MS), *Eleocharis robbinsii, Eleocharis melanocarpa*

Animals: Gopher tortoise, Bachman's sparrow, Black pine snake, Eastern diamondback rattlesnake, Scarlet snake, Scarlet king snake, Eastern coral snake, Southeastern shrew, Chicken turtle, Ornate chorus frog

Other noteworthy features: Longleaf pine-saw palmetto scrub, gum pond and creek

GATOR BITE POND AND SWEETWATER CREEK HEADWATERS

Location: CSJFTC Training Area 63, USFS Compartment 209

Ownership: USFS

Plants: *Myriophyllum laxum, Lindera subcoriacea, Nymphoides aquatica, Nymphoides cordata, Sagittaria isoetiformis, Melanthium virginicum, Gordonia lasianthus, Peltandra sagittifolia, Eleocharis robbinsii*

Animals: American alligator, Ornate chorus frog
Other noteworthy features: Boggy swamplands, seepages, freshwater deep marsh in pond setting

BIG MAGNOLIA-WHISKEY CREEK

Location: CSJFTC Training Area 63, USFS Compartment 211, 209

Ownership: USFS

Plants: *Magnolia grandiflora* (formerly State champion tree), *Epidendrum conopseum*

Animals: Gulf crayfish snake

Other noteworthy features: Good example of bottomland mixed pine-hardwood with prominent magnolia species component

2.2.2 Agricultural and Grazing Out-Leases

There are currently no agricultural or grazing out-leases at CSJFTC.

2.3 Philosophy of Land Management at Camp Shelby

The primary long-range planning goal at CSJFTC is to continue to provide quality training facilities while supporting environmental strategies and goals that are consistent with Army regulations and policies. With long-range planning goals in mind, CSJFTC has developed several short-range planning goals: (1) to implement a comprehensive environmental strategy that represents compliance, restoration, and conservation and (2) to improve the existing management approach to protecting and enhancing natural resources on the installation.

2.4 Public Use Management Goals and Objectives

Goals:

1. To facilitate the sustainable use by the public of natural resources on Camp Shelby to the extent that the use is not inconsistent with the needs of fish and wildlife resources subject to the requirements necessary to ensure safety and military security.

Table 2. Public Use Management Objectives

Description "Objectives"	INRMP Reference	Date Accomplished	Cost	Status
Develop lake creel limits and surveys	2.4.1A			
Educate public on cantonment hunting and fishing regulations	2.4.1B			
Assist Camp Shelby Law Enforcement with game laws at Camp Shelby	2.4.1C			
Develop handicap accessible areas for hunting and fishing	2.4.1D			

3.0 Environmental Overview

3.1 Climate

The climate is classified as temperate to subtropical. Intense thunderstorms, high rainfall, and strong winds can occur in association with hurricanes originating in the Gulf of Mexico. The mean temperature is 65.8o F, with monthly means of 48.4o in January and 81.4o in July. Average relative humidity is 55% during mid-afternoon. First frost may occur as early as mid-October, although late November frost dates are more common. The last frost date rarely occurs as late as early April. Mean annual precipitation is 59.9", with monthly averages ranging from 3.0" in October to 6.4" in March.

3.2 Geomorphology and Slope

Topography is gently rolling to hilly, with rounded ridges and broad, mature drainage. Topographic relief ranges from 60'-120' between depressions and ridgetops. Mean sea level elevation ranges from 280' in the Cantonment area to 150' in the Black Creek Valley.

Located in the Lower Coastal Plain Physiographic region, the geology consists of alluvium, coastal deposits dating back to the Holocene, Pleistocene Citronelle formation, Miocene Pascagoula, and Hattiesburg Formations.

Surficial Geology

The surface and near-surface geologic formations underlying most of northwest Camp Shelby are Tertiary and consist of the Hattiesburg Formation (Miocene) and the overlying (and younger) Upland Complex (Pleistocene) (also called Citronelle Formation). Stratigraphically, the Hattiesburg Formation overlies several thousand feet of sands, gravels, and clays of the Catahoula Formation and older geologic units. Typically, the Upland Complex occurs on hilltops or higher elevations, whereas the Hattiesburg Formation occurs in valleys. In the southeastern part of Camp Shelby, the valleys are formed in the Pascagoula Formation, which is somewhat younger than the Hattiesburg Formation. Both the Hattiesburg/Pascagoula formations and Upland Complex exhibit variable thicknesses of a few tens of feet. In the stream valleys, the Hattiesburg Formation is overlain by relatively thin beds of Holocene or Pleistocene alluvium. There are significant textural differences between these two geologic unit which, in turn, significant affect their hydrologic properties. The Hattiesburg Formation is predominantly sandy, clayey, silt; whereas the Upland Complex consists of sand, gravels, and sandy gravels. Being fine-grained, the Hattiesburg Formation is, thus, more impermeable and retains moisture; whereas the Upland Complex is coarse-grained and more permeable. Although these textural differences between these two formations are the usual case, there are local exceptions in which sandy interbeds may occur within the Hattiesburg Formation and clayey interbeds may occur in the Upland Complex.

The common occurrence of wetlands along stream valleys is due to the impermeable nature of the Hattiesburg Formation (See Figure 3). The upper reaches of most of the south-flowing streams at Camp Shelby occur near the contact between the Hattiesburg Formation and the Upland Complex. This relationship means that ground water within the Upland Complex emerges at and along the upper reaches and provides base flow to these relatively small streams. Thus, stream flow is maintained days or weeks after precipitation events and wetland hydrology is maintained. The largest wetland on Camp Shelby occurs in the upper reaches of Cypress Creek which is underlain by a broad expanse of the Hattiesburg Formation and a veneer of alluvium. The occurrence of these extensive wetlands and the Hattiesburg Formation is considered to be due to the influence of the Cypress Creek salt dome which underlies this area at a depth of approximately 900 ft. Slope wetlands also occur on side slope above flood plains; these wetlands are believed be due to perched water tables in the Upland Complex. The ground water is perched above either impermeable, clayey interbeds or weathering-induced hardpans in the Upland Complex.

Studies have shown that the stratigraphic relationships described above are also important factors, which control sensitive habitats and communities at Camp Shelby. For example, the sandy texture (and therefore drier nature) of the Upland Complex is more suitable for pine than hardwoods. Thus, red cockaded woodpecker habitats occur upon the Upland Complex whereas the Southern Mesophytic Hardwood Forest communities occur upon the Hattiesburg Formation. These communities are particularly well-developed along north-flowing drainages tributary to the Leaf River. The relationship between the gopher tortoise and the Upland Complex is due to weathering of this unit and the formation of more-or-less hardpans in which burrows will remain

open upon excavation by the tortoise. Crayfish habits are wetlands related and, therefore, associated with the Hattiesburg Formation. The relationship between quillwort habitats and stratigraphy is less clear; however, the habitats occur near the contact between the Hattiesburg Formation and the Upland Complex. (See Figure 4)

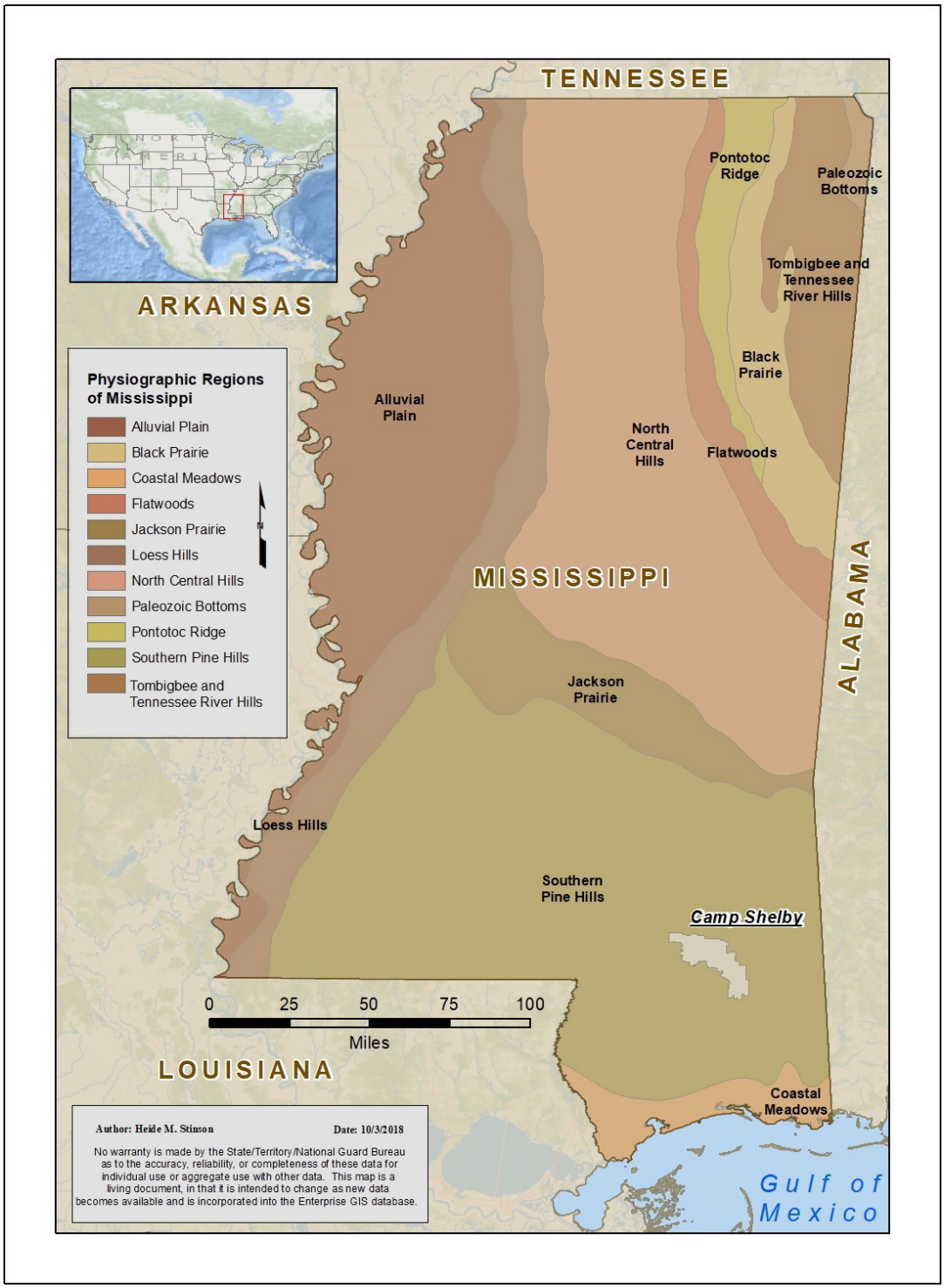


Figure 3. Physiographic Regions of Mississippi

3.3 Soils

Camp Shelby contains minerals of economic value, such as lignite, natural gas, crude oil, gravel, and sand. Lignite occurs in thin seams at a depth of 2,000' and is not likely to be developed. Gravel and sand for construction and road maintenance has been mined from the area in the past. There are no active surface mines on DOD property at CSJFTC. Historically, there were a number of surface mines utilized for production of construction materials. A 621-acre lease for exploration of sulfur exists, and wells were drilled in 1991, but no determination of economic viability was made. Mississippi's salt domes are located in south Mississippi, with the Cypress Creek salt dome underlying most of the northern portion of CSJFTC.

Currently, there are 42 active mineral leases on CSJFTC, encompassing 42,505 acres of National Forest land. Three of these leases total 3,963 acres in active production for natural gas and oil. No petroleum or mineral leases exist on DOD lands.

Regional soils are typically light-colored, comprised of sand, sandy loam, and clay textures, and low organic matter content. Organic matter is generally highest in drainage systems with mesophytic hardwoods, bogs, and bayheads.

The majority of soils are classified as Ultisols, which are old, intensely weathered, and found in warm, wet climates. High rainfall leaches clays from upper soil horizons into the subsoil. Iron oxides, translocated by leaching, render the red, yellow, or orange coloration of the subsoil. Leaching of nutrients also occurs with time; however, Ultisols can be productive if properly fertilized (See Figure 4).

The remaining CSJFTC soils are predominantly Alfisols, which exhibit a less developed horizon structure than Ultisols due to less leaching. Leaching has occurred to the extent that these soils are light in color and low in organic matter. Translocation of clay to the subsoil region has occurred in these soils

The primary soil associations are McLaurin-Heidel-Prentiss, Benndale-McLaurin-Heidel, Prentiss-Susquehanna-Falkner, and Poarch-Susquehanna-Saucier as described by the 1979 Forrest County Soil Survey (Weatherford et al 1991). Erodibility is of these associations are ranked using erosion factor ratings from 0.0 (least erodible) to 0.64 (most erodible)(See Figure 4).

McLaurin-Heidel-Prentiss Association, (Typic Paleudult-Typic Paleudult-Glossic Fragidult), are found on gently sloping to steep slopes, and consist of well-drained and moderately well-drained sands and loams. McLaurin and Prentiss Associations form ridgetops, and steep side slopes are comprised of Heidel. The erosion factor for this soil association ranges from 0.17-0.24 depending on percent content of each soil in the association.

Benndale-McLaurin-Heidel Association, (Typic Paleudults), are gently sloping to steep, well-drained soils (sands and loams) found on ridges and upper reaches of slopes. The erosion factor for this soil association ranges from 0.17-0.32.

Prentiss-Susquehanna-Falkner Association, (Glossic Fragiudult-Vertic Paleudalf-Plinthaquic Paleudult), are loamy soils in the southeastern portion of CSJFTC. Well-drained Prentiss, and

moderately to poorly drained Falkner are found on ridgetops. Poorly drained Susquehanna soils are on sloping lands. Erosion factors for this association range from 0.24-0.43.

Poarch-Susquehanna-Saucier Association, (Plinthic Paleudult-Vertic Paleudalf-Plinthaquic Paleudult), is located on the eastern edge of the installation. The well-drained loamy Poarch soils are found on ridgetops; the moderately, well-drained Saucier and poorly drained Susquehanna soils are on side slopes. Erosion factors for this association range from 0.20-0.43.

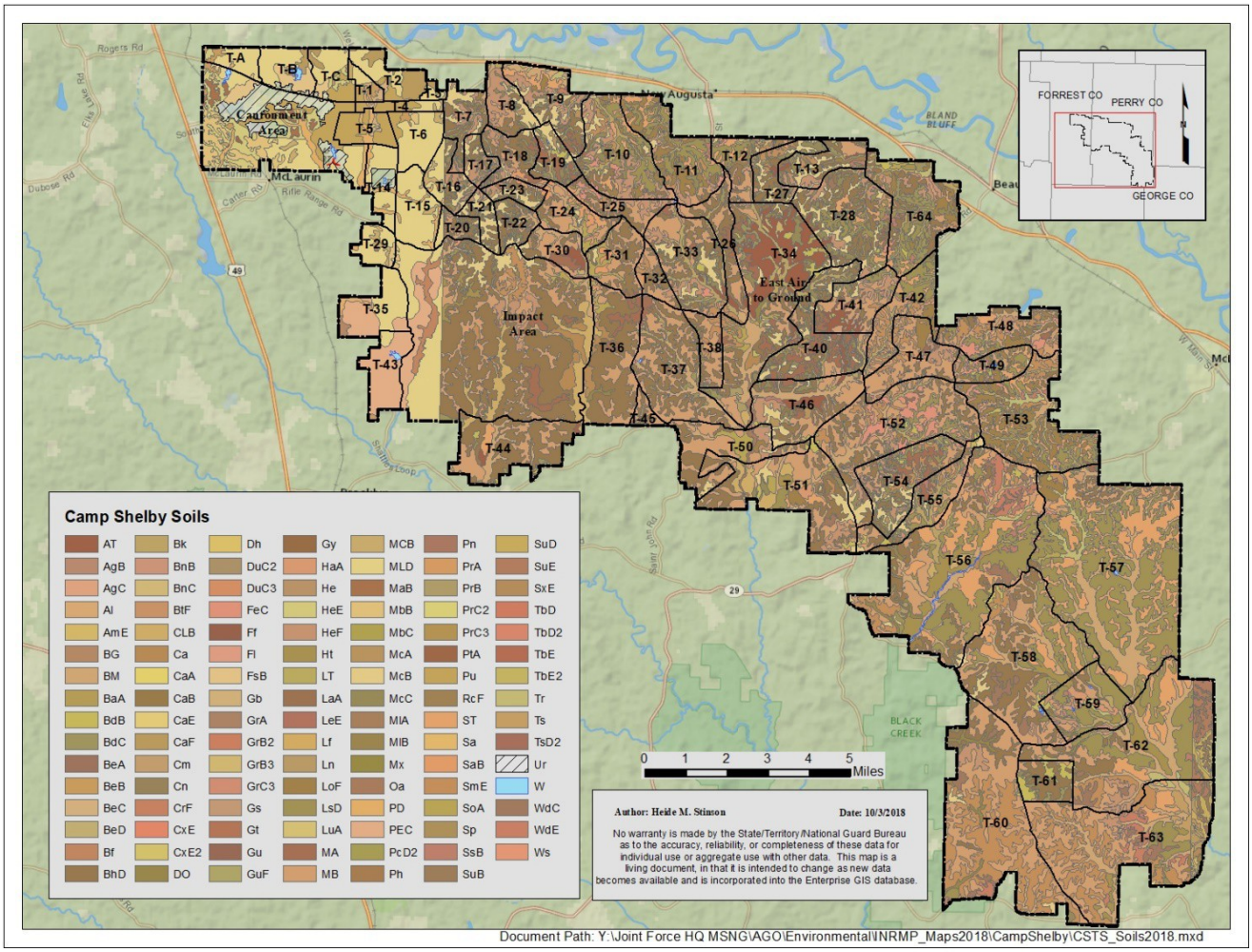


Figure 4. Soils of Camp Shelby

4.0 Natural Resources

A diversity of terrestrial ecosystems occurs on 45 tracts of DOD-owned lands at CSJFTC. Forest management on these tracts is focused on supporting the military training mission and accomplishing ecosystem restoration, biological conservation of flora and fauna, and sustainable timber commodity production.

To integrate the military training mission and timber harvest, extensive surveys and monitoring of natural communities and biological diversity have been conducted. Natural communities are areas categorized according to dominant vegetation within the communities. The major community types of the Camp Shelby land base are characteristic of Mississippi's Lower Coastal Plain Region. Ecotones or transition zones generally occur between biocommunity types. These zones typically support flora and fauna which are characteristic of each adjacent community (Dr. Sidney McDaniel pers. comm.). Thirteen habitat types were delineated by Mississippi Natural Heritage Program (MNHP, MDWFP) and The Nature Conservancy biologists. Descriptions and management are included in Appendix A. These habitat types include the following:

1. Black Gum - Bay - Pine Swamp
2. Bottomland Hardwood - Pine Forest
3. Longleaf Pine with Blackjack Oak Forest
4. Longleaf Pine Clay Glade
5. Longleaf Pine with Hardwood Forest
6. Longleaf Pine - Saw Palmetto Scrub
7. Pine Flatwoods
8. Pitcher Plant Wetlands
9. Pond
10. Slope Forest
11. Grasslands
12. Ephemeral Pond
13. Vernal Pond

4.1 Flora

The majority of CSJFTC is southern mixed pine-hardwood forest with longleaf pine and scrub oaks being dominant trees in well-drained, upland sites. Hardwoods are the dominant upper canopy trees in alluvial floodplains and watershed coves. A total 288 graminoid, 693 forb, 64 vine, 75 shrub, 32 shrub/tree, and 109 tree species have been collected on CSJFTC. A total of 1261 species have been cataloged in the CSJFTC herbarium (Rosso, Williford and Dickinson 2011) A complete list of surveys conducted on CSJFTC, and CSJFTC flora, are listed in

Appendices B and C, respectively. Approximately 16% (204) of CSJFTC species are non-native plants (Rosso, Williford and Dickinson 2011). Most non-natives are a threat to natural communities through increased competition, resulting in decreases of native plant diversity and wildlife habitat quality. No noxious weed law exists for Mississippi; however, the Federal Noxious Weed Law mandates control of all listed species on federally managed lands. The Federal Noxious Weed Law lists Cogongrass (*Imperata cylindrica*) and Dodder (*Cuscuta sp.*) as a pest species known to occur on Camp Shelby. Other problematic non-natives on CSJFTC include kudzu (*Pueraria montana*), Chinese privet (*Ligustrum sinensis*), Chinese tallow (*Triadica sebifera*), sericea lespedeza (*Lespedeza cuneata*), and Japanese climbing fern (Lygodium japonicum). Current control measures are in place for several of these species.

4.1.1 Forest Management

Forest management involves exercising influence over the ecological processes of a forest in an effort to provide specific sustainable products and amenities from the forest while maintaining its long-term health and vigor. The Army forest management program is required to support and enhance the immediate and long-term military mission and to meet natural resource stewardship requirements set forth in federal laws (AR 200-1) and supplemented with MSARNG 200-1. Army policy further stipulates that forest resources must be managed for multiple uses, using an ecosystem management approach to optimize the benefits of the installation's natural resources. Ecosystem management provides a framework for holistic management of the resources rather than focusing emphasis on a single aspect of activity such as commercial timber production or game species management.

Forest management enhances the CSJFTC military mission by providing for a healthy training area forest over the long term. Currently, DOD tracts exhibit a variety of stand conditions. Management techniques used to restore longleaf pine include natural regeneration, selective thinning, prescribed burns, and extended rotations. Factors influencing silvicultural recommendations include site (soils, topography, proximity to watershed, etc), condition of stand (age, basal area, species composition, etc), presence of protected species and sensitive habitats, and use by MSARNG. Timber management at CSJFTC is conducted for three main purposes – timber commodity production, timber removal as part of the military training mission, and wildlife habitat management. Forestry management for this INRMP utilizes a combination of management strategies from the *Forest Resources Management Plan for Camp Shelby National Guard Training Site* (1987), *Final Environmental Assessment for Forest Resources Management Activities at Camp Shelby, Mississippi* (1996), *Forest Resource Management for Camp Shelby, Mississippi* (1998), and comments from reviewers of aforementioned plans. Management strategies recommended in 1987 have been modified to address DOD initiatives and executive orders of ecosystem management and biological diversity conservation for public lands. Additionally, current management strategies consider ecological data that has been collected since 1996. Protection of sensitive habitats, unique ecosystems, protected species, water quality, and wetlands, limits on forest fragmentation, and ecosystem restoration are incorporated into this plan. In many cases, timber removal for military training needs cannot accomplish all of these initiatives due to training requirements. However, in many cases, these initiatives can be accomplished during commodity production management without degrading military training

activities or sacrificing timber production. Careful planning of harvest and regeneration can produce timber commodities without negative impacts to biological diversity and ecosystem integrity. All timber removal for development of military training sites will be done according to requirements of NEPA, the Endangered Species Act, and the Clean Water Act. Selected silvicultural practices, such as selective thinning, prescribed fire in upland habitats, and planting and/or natural regeneration of longleaf pine and hardwoods, are important wildlife management methods used at CSJFTC.

General management strategies should follow Best Management Practices for the State of Mississippi. *The following approaches integrate military training, forestry and ecosystem management and should be given priority over specific silvicultural recommendations and previously prepared forest management plans:*

Streams and wetlands will be protected from nonpoint source pollution and hydrological changes by a >100' vegetation buffer. Forestry activities that occur within buffers for military training include small group selection and single tree harvests for "line-of-sight" visibility on ranges, stream or wetland crossings, and low-impact training, such as bivouacking and military patrolling. A >100' width buffer strip of native vegetation will be retained around habitats with threatened and endangered species and other areas of special concern, except where necessary for habitat improvement. Site disturbance associated with military training will be ameliorated using erosion control and restoration treatments.

Restricted activities in wetland and streamside corridors and in alluvial hardwood forest stands include:

A. Injection, girdling, removal of mast-producing trees
B. Broadcast herbicide application
C. Site-conversion to pine species
D. Traffic from tracked vehicles, logging and farming equipment, and recreational vehicles
E. Removal of living cavity trees, snags, and deadwood

Forest fragmentation and soil compaction/disturbance in slope and bottomland hardwood forests will be prevented to maintain native biological diversity of fauna and flora. Specific fauna assemblages that benefit from this initiative include forest-dwelling neotropical migrant birds, (i.e. wood thrush, Swainson's warbler, and Acadian flycatcher), woodland game species (eastern wild turkey and gray squirrel), and salamanders and frogs. This effort is essential for the protection of mesic forest rare plants. Slope and bottomland hardwood forests will be protected from timber harvest, recreational vehicular traffic, wildfire, site conversion, and soil-disturbing military training, such as tracked vehicle operation.

Threatened and Endangered (T&E) Species, guidelines and recommendations from T&E species recovery plans and management plans take precedence over all other recommendations and operations. This includes recreational, logging, and military vehicles and equipment, and placement of fire lanes.

Use of prescribed fire is an integral part of ecosystem restoration of longleaf pine and pitcher plant wetland communities, and endangered species recovery. Therefore, in forest management recommendations where "no silvicultural activity" will occur around endangered or threatened species habitat, this does not include prescribed burning of these areas if burning is a management tool for species recovery and habitat enhancement.

Protected species habitats should be avoided when constructing logging decks, roads, or other site-converting activities. Any reclamation activity or planned stream crossing in these areas should involve the following pre-project protocol:

A. Check for protected sites and protected species.
B. Minimize activities near and/or upslope from protected species habitats, maintaining a 100' undisturbed buffer zone around area.
C. Outside of 100' buffer, use minimum disturbance reclamation options, i.e. seeding with non-aggressive plant species, or avoid site.

Ground disturbance during silvicultural operations should be avoided on slopes and upslope from sensitive or protected species habitats, wetlands, or streams. No silvicultural activity should occur where there is a possibility of erosion or downslope sedimentation. This effort will also protect and maintain site index and productivity over the long term.

When silvicultural recommendations are made to thin or reduce a stand to a particular basal area, remove poorly-formed or diseased pines first. Retain healthy longleaf pines in pine or mixed pine/hardwood stands.

Maintain at least one snag/acre (where safe for training) and 2 living cavity trees/5 acres in forested areas.

Develop a site-specific burning plan for each stand.

4.1.2 Forest Inventory

The average prices paid for standing timber in south Mississippi by cooperating public and private members of the forestry sector were obtained from the Mississippi Cooperative Extension Service (MCES) Third Quarter 2011 Mississippi Timber Price Report (Table 7). Standing timber price is the amount a logger is willing to pay for the landowner's timber before it is cut. All expenses (i.e. machinery, manpower, transportation, etc) are incurred by the logger. Prices reported for pine and hardwood pulpwood are per cord. Prices for pine and hardwood sawtimber are per 1,000 board feet (MBF) Doyle.

Table 3: Projected 2011 timber volume of DOD lands on CSJFTC derived from 2011partial forest inventory.

Species	Product	Total Tons	Tons/Acre	MBF	% of total
Pine	Saw Timber Poles	80650 1475 10356	20.1 .37 2.58	1537 7 140 0	47.68 0.87 6.12
	Chip and Saw Pulpwood	12380	3.09	0	7.32
Hardwood	Saw Timber Pulpwood	14998 35261	3.74 8.79	2345	8.87 20.84
Oak		14038	3.5	2217	8.3

The primary site preparation methods used in upland pine habitats will be prescribed fire or herbicides.

Methods, such as drum chopping, broadcast herbicides, or bedding, will not be used frequently due to occurrence of gopher tortoises on many upland sites. Herbicides may be used selectively or through injection to reduce midstory cover or non-native plant cover. Herbicides with the following characteristics should be used: a) low acute toxicities to wildlife, especially reptiles and amphibians are recommended, b) low residual effects on native grasses, forbs, and legumes, and c) control activity during late summer to fall months to allow spraying after gopher tortoises become less active. Products which meet these criteria, control woody plants, and exhibit minimal toxicities to leguminous wildlife food plants. See Appendix B for specific stand-management and site-preparation recommendations.

Longleaf pine will be restored using natural regeneration methods and prescribed fire on selected DOD tracts. Selective thinning and small-group selection harvest will be used to retain healthy longleaf seed trees for regeneration stocking. Artificial regeneration through planting of bare root or container seedlings is currently planned as part of the recovery effort from Hurricane Katrina. Longleaf pine is historically found in the lower coastal plain in well drained soils where fire can remove competing vegetation.

Prescribed burning is the main management practice to be used on longleaf pine restoration sites.

Table 4. Inferred Fire Return Intervals for Habitats

Habitat Type	Soil Type	Drainage	Topographic Exposure	Inferred Fire Return Interval
Sand pine-scrub	Sandy	Rapid	very low	20-100 years
Sandhill	Sandy	Rapid	moderate	3-20 years
Longleaf pine savanna	loamy-sand	moderate	high	1-3 years
Longleaf pine flatwoods	Sandy	Slow	high	1-3 years
Slash pine flatwoods	Sandy	Slow	moderate	1-3 years
Canebrake	Sandy	Slow	moderate	1-3 years
Herb bog (savannah bogs)	sandy peat	Slow	moderate	Whenever Bog is not wet
Shrub pond pine bog	sandy peat	Very slow	low	10-20 years
Swamp forest (bottomland hardwood forests)	Sandy peat	Very slow	Very low	25-33 years

Longleaf pine seeds germinate in late fall, thriving best on a clean forest floor. Until the first dormant terminal bud is formed 9 months later, longleaf pine seedlings can be killed by fire. Once in the "grass stage", it is necessary to burn every 3 years to control brown-spot disease. Longleaf pines remain in the "grass stage" without growing in height until the taproot is approximately 1" in diameter. At this point, there is a sudden increase of height growth during which they are moderately vulnerable to fire until approximately 4' tall. Therefore, primary management considerations for longleaf pine regeneration are as follows:

1. Provide a clean forest floor for fall germination by burning stand after harvest.
2. Do not burn longleaf pine until after the dormant terminal bud is formed approximately 9 months after germination.
3. Once in the "grass stage", burn every 1 to 3 years to limit brown-spot disease.
4. Once the growth spurt occurs from the grass stage, longleaf pine is particularly sensitive to prescribed fire during the candling stage. Fire will be implemented on a stand by stand basis.

Prescribed burning of longleaf pine stands requires specific recommendations for each site. Stand inspection should be carried out immediately following harvest. During inspection, determine if a late summer burn that year would "crown out" based on the amount of ground fuel available. If not, prescribe burn during late summer to prepare the ground for longleaf pine seed germination in the fall. However, if there is too much ground fuel for a summer fire; perform a winter burn (January-February) following harvest. This should reduce ground fuel to a saferlevel

so that a late summer burn that year or the next will provide a good seedbed for germination. A burning plan specific to each stand on DOD lands at CSJFTC will be developed.

Damage

The southern pine beetle is the primary forest insect pest on CSJFTC. The Mississippi Forestry Commission makes aerial inspections and will notify landowners of infestations. If infestations occur, the infested timber, and unaffected timber in a buffer strip of width equal to tree height, should be felled. Merchantable timber can be removed and sold, if possible. If not possible, trees can be left exposed to sunlight where they were felled. For more information, refer to the MCES publication and video series *"Detecting and Preventing the Spread of Southern Pine Beetles"*. There are two diseases that may damage pine trees on CSJFTC. One is brown-spot disease of longleaf pine seedlings. The other is gall canker (*Cronartium*). There is no preventative for gall canker and it does not spread from tree to tree. Infested trees should be removed during normal thinning operations.

4.1.3 Flora Threatened and Endangered Species Management

Louisiana Quillwort

Rankings GLOBAL: G2G3 STATE: S2 FEDERAL: Endangered USFS: Endangered

General: Three species of quillworts have been verified in southern Mississippi. Only one, the Louisiana quillwort (*Isoetes louisianensis* Thieret), has been listed as endangered without critical habitat. Identifications were determined based on cytological and morphological observations by quillwort experts at the Milwaukee Public Museum. (Email documentation from W. Carl Taylor and N. T.Luebke to S.W. Leonard; S.W. Leonard pers. comm.)

Habitat: Louisiana quillwort is a colonial species, known to occur in 20 watersheds and 42 subwatersheds across southern portions of three states: Alabama, Louisiana, and Mississippi. Typical colonies in south-central Mississippi are located in shallowly entrenched intermittent streams lined with swamp black gum (*Nyssa biflora)* and laurel-leaf oak (*Quercus laurifolia)* as well as a streamside, overhanging component of titi (*Cyrilla racemiflora)* and sparse herbaceous groundcover (Larke 1997, Leonard 2011). Toward the coast in both Louisiana and Mississippi, Louisiana quillwort habitat shifts to perennial stream environment where bald cypress (*Taxodium distichum)* may be the prominent bottomland component and the stream itself may harbor macrophytes such as *Sparganium* spp. And *Orontium* spp. (Leonard 2011). Neither of the two Alabama colonies occurs in habitat that resembles any known Louisiana or Mississippi habitats. One colony is located in a spring-like seepage with sandy-muck soil and bald cypress overstory that drained into a permanently flowing creek. The other colony is located along the margins of a grassy meadow and small hardwood swamp (Leonard 2011).

Management Plan on CSJFTC: General recommendations are provided in the original *Recovery Plan for the Louisiana Quillwort* (USFWS 1996) and in the modified version (USFWS 2002). Recommended actions would limit destructive activity adjacent to and upstream from, quillwort colonies. Another action would prevent sedimentation from upstream activities (land clearing/logging operations, runoff from unpaved roads, wetland crossings, 4WD and ATV activity, etc). The USFWS issued a Biological Opinion on 8 November, 1999 in regards to the

construction of G.V. Sonny Montgomery Range at Camp Shelby which stated that future actions associated with military training will continue to cumulatively impact vegetation and stream flows in the Poplar Creek stream system and recommended wetland buffer zones on the ranges. The following recommendations will minimize streamside habitat loss in areas supporting the quillwort (USFWS 1996):

1. Establish a streamside and wetlands buffer of 165' or greater depending on the slope on each side of water in which timber harvest is restricted. This will ensure that habitat conditions such as ambient light, sediment load from runoff, or streamflow are not altered.
2. Timber should be harvested selectively during dry periods outside of streamside zones.
3. Mechanical site preparation methods such as drum-chopping or disking should be prohibited. Timber removal techniques should minimize soil disruption.
4. Prescribed burning is compatible with quillwort management.
5. Herbicide application should be prohibited.
6. Surface mining for sand/gravel should be prohibited near quillwort habitat and should be monitored in watersheds.
7. Habitat should be protected from ORV's, flood control measures, channelization, road construction, and feral hogs.

4.1.4 Flora and Forestry Goals and Objectives

Goals:

1. Restoring longleaf pine on historically appropriate sites, aiding in the recovery of listed species assemblages for this ecosystem.
2. Protecting streams, creeks, and wetland communities.
3. Maintaining natural communities through ecosystem management.
4. Providing habitat diversity for game and nongame wildlife.
5. Limiting forest fragmentation.
6. Integrate management into neighboring stakeholders (USFS, MDWFP, etc.) programs as well as regional efforts to improve the existing longleaf ecosystem.
7. Eliminate clear cut harvests on established long leaf stands.
8. Maintain and protect established property boundaries.

Table 5. Flora and Forestry Objectives

Description "Objectives"	INRMP Reference	Date Accomplished	Cost	Status
Restore 400 acres of long leaf pine within DoD property.	4.1.4.1A			
Conduct Timber Stand Improvement harvest to aid in natural regeneration.	4.1.4.7A			
Conduct prescribed fire on 1 to 3 year intervals to aid in natural regeneration.	4.1.4.7B			
Establish and maintain 165 foot SMZs and flag affected areas prior to timber harvest.	4.1.4.2			
Control invasive species within forested areas.	4.1.4.3A 4.1.4.4			
Participate in implementation teams/working groups to accomplish landscape level ecosystem management.	4.1.4.5 4.1.4.6			
Complete forest stand inventory.	4.1.4.1B			
Restore and maintain firebreaks and painted boundaries.	4.1.4.8			
Conduct artificial regeneration when natural seed source is inadequate.	4.1.4.1C			
Conduct mechanical and chemical site preparation in deforested areas.	4.1.4.1D			
Conduct required floral inventories	4.1.4.3B			

4.2 Water Resources

The major uses of CSJFTC's water resources are water supply, recreation, training, and aquatic habitat. The water resources at CSJFTC can be divided into three main categories – groundwater, surface water, and wetlands. Each has its own physical and chemical components, which in turn influence the aquatic flora and fauna that compose the biological communities.

4.2.1 Groundwater

In the Camp Shelby region, including Perry and Forrest counties, domestic, municipal, and industrial water supplies are developed in aquifers within the Catahoula Formation (Miocene), the lower sandy facies of the Hattiesburg Formation (Miocene), and the Upland Complex (Citronelle Formation). These aquifers collectively are referred to as the Neogene Aquifer System. The Catahoula Formation and Hattiesburg Formation aquifers are relatively thick sandy interbeds within these formations and are separated by impermeable, clayey confining layers. The aquifers are, thus, artesian in that the aquifers are pressurized and when penetrated during well drilling, water rises in the well above the top of the aquifer. In the past, some of these aquifers have flowed at the surface. Today, these aquifers provide ample supplies of usually high quality water, even though aquifer pressures have declined over the years. The depths of these confined aquifers are variable; however, depths from a few hundred feet to nearly 1,000 ft are common. Locally and less frequently, and beyond Camp Shelby, smaller quantities of water are also obtained from aquifers within the Upland Complex. These aquifers are usually, but not exclusively, water-table aquifers, they have less capacity than the deeper aquifers, and the water quality is lower.

4.2.2 Surface Water

<u>Streams and Rivers</u>

The reservation lies within the Pascagoula River Basin in the East Gulf Coastal Plains of the Pine Hills Physiographic Region. The major sub-basins in the region are the Leaf River near the north and northeast boundary of CSJFTC, and Black Creek to the south. Areas along the north border of CSJFTC drain into tributaries of Leaf River, including Garraway, Denham, Milky, Coleman, Carter, and Little Creeks. The Black Creek tributaries comprise 90% of the watershed on the reservation proper. Primary Black Creek tributaries on CSJFTC include Chaney, Middle, Davis, Hartfield, Pierce, Cypress, and Hickory Creeks (EIS 2007). The southeastern portion of the base is drained by Whiskey Creek, which flows into the Pascagoula River. Most of the streams are clear or black water (tannic) streams with sand, or hard clay bottom substrates. Garraway, Denham, Milky, Coleman, extreme lower Pierce and lower Hickory Creeks are intermittent streams. Some streams, such as Cypress Creek, exhibit slack water areas and swamps. Bayheads, and spring seeps are common throughout CSJFTC. The U.S. Army Engineer Waterways Experiment Station *Delineation of Wetlands and Other Regulated Waters, Camp Shelby, MS*, dated September 1998 identified 744.2 miles of streams on Camp Shelby.

<u>Lakes and Ponds</u>

Lakes and ponds located on CSJFTC include Dogwood Lake in the northwest corner of the

Cantonment Area, and Walker Lake north of the Cantonment Area in DOD Tract No. 2. These lakes are used primarily for recreation. Lake Janney is located on the western edge of the impact area buffer zone in T-43. It is closed to recreation due to its location with the Closure Area "A" (USFS) typically called the Impact Area. Other small ponds on USFS property include Ashley Pond (a dip-site for wildfires on USFS and DOD properties) east of the impact area buffer zone in Compartment 37, Blue Pond, southwest of Lake Perry, in T-49, and two small impoundments within the confines of the MPRC-H on USFS land. Beaver ponds are frequent in certain areas of CSJFTC. The U.S. Army Engineer Waterways Experiment Station *Delineation of Wetlands and Other Regulated Waters, Camp Shelby, MS*, dated September 1998 identified 146.2 acres of lakes or ponds on Camp Shelby.

Chaney Creek Watershed Study

One of the most significant studies establishing the baseline watershed data for Camp Shelby was the Chaney Creek Watershed Study. The need for the Chaney Creek Watershed Assessment evolved out of the ongoing efforts of the Mississippi Army National Guard (MSARNG) to prepare an Environmental Impact Statement (EIS) addressing the environmental effects of the continued use of De Soto National Forest lands [managed by the U.S. Forest Service (USFS)] by Camp Shelby to accommodate the installation's military training mission. The EIS Record of Decision was signed in February 2008. The new Special Use Permit allowing the MSARNG to continue using National Forest lands was extended through 2029.

The Chaney Creek Watershed Assessment evaluated the effects of a variety of sediment transport and deposition issues on streams draining the Multiple Purpose Range Complex – Heavy (MPRC-H) construction site. The MPRC-H is a state-of-the-art tank gunnery range. Construction of the approximately 1,500-acre MPRC-H began in 2000. All earthwork associated with the excavation, placement, and shaping of around 10 million yd^3 has been completed.

The MPRC-H is located in the headwater reaches of Poplar Creek and Davis Creek that are major tributaries to Chaney Creek. Chaney Creek flows into Black Creek which is the only designated Wild and Scenic River in Mississippi. The off-site migration of sediments from the construction site was a major project concern. Over the 5-year construction period, two cease and desist orders were issued to the MSARNG by the U.S. Army Corps of Engineers (USACE) – one in May 2001 and the second in January 2005 – for various wetlands related permit violations.

The Watershed Assessment was focused on investigating the effects associated with the transport and deposition of sediments originating from the MPRC-H construction site on downstream stream courses and their associated floodplains. The Assessment does not address the effects of sediment deposition within the MPRC-H site that has occurred during construction. A restoration plan for on-site impacts was prepared by the MSARNG, approved by the USACE, and was implemented.

4.2.3 Wetlands

Approximately 117 million acres of wetlands have been lost in the contiguous U.S. since 1780, representing 53% of the original pre-settlement wetlands. Drainage, filling, and diversion of wetlands has caused increased flooding, property damage, aquifer reduction, decreased filtration

of pollutants, commercial and recreational fishing damage, and fish and wildlife habitat loss. CSJFTC management seeks to protect existing wetlands through best management practices, restore and/or protect unique wetland habitats that support protected species assemblages, and mitigate for unavoidable wetland losses through Clean Water Act and NEPA requirements.

Wetland habitats for flora and fauna include swamps, bottomlands, pitcher plant wetlands, and ephemeral wetlands. Vegetation is dependent on canopy coverage, hydrology and soils. Wetlands provide habitat for many of the protected and rare species found at CSJFTC, and are important habitats for many animal species, partially due to plant diversity, availability of water, and variable habitat structure. The vegetation provides nesting habitat for songbirds and an abundant food source (insects, spiders, and seeds). Wetlands support many amphibians, such as frogs, toads, and salamanders. Frogs, toads, and many salamanders need open water for reproduction and early development, and most salamanders require moisture throughout their lives. Ephemeral wetlands are important as breeding habitats in the life cycle of amphibians, such as the Dusky Gopher Frog (*Rana capito sevoso*), salamanders (*Ambystoma* spp.), and anurans (including the genera *Hyla, Acris, Pseudacris, Rana, Bufo*, and *Gastrophryne*). Floodplain *Mississippi Army National Guard* wetlands and swamps are essential habitats for waterfowl, alligators, snapping turtles, and many fish species. Wetlands of the bottomland hardwoods support many neotropical migrant birds, reptiles, owls, turkey, gray squirrels, and furbearers.

The CSJFTC follows guidelines set forth in the *Erosion Control Plan for Camp Shelby* (1989), which provides for erosion control both during, and immediately following, AT. It includes a monitoring program of routine inspections to identify potential problem areas, with the purpose of repairing problems before erosion and resulting sedimentation becomes critical. This minimizes damage, and reduces time and resources required for repair.

Streams and wetlands are protected from point source pollution (chemical spills) to prevent damage to aquatic life. All chemicals, including organic and commercial lawn fertilizers and sewage effluent are restricted from streams and wetlands. Containers should be constructed around chemical tanks to hold leakage until clean-up procedures are completed. Results from water quality investigations (1993-1998) on CSJFTC show that there were no adverse levels of sediment and pollutants in water exiting the base.

Currently wetlands are protected with buffers of 100', when feasible. Activities, such as use of ATV's, horseback riding, heavy equipment, pesticide application with acute toxicities to fauna, and timber harvest operations will be restricted in these protected areas. Streams will be protected from bank destabilization, channelization, and diversion. No culverts or bridges will be installed without the completion of environmental analysis and appropriate consultation with the US Army Corps of Engineers for any required permits. Any unavoidable alterations to wetland hydrology and habitats will comply with Section 404 of the Clean Water Act and NEPA.

Wetland fauna and flora are protected from unregulated collection. Collection or harvest of nongame aquatic organisms is not allowed without state, federal and CSJFTC-approved permits. Incidental take of nongame fish such as golden shiners by licensed anglers is allowed.

<u>NWI Classifications that exist on Camp Shelby</u>

Wetlands at CSJFTC are separated according to geomorphic position and hydrologic factors (Patrick et al 1999) as follows:

1. Bottomland Wetlands - found in floodplains of rivers. Divided into the following classifications:
    A) Riverine wetlands - areas adjacent to creeks and streams. Divided into the following two subclasses:
        1) Low order riparian wetlands – These wetlands develop as broad, forested, bayheads along either the headwaters or first order reaches. The extent of bayheads associated with low order riparian wetlands is influenced by size, number, and proximity of seeps occurring along the topographic break. Some to all of the water is supplied by seeps or slope wetlands.
        2) High order riparian wetlands – These wetlands occur as thin strips of hydrophytic hardwoods along larger streams that may follow the channel for several miles.
    B) Backswamp Wetlands – These swamps are located on outer fringes of floodplain in topographic lows, are generally created by surface water, and may dry out during summer months.

2. Non-Floodplain Wetlands – These wetlands are created by perched water tables that may occur on slopes or ridges. They are classified as follows:
    A) Slope Wetlands (>5% slope) – These wetlands occur on inclined surfaces characterized by seeps. They are created by the water table intersecting the surface and the surface is perennially saturated from seeping ground water, producing an organic-rich soil.
    B) Flat Wetlands (<5% slope) - Formed outside of a floodplain at the intersection of a perched water table and a flat surface, the water table remains within the upper 12" of the soil surface throughout the year in these wetlands.

CSJFTC wetlands are protected, restored, and mitigated for under the jurisdiction of the Clean Water Act. Wetland conservation at CSJFTC also addresses ecosystem management initiatives of biological diversity protection due to the diversity of wetland flora and fauna found at CSJFTC.

4.2.4 Water Quality Summary

Water quality was measured since 1993 on watersheds exiting CSJFTC (Pessoney 1998). Parameters measured include: Chlorophyll a (mg/m^3), BOD (mg/l), Phytoplankton (org./l), Fecal Coliform (col./100ml), Turbidity (NTU), Alkalinity (mg/l), Total Hardness (mg/l), Ammonia-N (mg/l), Nitrite-N (mg/l), Nitrate-N (mg/l), TKN-N (mg/l), Total Phosphorus (mg/l), Orthophosphate (mg/l), Potassium (mg/l), Total Solids (mg/l), pH, Temperature (deg. C), Conductivity (umhos), and Oxygen (mg/l).

Sample points in 1993 (n=48), 1994 (n=18), 1995 (n=5), 1996 (n=6), 1997 (n=18), and 1998 (n=3) were established in the CSJFTC interior and at the point where streams exit the military

border to detect changes in water quality. Results of the study show that there were no adverse effects on water exiting the base and no environmental deterioration caused by the land uses at CSJFTC during the study period. This data provided baseline information for determining trends in water quality and assessing impacts caused by changes in land use over time. MSARNG Environmental staff at Camp Shelby conduct ongoing water quality assessments in order to maintain a record of existing water quality conditions and rapidly identify any changes.

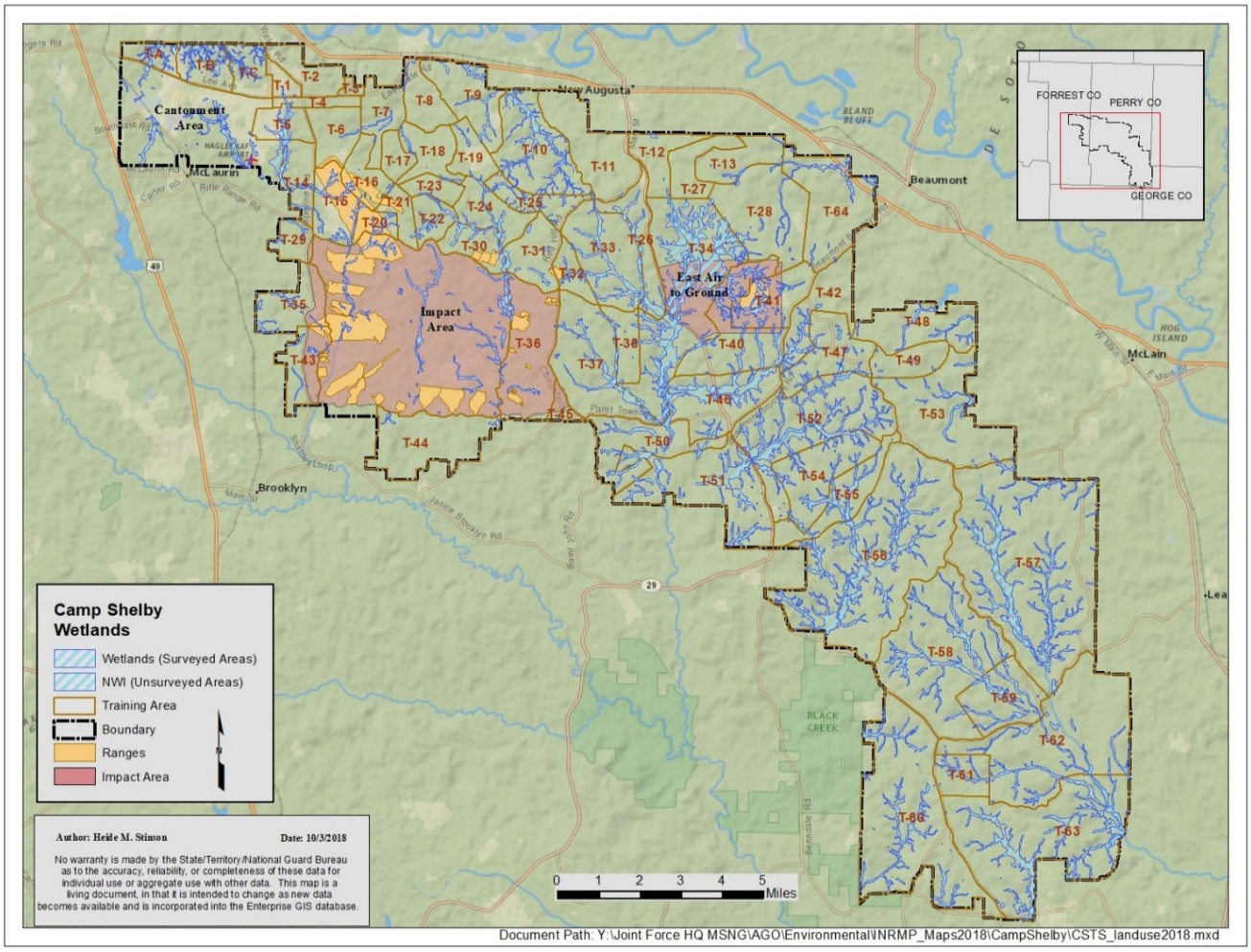


Figure 5. Camp Shelby Wetlands

4.2.5 Wetlands Goals and Objectives

Goals:

1. Protect, restore and manage wetland on Camp Shelby for the protection of wetland dependent species in accordance with federal and state laws and regulations.

Table 6. Wetlands Objectives

Description "Objectives"	INRMP Reference	Date Accomplished	Cost	Status
Obtain all necessary permits required by the Clean Water Act before project implementation.	4.2.5.1A			
Conduct storm water pollution prevention training.	4.2.5.1B			

4.3 Wildlife

4.3.1 Mammals

Management of game and nongame mammals excluding threatened, endangered, candidate, or species of special concern on CSJFTC is accomplished through landscape level habitat management.

1. Protection of forests from fragmentation
2. Develop multiple layered forests through uneven-aged and even-aged management with small gap creation (<2 acres), single tree selection harvests, and shelterwood harvest interspersed with older age class trees (>65 years old)
3. Retention of at least one living cavity tree/acre and at least one snag/acre
4. Retention of older age class trees (pine: >60 years; hardwoods: >70 years) in forest
5. Prescribed fire in upland pine and pine/hardwoods for creation of herbaceous ground cover
6. Maintain soft mast producing vines, shrubs, and trees in floodplain/ riparian forests
7. Restoration of longleaf pine and use of prescribed fire.

<u>Bats</u>

CSJFTC is within the range of at least eight bat species, including four of the state's species of special concern, Rafinesque's Big-eared Bat, Southeastern Myotis, Hoary Bat and Northern Yellow Bat. Bat conservation is critical due to their ecological importance, listed status of some species, occasional occupancy of buildings, and consumption of flying insects. Insect control is of primary importance to many people in urban-suburban areas. For example, a single big brown bat (*Eptesicus fuscus*) consumes from 3,000 to 7,000 night flying insects including mosquitos and many agricultural pests each night.

Bat management includes protection from harvest or collection, and enhancement of roosting and nursery sites. Ample foraging sites exist over open fields, water bodies, and near night security lights. Placement of bat houses and exclusion structures may be used to limit bat use of human occupied buildings. Uninhabited buildings being used by bats should be retained. Natural roosting and nursery sites are expected to result from forest management in which older age classes of trees (>70 years) and cavity trees will be retained. Some species of bats use bat houses readily. If these species begin to occupy buildings at undesired densities, bat houses may be placed to deter them. Bat houses should be built according to specifications developed by Bat Conservation International (BCI). The following BCI guidelines can increase use of houses and structures in the southeastern United States.

1. Bats exhibit preferences for houses placed back to back on 20 foot poles in open or agricultural settings.
2. Locate bat houses within 1/4 mile of streams or ponds >3 acres.
3. Southern bats use houses more frequently if the house receives >6 hours of sun daily.
4. Highest occupancy rates (70%) have been recorded when houses are placed 21-30' above ground. Placement at heights of 11-15' above ground resulted in 50% occupancy rates.
5. Maximum use has been recorded for the selected bat species by placing houses at least 20' from trees or forests. This placement increased sun exposure and warmth in boxes.
6. Use of predator guards with bat houses mounted on poles or buildings is essential.
7. Corrugated tin or sheet metal wrapped around wood duck nest box posts over water may provide excellent roosting and nursery sites for some species, such as evening bats.

4.3.2 Birds

Table 7. Featured Game Bird Species and Management Strategies at Camp Shelby, Mississippi

Featured Species	Habitat Type	Management Requirements
Eastern Wild Turkey	**Most forest types and ecotones**	**Protect older age-class riparian and bottomland hardwoods.** **Limit fragmentation of hardwoods and hardwood-pine forests.** **Retain hard mast trees (oak, hickory, pecan, beech).** **Prescribe burn upland pine and pine-hardwoods.** **Seed reclamation sites and plots with annual clover/winter wheat mixes.** **Develop unmowed ecotones for nest, food, and brood cover.** **Favor soft mast-producing shrubs, vines, and trees.** **Allow bahiagrass and other food plants to develop seeds through reduction of mowing along roadsides and firing points.** **Limit disturbance and access on logging roads during nesting season.** **No mowing of selected roadsides, fields, and firing points from April-November.** **Retain records and control of harvest.**
Northern Bobwhite	**Pine-hardwoods** **Upland pine ecotones** **1-5 year-old cutovers** **Impact Area** **Firing Points**	**Prescribed fire to stimulate food plants (legumes, grasses).** **Selective thin to <65 BA in pine forests.** **Seed annual clover and native lespedeza on reclaimed sites and bare soil.**

	Selected Ranges	**Limit mowing in ecotones along roadsides and in old-field edges from April-September.** **Restore longleaf pine ecosystem.**
Mourning Dove	**Old fields** **Cantonment Area** **Open pine stands** **Impact Area** **Ranges** **Firing Points**	**Limit roadside mowing for increased seed production by food plants.** **Prescribe burn upland pine forests.**

Nongame Birds

Conservation of migrant and resident birds is a priority in forest and land management activities at CSJFTC. Nongame birds are managed through protection from collection or harvest, and habitat management. Habitat management will be implemented to benefit assemblages and retain bird species richness at CSJFTC. Cavity nesting birds in the Cantonment Area may be managed by landscaping with native food plants and placement of nest boxes if nesting cavities are limited. Nongame birds will be protected from harvest or collection. Monitoring programs for nongame bird diversity have been developed for determining and assessing conservation goals for nongame birds.

Habitat management implemented to favor nongame birds includes the following:

1. Protection of forests from fragmentation
2. Develop multiple layered forests through uneven-aged and even-aged management with small gap creation (<2 acres), single tree selection harvests, and shelterwood harvest interspersed with older age class trees (>65 years old)
3. Retention of at least one living cavity tree/acre and at least one snag/acre
4. Retention of older age class trees (pine: >60 years; hardwoods: >70 years) in forest
5. Prescribed fire in upland pine and pine/hardwoods for creation of herbaceous ground cover
6. Maintain soft mast producing vines, shrubs, and trees in floodplain/ riparian forests
7. Develop ecotones for nesting/feeding along roads, ranges, and firing points by reduced mowing
8. Restoration of longleaf pine and use of prescribed fire

4.3.3 Reptiles and Amphibians

The management for threatened or endangered reptiles and amphibians known to occur on CSJFTC are outlined in the T/E section. A continuous sampling of the herpetofauna on CSJFTC has been in place since 2008.

Habitat management implemented for conservation of reptiles and amphibians includes:

1. Wetland and ephemeral pool protection
2. Retention of snags and downed deadwood
3. Forest management that favors older-age-class trees
4. Protection/regeneration of riparian, mesic slope forest
5. Habitat protection from ORV's/ATV's and timber harvest operations that disturb soil surface and sediment deposition

4.3.4 Mussels

No candidate or petitioned mussel species are known to occur on CSJFTC. *Strotophitus pascagoulaensis* occurs in small streams/creek tributaries of the Leaf River above Camp Shelby. There is potential for occurrence, but hasn't been found on the installation. *S. pascagoulaensis* is formerly part of *Anodontoides radiatus*, a petitioned species. BMP's are followed in wetlands and SMZ's to ensure preservation of habitats.

4.3.5 Insects

No candidate or petitioned insect species are known to occur on CSJFTC. All natural resources management efforts are made with the intent of protection, restoration and enhancement of native habitat types.

4.3.6 Crustaceans

The Camp Shelby Burrowing Crayfish management is outlined under threatened and endangered species management. No other candidate or petitioned crayfish species are known to occur on CSJFTC. One petitioned crayfish, *Procambarus fitzpatricki* has been found approximately 18 air miles SSW of Camp Shelby in Forrest County. *P. fitzpatricki* has the potential to occur on Camp Shelby particularly in the southern portion. This species is usually found in muddy ditches ans in some bogs closer to the Gulf Coast. It has also been collected in pitcher plant bogs. BMP's are followed in wetlands and SMZ's to ensure preservation of habitats.

4.3.7 Fauna Threatened and Endangered Species Management

Louisiana Black Bear

Rankings GLOBAL: G5T2 STATE: S1 FEDERAL: USFS:

The Louisiana Black Bear (*Ursus americanus luteolus*), currently listed as state threatened, is indigenous to the Lower Mississippi Valley and Lower Coastal Plains of the southeastern U.S. It has been reported on DeSoto National Forest. Authenticated sightings have been reported throughout south and western Mississippi (Cathy Shropshire, MDWFP biologist, personal comm.). Recent sightings at corn bait stations have been reported by biologists on Leaf River Wildlife Management Area, DeSoto National Forest (Jake Bowman, Bear biologist Research

Assistant, Mississippi State University, personal comm.). The most recent sighting in the cantonment area of CSJFTC was in 2009. Home range and dispersal movement of radio-collared bears in southern Mississippi average 40 to 50 square miles/year; therefore, bears utilizing LRWMA may move into habitats on CSJFTC DOD and USFS-SUP lands (Jake Bowman, bear biologist and research assistant, Mississippi State University, personal comm.).

CSJFTC managers are aware of the potential for CSJFTC lands to be used by transient or resident bears over time.

Habitat**:** Bear can adapt to a diversity of habitats if they are protected from poaching and harassment by humans. In the Gulf Coastal Plains region, primary habitats are forested alluvial floodplains and hardwood forests. Interspersion of farm woodlots, small cutovers, and early succession shrub thickets provide forage and soft-mast for bears in forested habitats. In the southeastern U.S., swamp areas with overmature cypress, extensive canebrakes, or titi are important for den and escape cover. Titi swamps are especially important where free-ranging and feral dogs occur. Forest corridors >2-3 chains wide (> 100 feet.) are essential in agriculture areas or open habitats to connect fragmented tracts. Bears may rest in dense thickets or in trees. Elevated cavities in hollow trees (usually 2-3 feet wide and possibly as high as 50 feet from the ground) provide winter den sites. Hollow logs, undersides of rock outcrops, or upturned stumps, cane thickets, and vine mats may also be used as dens. Guidelines provided by USFWS specify protection of old growth cypress and tupelo gum for reproducing sows during winter.

Escape cover may be provided by large areas with minimum human disturbance, swamps with dense briars and cane, stream channels and standing water, or Carolina bays of titi, gallberries, fetterbush, and laurel greenbriar. Weaver (1989) reported that the quality of escape cover can be increased when logging slash and vegetative regrowth are combined with natural understory.

Bears are opportunistic omnivores. Mast, fruit, insects, animal matter, and succulent plants make up most of the bear's diet. However, composition of diets may vary seasonal based on nutritional needs. Food and cover management for year-round bear conservation should consider the following seasonal periods and activity:

General Management Plan on CSJFTC: Alluvial floodplains of transecting streams are primary areas where CSJFTC can focus on bear habitat management without impacting the military training mission.

1. Provide areas with both early and late stages of vegetation development
2. Retain all older-growth timber for den trees. Large cavity trees (>36" DBH) should be retained with sheltering stems around them whenever they occur. Generally, cypress and tupelo gum of all ages should be retained to provide future den trees. Retain cavity trees by growing hardwoods on longer rotations, and by featuring the appropriate den-using species. Large cavities (>5" wide) suitable for dens occur in a small percent of trees and require a long time to develop; as such, all such trees should be retained regardless of their position in the stand.
3. Maintain forested streamside management zones of 100 ft. or more on each side of water as travel corridors, feeding habitat, and day bed sites.
4. Provide hardwood stands from 50-100 acres in size, with two or three stands in close

proximity to each other. Stands containing numerous hickories are key areas.

5. Retain huckleberries, blackberries, blueberries, greenbriar, grape, viburnums, dogwood, and chinquapins, especially along ecotones of alluvial floodplains where bear may travel. Herbicides should not be used on understory food plants.
6. Protect Titi bays and hardwood swamps with dense canes and greenbriar which provide escape cover.
7. Bear habitat management also provides habitat diversity for gray squirrels, raccoons, and an array of songbirds and other species. Den tree requirements are also fulfilled for squirrels, wood ducks, owls, and other cavity users.

Table 8: Activity and time periods and major foods taken by Louisiana Black Bears in Gulf Coastal Plains Region of the southeastern United States (Weaver 1990).

Activity	Time Period	Major Foods
Pre-denning	**August through November**	**High fat foods, such as hard mast of oaks, chinquapin, hickory, pecan, walnut, beech; soft mast of blackgum, blackberries, huckle and blueberries, black cherry, hollies, dogwood, sassafras, buckthorn, pokeberry, grapes, greenbriar, American beauty berry, and hawthorns.**
Denning	**December through March**	**High fat and carbohydrate foods, such as corn, hard mast (oak, hickory, pecan, walnut, beech), and soft mast of gallberries and greenbriar.**
Post-denning	**April through May**	**High protein foods, such as succulent herbaceous plants (arrow arum, greenbriar, native grasses and annual legumes, poke salad, squaw root, inner bark of trees, insects, and animal matter**
Breeding	**June through July**	**High carbohydrate and protein foods, such as soft mast of swamp privet, blue and huckle berries, hawthorns, holly, poke salad, devil's walking stick, blackberries, dewberry, wild grapes, palmetto, hard mast of oak, hickory, beech, chinquapin, pecan, walnut, thistle and herbaceous forage, invertebrates (Ants, wasps, yellowjackets, beetle larvae, crayfish), bird eggs, small mammals and amphibians.**

Red-cockaded Woodpecker (RCW)

Rankings GLOBAL: G3 STATE: Endangered FEDERAL: Endangered USFS: Endangered

All RCW colonies, or clusters, occurring on CSJFTC are located on USFS land in the southern portion of Camp Shelby. All RCW populations on USFS lands were rated according to the Management Intensity Level (MIL), which is based on the risk of local extinction. Inactive clusters on USFS- owned lands of CSJFTC were given a MIL rating of 4, and as a result, cannot be declared abandoned (USFS 1995). Management planned within RCW-related boundaries, follow the guidelines stipulated in *Recovery plan for the red-cockaded woodpecker(Picoides borealis): second revision* (2003) U.S. Fish and Wildlife Service, Atlanta, GA. RCW management will include a Habitat Management Unit approach whereby designated areas will be managed for RCW nesting and foraging, including clusters and areas determined to be appropriate for recruitment and replacement stands.

Designation of Habitat Management Units on DeSoto National Forest will be based on colony status and potential for areas to support augmented or naturally colonizing birds. Areas have yet to be designated on SUP lands. Areas have been designated on the DeSoto National Forest in the Technical/Agency Draft Revised Recovery Plan for the Red-cockaded Woodpecker (*Picoides borealis*), July 2000 in areas North and South of Camp Shelby but do not include land currently used by the MSARNG. In the fall of 2008 the USFS reintroduced 5 pairs into the Leaf River Wildlife Management Area in Training Areas 58 and 60.

The red-cockaded woodpecker (*Picoides borealis*) was listed as an endangered species in 1970 due to population declines related to four factors:

1. Specific habitat requirements

2. Land use changes brought on by larger human populations and the resulting greater demands for the bird's living space

3. Past timber management emphasizing immature pine forests in much of its range

4. Exploitative logging of extensive tracts of pine throughout the southeast in the early 1900's.

Management of habitat for red-cockaded woodpeckers benefits a diverse species assemblage in upland pine ecosystems, including gopher tortoise, indigo snake, black pine snake, Bachman's sparrow, indigo bunting, brown-headed nuthatch, northern bobwhite, and cottontail rabbit. Careful fire management and thinning operations can also retain habitat quality for amphibians, such as the Dusky Gopher Frog, that use temporary pools.

General Habitat Requirements Under Recruitment Conditions (US Fish and Wildlife 2003):

1. There are 45 or more stems/ha (18 or more stems/ac) of pines that are > 60 years in age *and* > 35 cm (14 in) dbh. Minimum basal area for these pines is 4.6 m^2/ha (20 ft^2/ac). Recommended minimum rotation ages apply to all land managed as foraging habitat.

2. Basal area of pines 25.4 – 35 cm (10 – 14 in) dbh is between 0 and 9.2 m^2/ha (0 and 40 ft^2/ac). Basal area of pines < 25.4 cm (< 10 in) dbh is below 2.3 m^2/ha (10 ft^2/ac) *and* below 50 stems/ha (20 stems/ac). Basal area of all pines > 25.4 cm (10 in) dbh is at least 9.2 m2/ha (40 ft^2/ac).That is, the minimum basal area for pines in categories (1) and (2) above is 9.2 m^2/ha (40 ft2/ac).
3. Groundcovers of native bunchgrass and/or other native, fire-tolerant, fire dependent herbs total 40 percent or more of ground and midstory plants and are dense enough to carry growing season fire at least once every 3 years.
4. No hardwood midstory exists, or if a hardwood midstory is present it is sparse and less than 2.1 m (7 ft) in height.
5. Canopy hardwoods are absent or less than 10 percent of the number of canopy trees in longleaf forests and less than 30 percent of the number of canopy trees in loblolly and shortleaf forests. Xeric and sub-xeric oak inclusions that are naturally existing and likely to have been present prior to fire suppression may be retained but are not counted in the total area dedicated to foraging habitat.
6. All of this habitat is within 0.8 km (0.5 mi) of the center of the cluster, and preferably, 50 percent or more is within 0.4 km (0.25 mi) of the cluster center.
7. Foraging habitat is not separated by more than 61 m (200 ft) of non-foraging areas. Non-foraging areas include (1) any predominantly hardwood forest, (2) pine stands less than 30 years in age, (3) cleared land such as agricultural lands or recently clearcut areas, (4) paved roadways, (5) utility rights of way, and (6) bodies of water.

General Management Plan for RCW:

1. Manage clusters as stands rather than as individual trees. RCW trees should be contiguous with adjacent forest cover and foraging habitat.
2. Provide nesting and roosting habitat by maintaining open stands of mature southern pines. Active cavity trees are usually infected with red heart fungus, which only occurs in >40 year old pines. Stands of pine and pine-hardwood must be at least 20 years old to be used for foraging and travel.
3. Longleaf pine is preferred in the Lower Coastal Plains Region; therefore, do not convert existing longleaf pine stands to other pine species. Management for open, mature longleaf pine stands, including regularly scheduled prescribed burns, provides excellent habitat for RCW.
4. Cavity trees should be protected from fire when fuel build-up is high, because the result could be tree mortality or loss of suitable cavities.
5. All cavity trees located through surveys, prescription preparation, and work activity should be mapped. Cavity trees should be marked with paint, and the cluster perimeter marked at intervals with plastic tags or flagging. Place a numbered aluminum tag on individual cavity trees and keep a detailed record of each location. Cluster perimeters should not be painted because they change as new cavities are created. Buffer strip perimeters should be posted "off limits" and fenced.
6. Snags should not be removed and firewood permits should not be issued for cluster sites.

Specific Management within Habitat Management Units:

Clusters and Recruitment Stands: Research has shown that increased height (> 15 feet) and density (> 49.2 feet^2) of hardwood midstory is associated with RCW cluster abandonment and failure to initiate new clusters (Jordan et al. 1995). Therefore, cluster and recruitment stands within HMUs should receive the most intensive management to create open, park-like stands of mature pine trees. Midstory of >15 feet in height within 50 feet of cavity trees will be removed. Beyond 50 feet, the following prescriptions should be implemented for optimal RCW habitat:

1. hardwood stocking below 10 feet^2/acre,
2. hardwood canopy cover not to exceed 10%,
3. hardwood midstory not to exceed 10%, and
4. average of three midstory hardwoods/acre (dogwood, redbud, or other shrubby to midstory size) can be retained.

Some midstory of less than 15 feet and widely scattered does not appear to discourage RCW use and can be maintained for soft mast production and cover for thicket-nesting birds.

Foraging Habitat: RCW's prefer open pine stands of greater than 30 years old for foraging, but will also use mixed pine hardwoods and hardwoods (Crosby 1971, Hooper et al. 1980, Hooper and Harlow 1986, Jordan et al. 1995). Most foraging occurs on old living pines or in open habitats and RCW territories tend to be smaller in pine stands managed with fire to control hardwoods (Hooper et al. 1980). The actual amount of foraging habitat needed may vary in size depending on timber age class, distribution of stands, pin stand stocking levels, and RCW population density (USFS 1993). Average foraging habitat equivalents set by USFWS are (Henry 1989):

1. At least 8,490 feet^2/acre basal area in pine stems > 5 inch d.b.h., and
2. At least 6,350 pine stems > 10 inch and > 30 years old.

In general, 100 acres of good habitat (mature open pine forests) may be sufficient, but several hundred acres of poor habitat may be required depending on RCW population density. To provide high quality foraging habitat in close proximity to clusters, foraging habitat should be:

1. Located within ½ mile of the geometric center of the cluster,
2. Continuous and contiguous with the cluster, and
3. Include only pine and pine-hardwood stands, with most pines being >30 years old.

No rotational age should be set for pines in foraging habitat, since recent research supports the idea that older trees may be more important than size of pine stems (Jordan et al. 1995).

Because RCW's appear to accept a diversity of foraging habitat conditions, managers can develop approaches that support the needs of other species on the landscape that require hardwood cavity trees and mast producing trees and shrubs. Hooper (1994) reported that hardwood control is less critical in foraging stands than in recruitment and replacement stands.

To integrate RCW foraging habitat with multiple species management the following can be implemented:

1. About 3 midstory hardwoods can be retained without detrimental effects to foraging RCW's (Hooper 1994).
2. In foraging areas, up to 50 percent hardwoods in dominant and co-dominant classes is "entirely acceptable", unless the restriction on available land area requires an emphasis on production of mature pines in these stands (Jordan et al 1995).

Midstory Control Methods: Midstory control will normally involve prescribed burning, specifically as follows (Jordan 1995):

1. Burns will be conducted at least every three years in longleaf, loblolly, slash, and shortleaf pine habitats,
2. Burn intervals may be increased to no more than five years after midstory has been controlled with agreement of the USFWS.
3. Mechanical treatment and selective herbicide application should only be used when burning is not feasible or is insufficient to control a well-advanced hardwood midstory.
4. Cavity trees will be protected from fire damage during burning.
5. Burning should normally be conducted during the growing season; however, winter burns should be conducted initially to reduce fuel loads.
6. Use of fire plows in clusters will be allowed only in emergency situations.

Pine Thinning: Thinning operations in clusters and recruitment stands will adhere to the following prescriptions:

1. Pine stocking should achieve 50 to 80 $feet^2$/acre basal area.
2. Stands should be thinned when pine basal area exceeds 80 $feet^2$.
3. No thinning cut should exceed 30 $feet^2$/acre.
4. Stands should approximate 25-foot spacing between mature trees, retaining scattered clumps.
5. All dead, dying, and inactive cavity trees will be retained.

Timber Harvest: Timber harvest within HMUs is restricted during RCW breeding season and should be planned and approved by a certified biologist. Additional prescriptions are as follows:

1. No rotation ages are to be set within cluster and recruitment stands. A 120-year rotation for longleaf pine and a 100-year rotation for other pines will be set for the remainder of the HMU.
2. Timber prescriptions should mimic natural processes to maintain historical conditions: old growth, uneven-aged longleaf pine stands with small (0.25 to 0.5 acre) even-aged patches.
3. Timber harvest should employ small group selection, small clearcuts (< 0.5 acres), seedtree, or shelterwood cutting , retaining 6-10 relict trees/acre and all snags and relict trees in thinnings.

4. Off-site stands will be converted to longleaf pine.

Training Restrictions: HMU Guidelines place certain restrictions on military training activities within RCW cluster in an effort to integrate installation training missions and operations and RCW population recovery and protection. The following restrictions apply only in RCW clusters:

1. Limiting military training to dismounted operations of a transient nature,
2. Preventing establishment of bivouacs,
3. Restricting digging and cutting of vegetation other than hardwood used for camouflage,
4. No use of CS gas, smoke, flares, or other incendiary devices, and
5. Limiting vehicle traffic to designated and maintained roads and firebreaks

The use of blanks in handguns and rifles is permitted. Off-road traffic by wheeled vehicles that weigh less than 5 tons traveling through clusters, 100 feet from cavity trees is permitted on an infrequent basis if first approved through informal consultation with the USFWS. Also, after consultation with the USFWS, up to 10% of RCW clusters may have expanded training activities that permit bivouacs more than 200 feet from cavity trees, the use of M60 MG blanks, and wheeled vehicles more than 200 feet from cavity trees as long as soil erosion is controlled.

Gopher Tortoise

Rankings: GLOBAL: G3 STATE: Endangered FEDERAL: Threatened USFS: Threatened

Population Objectives: In the *Gopher Tortoise Recovery Plan* (1990), successful prevention of Endangered status would be considered by evidence of tortoise densities are maintained at an average of 5 gopher tortoise burrows per hectare (2 tortoise burrows per acre) on priority soils for 30 years. Anytime tortoises are trapped/translocated, the USFWS approved methodology will be utilized (Appendix F).

Habitat: The gopher tortoise (*Gopherus polyphemus*) lives in a range of upland habitats; however, general physical and biotic features provided by Landers (1980) characterize most suitable habitat as:

1. Well-drained, sandy soils, which allow easy burrowing. Western populations may require sandy soil depths of more than one meter due to lower ambient temperatures.
2. Abundant herbaceous ground cover, including native grasses, forbs, and legumes.
3. Open tree canopy and limited shrub cover that allows sunlight to reach the forest floor.

The original habitats of the western population of gopher tortoises were natural dry communities of the longleaf pine-scrub oak type, located on sand ridges. Since the original ecology of the dry, fire-dependent communities has significantly changed, gopher tortoises may also be found in marginal habitats (fence rows, pastures, field edges, and powerlines); however, in these habitats they become more noticeable and more susceptible to human depredation and vehicle mortality (USFS 1995). Habitat requirements and use is similar for adult and juvenile tortoises.

Native grasses, grass-like plants, and legumes are reported to be the most important foods

(Garner and Landers 1981). A relatively open canopy is necessary for growth of herbaceous food

plants and egg incubation. Nests located in openings such as firelanes or roadsides are common when overstory overshadows the burrow entrance (Landers and Buckner 1981).

The gopher tortoise (*Gopherus polyphemus*) is the only naturally occurring tortoise in the southeastern United States. It is found in varying numbers in dry, sandy habitats, and its range nearly coincides with the original range of the longleaf pine (*Pinus palustris*).

On July 18, 1984, the U.S. Fish and Wildlife Service was petitioned to list the population of the gopher tortoise west of the Tombigbee and Mobile Rivers, under provisions of the Endangered Species Act. The petition and report (Lohoefener and Lohmeier 1984) showed substantial information on numbers and distribution of the western population. On July 7, 1987, the western population was listed as threatened under the Endangered Species Act (52 FR 25376-25380).

Although the general biology of the gopher tortoise has been well-documented, many specific details remain unknown. Many biological factors for this species vary considerably, including: age (or size) at sexual maturity, clutch size, growth rates, phenological characteristics, burrow depths, specific food habits, and others (Diemer 1986). Most biological information on the gopher tortoise originates from Georgia and Florida. The recovery plan relies primarily on the research by Landers and Buckner (1981) in Georgia, since their study sites are more similar to the western population (by latitude), than to populations in Florida. This plan is specifically for the western population, although it does rely greatly upon data sources and expertise developed elsewhere.

Description and Taxonomy: The gopher tortoise, described by F. M. Daudin in 1802, is the only species of the genus *Gopherus* in the Southeastern United States. It has a large shell, 15-37 centimeters (cm) (5.9-14.6 inches) long. The gopher tortoise is a dark-brown to grayish-black terrestrial turtle with elephantine hind feet, shovel-like forefeet, and a gular projection beneath the head on the yellowish, hingeless plastron (Ernst and Barbour 1972). The hatchlings are yellowish-orange, with a soft shell, and are 4-5 cm (1.5-2.0 inches) long at hatching. The sex of adult gopher tortoises can be determined by shell dimensions; the male has more plastral concavity, and a longer gular projection. However, the sex of immature tortoises is hard to assess.

Life History and Ecology Distribution:

Distribution: Originally, the western population was located in the longleaf pine hills of northern Mobile, Washington, and southeastern Choctaw counties in Alabama; in the southeastern upland areas of the pinehills province in Mississippi (a 14county area); and in the upland pine ridges in St. Tammany, Washington, and Tangipahoa Parishes, Louisiana (Lohoefener and Lohmeier 1984). Lohoefener and Lohmeier (1984) defined the amount of gopher tortoise habitat, for the listed population by state is as follows: southwestern Alabama - 40,770 hectares (ha) or 100,741 acres (A); Louisiana -4,815 ha or 11,898 A and Mississippi - 102,084 ha or 252,246 A. The complete western population coincides with the original range of the longleaf pine.

The xerophytic nature of gopher tortoise habitat is due to the soil conditions. A positive correlation exists between the amount of herbaceous ground cover and tortoise density. Grasses,

grass-like plants, and legumes are reported to be the most important food plants (Garner and Landers 1981) The percent ground coverage and species of low growing herbaceous plants may depend upon forest cover, burning history, nature and timing of past soil disturbance, and inherent soil fertility.

A relatively open canopy is necessary for growth of herbaceous food plants and egg incubation. The female gopher tortoise chooses a bare spot for nest excavation, usually in the mound of excavated sand at the burrow entrance. Nests located in openings such as firelanes or roadsides are common when overstory overshadows the burrow entrance (Landers and Buckner 1981).

A major portion of the gopher tortoise's life is spent in the burrow, which is also the focal point of many above-ground activities. Most burrows have a single entrance, and adult burrows average about 4.5 meters (m) (15 feet) in length with a depth of 1.8m (6 feet) (Hansen 1963). Similar burrows, often as shallow as a few inches, are used by small juveniles. Tortoises will typically excavate more than one burrow. Results of surveys by Wester (2005) showed that of the 3710 active or inactive burrows for which occupancy could be conclusively determined, 1310 (35.3%) contained tortoises. The burrow can serve as protection from fire, predators, climatic extremes, and habitat for a host of unique species. More than 60 vertebrate and 302 invertebrate species have been reported to use gopher tortoise burrows (Jackson and Milstrey 1989). Some of the species known to occupy burrows on CSJFTC include the eastern diamondback rattlesnake (*Crotalus adamanteus*), eastern coachwhip (*Masticophis flagellum flagellum*), eastern box turtle (*Terrapene carolina*), armadillo (*Dasypus novemcinctus*), cotton rat (*Sigmodon hispidus*), opossum (*Didelphis virginiana*), and *Peromyscus* spp.

Longevity and Reproduction: The life span of gopher tortoises is estimated at 40-60 years (Landers 1980) and may extend to 80-100 years (Landers *et al*. 1982). Growth annuli on shells become worn at 20-40 years, making age determination imprecise. In a Georgia study (Landers *et al*. 1982), age at sexual maturity ranged from 19-21 years for females. The ventral surface (plastron) of these animals' shells had a length of 25-26.5 cm (9.8-10.4 inches).

Generally, males reach reproductive maturity at a smaller size and younger age than females. Environmental and genetic factors cause growth rates to vary among gopher tortoise populations. Depending on location, breeding periods may begin as early as February and extend into September. Primary nesting season is mid-May through the end of June (Iverson 1980, Landers *et al*. 1980, Smith 1995, Butler and Hull 1996, Epperson and Heise 2003), clutch sizes average 4-8 eggs (Butler and Hull 1996, Smith *et al*. 1997, Epperson and Heise 2003. Generally, the nest is 15-25 cm (6-10 inches) beneath the surface (Landers *et al*. 1980). Incubation periods range from 80-90 days in northern Florida (Iverson 1980) to 110 days in South Carolina, the northern limit of the gopher tortoise's range (Wright 1982). Recruitment is a major issue in tortoise populations on CSJFTC, and many possible contributing factors are currently being investigated, including: 1) nest predation; 2) hatchling predation; 3) senescence; 4) low genetic diversity or inbreeding; and 5) nest chamber attributes such as clay content and gas exchange.

Food: The gopher tortoise is the primary grazer in its dry habitats (Landers 1980) and aids in seed dispersal for native grasses (Auffenberg 1966). Observations and studies of food habits

come primarily from Georgia and Florida, where wiregrass (*Aristida stricta*) is often considered an important food plant and is a common member of the longleaf-scrub oak community. However, in western parts of the coastal plain, bluestem grasses (*Andropogon*) are often the most common herbaceous species in mature longleaf pine forests (Wahlenberg 1946). Lohoefener and Lohmeier (1981) observed tortoises in Mississippi eating crabgrass (*Digitaria sangunalis*) and panic grasses (*Panicum*). Garner and Landers (1981) found that broad-leaved grasses were staple foods, while wiregrass was used primarily in early spring and summer. Also, their study showed that wild legumes (Fabaceae), which are high in protein, were used extensively by juveniles. Garner and Landers (1981) also found that fleshy fruits were consumed, including blackberry (*Rubus cunefolius*), sloeplum (*Prunus umbellata*), blueberry (*Vaccinium*), maypop (*Passiflora lutea*), and hawthorne (*Crataegus*). Although specific plants are available for forage, the conclusion reached by Garner and Landers (1981) that "grasses, grass-like plants and legumes are the most important food plants and evidently determine carrying capacity" is most likely a statement which can be equally applicable to the western population.

Activity/Movement: A three-year radio-telemetry study was completed in 2004, which documented the burrow use, movement patterns, and home range of 40 gopher tortoises on Camp Shelby. Active season was defined for the study as the time period when tortoises were not overwintering, and lasted approximately from early April to mid-October. Females had significantly longer overwintering periods than males; the average overwintering period was 234 ± 56 (mean ± SD) days for females and 167 ± 38 days for males. McRae *et al*. (1981) found activity to be very restricted in winter months, and feeding activity, from late Novemberthrough February, was observed only five times. For the Camp Shelby study, males moved the most each year between July and September; females moved the most in June, presumably from searching for optimal nesting areas. During July and August, McRae *et al*. (1981) found a bimodal movement pattern, with feeding forays peaking at mid-morning (1000-1200h) and mid-afternoon (1600-1800h), and activity much reduced during the hottest part of the day (1300-1500h).

Estimation of total distance moved was solely based on straight-line movements between burrows, and should therefore be taken as a minimum estimate. Total distance moved was also significantly different for males than females; males moved farther (3765 ± 2154 meters) than females (1188 ± 629 meters) over the course of the study. Extremes in total distance traveled ranged from a female that moved a total of 369 meters in 650 days to a male that moved over 10,500 meters in 755 days. Additionally, the number of times an animal changed burrows was significantly different for males and females. On average, males (29 ± 7 times) changed burrows more than females (8 ± 3 times). Extremes in numbers of movements ranged from a female that moved 8 times in 650 days to a male that moved 82 times in 758 days.

McRae *et al*. (1981) studied movement related to feeding separately from movements related to other behavior and determined 95 percent of all feeding activity took place within 30m of the

burrow being used. The foraging distance was increased from the burrow in areas with reduced ground cover (Auffenberg and Iverson 1979). This suggests that the foraging distances can increase or decrease depending on food availability. McRae et al. (1981) trailed 13 adults and determined their movements to be in a nearly circular or elliptical pattern around the burrow. Larger movements later in the year are thought to be caused by a depletion of preferred foods near burrows by late summer.

Home range: Average minimum convex polygon (MCP) home range sizes range between 0.3 and 1.9 ha (Diemer 1992, Smith 1995, Smith *et al*. 1997, Eubanks *et al*. 2003) and some studies have found home range sizes for males to be significantly larger than those of females. Douglass (1976) reported home ranges of two males in Florida to be 4.2 and 6.3 ha in studies over five years long, and Eubanks *et al*. (2003) reported maximum annual home ranges from a study in Georgia to be 3.4 ha for females and 4.8 ha for males. However, a female in the Camp Shelby study had the largest annual home range of all tortoises (7.6 ha).

Behavior: Gopher tortoises have a well-developed social structure, courtship, and territorial combat (Auffenberg 1966, Douglass 1976, McRae *et al*. 1981). During breeding season, males bob their heads to attract females. The head bobbing increases in speed and amplitude as the male draws closer to a reproductively active female, and the first contact between individuals consists of males biting females on the forelimbs and around the gular area, perhaps seeking olfactory cues (Auffenberg 1966). There is usually some act of dominance or submissive behavior when males confront each other. The dominance hierarchy in males is based on size according to McRae *et al*. (1981). In dense populations, smaller males are found around the colony's periphery rather than in the middle, close to the breeding females, as is the case with larger males. A component of the current USACE-CERL study involves video surveillance of females' burrows, where much of the combat and mating behavior take place.

Threats and Causes for Decline:

Habitat Alteration: The most important step in developing this recovery plan was understanding the reasons behind the threatened status of the gopher tortoise. The gopher tortoise, historically and currently, lives in dry plant communities originally identified by the longleaf pines in this area. The ecosystem of the gopher tortoise changed when the original longleaf pine communities were altered. To maintain the listed population, the forest lands must also be maintained.

The longleaf pine was the main tree species on southeastern coastal plain upland soils before the European colonists arrived in the New World. Croker (1987) concludes that 4 million acres of the original 60 million acres remains. After cutting the red and white pine forests of New England and the Great Lake States, lumbermen turned to the virgin longleaf stands, with peak production occurring in 1909 (Croker 1987). Mechanized forestry operations and railroad logging expedited the clearing. After extraction of timber, second growth longleaf pine stands grew. However, these second forests only make up a small fraction of the area of virgin stands. Since the longleaf pine presented planting difficulties, slash and loblolly pines were often planted in these droughty sites. This practice, along with excessive burning intervals and intensive site preparation methods, is still practiced today on soils which originally supported longleaf pine.

Many foresters are rediscovering the valuable traits of longleaf pine, since artificial planting of longleaf is now successful. Longleaf pines can also be successfully regenerated naturallythrough a shelterwood system of cutting, combined with burning just in advance of an adequate seed fall. Recently, the U. S. Forest Service has adopted a practice of regenerating only longleaf pines on longleaf sites in the DeSoto National Forest. Planting is the agency's preferred method; however, most private landowners continue to regenerate longleaf pine sites to off-site species.

The original longleaf pine community burned and reseeded naturally. Particularly important to the gopher tortoise, it contained a diverse ground cover with much edge and trees of many ages. In longleaf pine-scrub oak stands that were thinned and burned every 2-4 years, Landers and Speake (1980) found better gopher tortoise densities. Sparser population densities were found in slash pine plantations, which had a similar system of thinning and burning. Although it is clear that gopher tortoises can be maintained under a modified (heavily thinned, frequently burned) plantation system of management, Landers and Buckner (1981) showed that gopher tortoise densities are greater (32 percent) in more naturally managed stands of longleaf.

The natural longleaf pine community, with its biological diversity, is the optimal forest habitat for the gopher tortoise. This community occurred in pure stands, interspersed with small, even-aged groups of a few hundred square feet (Chapman 1909). Following blow-downs from severe weather, larger even-aged patches and strips were found. These stands were often interspersed with openings, creating glades and a patchiness which favored the gopher tortoise. Management practices which alter this system, and should be avoided, include: clear-cuts of large blocks, dense plantings of off-site species, diversity-diminishing soil churning activities that often accompany even-aged timber management, and prolonged frequent burning intervals. Timber practices that most nearly mirror the natural system, such as shelter wood regeneration with 1-3 year burning regimes, and natural regeneration, improve soil and herbaceous cover conditions to optimally support the gopher tortoise.

Longleaf pine trees, as well as fire-dependent annuals and perennials, originally occurred in a naturally-occurring summer burning cycle, which has long since been interrupted. The one most important factor influencing other alterations which have changed the original dry communities may be the change in fire frequency and timing. For example, removing most of the longleaf pines from these dry ridges and exclusion of fire have been common practices. This allows oaks (Quercus laevis, Q. incana, and Q. marilandica) and woody shrubs such as yaupon (Ilex vomitoria) and gallberry (I. glabra) develop dense ground cover. The leaf litter from oaks forms a thick mat, which retards fires that would otherwise be carried by longleaf pine needles and the common grass associates under the open longleaf pine canopy. Fire exclusion allows the oaks to mature and shade out herbaceous ground cover needed by gopher tortoises. Throughout the range of the gopher tortoise this situation is not uncommon. Substantial evidence, provided by Landers and Speake (1980), states that these altered sites originally were good gopher tortoise habitat but now support the fewest gopher tortoises.

In the Conecuh National Forest in Alabama, Hedrick and Zimmermann (1988) monitored gopher tortoise densities in various forest types and age classes for a two-year period. Their unpublished data indicate gopher tortoise densities within three stand conditions (seedling/sapling stands, pole

stands, and sawtimber stands). Gopher density was greatest (1 active burrow/1.51 ha or 3.73A) in the seedling/sapling stands, greatly reduced (200 percent) in pole stands (1 active burrow/3.10 ha or 7.66A) and followed by a reduction recovery (177 percent increase) in sawtimber (1 active burrow/1.75 ha or 4.32A).

Current threats to the western population of the gopher tortoise in terms of habitat loss or degradation consist of certain forest management practices, conversion of dry sites to agriculture, road placement and other developments on these higher ridges, and urbanization (Lohoefener and Lohmeier 1984).

Predation: During the Great Depression, the gopher tortoise was an important food source, as reflected in the name "Hoover Chicken" (Hutt 1967). According to Taylor (1982), gopher pulling removes an average of 20 percent of the larger tortoises. Gopher pulling (the taking of gopher tortoises by use of a long flexible rod with a hook) remains a cultural ethos in rural areas where the western population is found. The gopher tortoise's low reproductive rate, high mortality of eggs and young, slow growth to sexual maturity, and long life indicate a K-selected strategy adapting to dry communities (Landers 1980). Annual population growth may only be 3-5 percent (Landers et al. 1980); accordingly, human predation on mature adults may produce long-term adverse effects which are difficult to overcome. Because many gopher tortoises exist in degraded or declining habitats, and populations are often fragmented, the adverse effects of even limited poaching may be devastating to populations. A siginificant number of Mississippi gopher tortoises have been taken for pets in the past (Lohoefener and Lohmeier 1984).

Mortality rates of hatchlings have been documented as 100% in two years on Camp Shelby (Epperson & Heise 2003); 100% in two years in Florida (Butler & Sowell 1996; D. Pike, pers. comm.); and 92.3% in the first year in Florida (Witz *et al*. 1992; Smith 1997). By far the most common cause of mortality in tortoise hatchlings is predation, and many different predators have been documented, including raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), eastern coachwhip (*Masticophis flagellum*), red-tailed hawk (*Buteo jamaicensis*), and red imported fire ants (*Solenopsis invicta*) (Douglass and Winegarner 1977; Fitzpatrick and Woolfenden 1978; Epperson and Heise 2003).

Other Mortality: Road mortality is reported by Landers and Buckner (1981) and Lohoefenerand Lohmeier (1984) as a significant mortality factor. Lohoefener and Lohmeier (1984) believe nests and juveniles are often destroyed by intensive site preparation (heavy equipment). Tanner and Terry (1981) report a major reduction in burrow density in Florida which was believed attributable to roller chopping or web plowing. Moler (1982) demonstrated that tortoises are able to dig out following chopping treatment on deep sandy soils, but concluded that additional data were needed regarding tortoise response to various site preparation techniques in different soil types.

Lohoefener and Lohmeier (1981) believed that a serious problem for the Mississippi gopher tortoise was isolation of sexually mature animals because of habitat fragmentation aggravated by forest management practices. In density survey transects by Lohoefener and Lohmeier (1981),

only 14 percent of the tortoises in Mississippi were considered so situated that interactions with other sexually mature tortoises might occur. Also, the discontinuous nature and small size of Mississippi sand ridges, which are often separated by streams or wet boggy areas, may serve as barriers to courtship travels of adult males (Lohoefener and Lohmeier 1984).

Population Viability: In theory, local populations of the western gopher tortoise can become eradicated through chance events and these extirpations (and thus more rangewide extirpations) are inversely related to population size. Shaffer (1981) cites four sources of uncertainty to which a population may be subject: (1) demographic stochasticity, which arises from chance events in the survival and reproductive success of a finite number of individuals; (2) environmental stochasticity due to temporal variation of habitat parameters and the populations of competitors, predators, parasites, and disease; (3) natural catastrophes, such as floods, fires, and droughts, which may occur at random intervals through time; and (4) genetic stochasticity resulting from changes in genetic frequencies due to founder effect, random fixation, or inbreeding. Genetic drift and inbreeding may already be occurring due to reproductive isolation (Lohoefener and Lohmeier 1984). Recovery, therefore, must consider population viability in establishing both the objectives and the procedures for meeting those objectives.

Gopher Tortoise Distribution and Protection: During 2003-2004, surveys were conducted to assess the status of the gopher tortoise on CSJFTC for comparison to the previous surveys conducted in the mid 1990's (Wester 2005). Approximately 35,000 acres of the 139,000 acre installation area were surveyed; 1,343 gopher tortoises were observed within 5,649 known burrows. Gopher tortoise abundance declined approximately 33 % on 89 survey areas compared to survey data of those same areas from 1995.

Five previous consultations have occurred involving the tortoises at Camp Shelby:

January 26, 1989 Biological Opinion to NGB and USFS
Biological opinion on the effects of continued military training (CSJFTC), proposed construction, and forest management on CSJFTC. (Biological Assessment by Mount, R.H., E.E. Wester and C.K. Swing. 1988. Final Biological Assessment of Land Altering Activities of the Mississippi Army National Guard on the Federally Threatened Gopher Tortoise, Gopherus polyphemus, at Camp Shelby Military Reservation, Mississippi. Mississippi Military Department, Jackson, MS.)

July 26, 1990 Biological Opinion to USFS
Biological opinion on the effects of proposed habitat management guidelines for the gopher tortoise on DeSoto National Forest, as such measures are applied to SUP areas and DOD lands on CSJFTC.

September 29. 1992 Biological Opinion to NGB and October 13 1993 Biological Opinion to USFS
Biological opinions on current military activities, the proposed reconfiguration of tank maneuver training, new or improved facilities at Camp Shelby, and the proposed issuance of a Special Use Permit for military training activities on USFS land. (Biological Assessments by Wester, E.E.

and Swing. 1990. Biological Assessment of the Effects of Military Activities on the Federally Threatened Gopher Tortoise, *Gopherus polyphemus*, on Selected Lands at Camp Shelby, Mississippi. Mississippi Military Department, Jackson, MS. Wester, E.E. and C.K. Swing. 1992. Biological Assessment of the Effects of Continued/Proposed Military Training Activities on the Federally Threatened Gopher Tortoise (*Gopherus polyphemus*), on Selected Lands at Camp Shelby, Mississippi. Mississippi Military Department, Jackson, MS)

June 11, 1997 Biological Opinion to USFS
Biological opinion amending the October 13, 1993 opinion on the Special Use Permit on the effects of the Multi Purpose Range Complex-Heavy.

May 18, 2006 Biological Opinion to NGB
Biological opinion reviewing the proposed construction of a waste water treatment facility by MSARNG at Camp Shelby, and its effects on the gopher tortoise.
A protection zone, consisting of a 200' buffer zone surrounding the perimeter of the aggregate of colony burrows, should be established around each colony. A colony is described as two or more burrows (active or inactive) within 600 feet of each other. This "zone" is currently under review by USFWS and may change in the future. All USFS-SUP lands used by MSARNG which are designated as restricted zones for protection of sensitive flora and fauna are managed by the USFS and MSARNG, in cooperation with the USFWS and MDWFP. DOD lands are managed cooperatively by MSARNG, USFWS, TNC, and MNHP. Endangered and threatened species protection on CSJFTC is mandated by the USFWS through species recovery plans, records of decision, the *1993 Biological Opinion for Gopher Tortoises on Camp Shelby Training Site, Mississippi*, and the amendment to that biological opinion (1997).

June 4, 2007 Biological Opinion to NGB
Biological opinion reviewing the proposed renewal of a Special Use Permit (SUP) for Military Activities on the DeSoto National Forest and Implementation of Installation Mission Support Activities by the Mississippi Army National Guard for a 20-year period for the Camp Shelby Joint Forces Training Center, Forrest, George, and Perry Counties, Mississippi, and its effects on the gopher tortoise (*Gopherus polyphemus)* and the Louisiana quillwort, (*Isoetes louisianenesis*) per section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C 1531 et seq.).

The CSJFTC has established a 2,200-acre gopher tortoise refuge (T-44) where military use is restricted and forest management is conducted to achieve and maintain optimal habitat conditions. Protection and management in T-44 also benefits the species assemblages associated with gopher tortoises, including the black pine snake (*Pituophis melanoleucus lodingi*), red-cockaded woodpeckers (*Picoides borealis*)(no indiviaulas are currently located within this area), Bachman's sparrow (*Aimophila aestivalis*), and dusky gopher frog (*Rana capito sevosa*). Management of this area is covered under the January 26, 1989 Biological Opinion to the USFS.

Black Pine Snake (*Pituophis melanoleucus lodingi*)

Rankings GLOBAL: G4T2T3 STATE: S2 FEDERAL: Threatened USFS: Threatened

Trapping/Monitoring: Unlike gopher tortoise or red cockaded woodpecker, the black pinesnake

does not leave a characteristic mark (e.g., burrow or cavity) upon the landscape which would readily signify to an observer that the species has or currently occurs at the site. This fact coupled with the snake's fossorial nature, extended periods of inactivity, low population densities, and/or extensive movements make surveys for the species difficult. Road-cruising and trapping appear to be the most effective and reliable means of detecting black pinesnakes, and both of these methods can provide a quantitative measure of abundance.

Long-term monitoring, via mark-recapture studies at established sites may provide valuable information related to species population dynamics, life history, ecology, and can give land managers guidance in how forest management practices affect snake populations. Black pinesnakes appear to be most abundant in open, fire-maintained pine forests, with a dense herbaceous understory. Therefore, vegetation monitoring will also be an effective tool in assessing the health of the community and the black pinesnake, as well as the effectiveness of habitat management.

Trapping of black pinesnakes will consist of 90m of drift fence buried to a depth of 0.1m, six box traps (height and width = 0.6m, length = 1.2m) constructed of hardware cloth (6-mm mesh) and plywood, and five 19-liter pitfall traps. Box traps, equipped with a rectangular funnel entrance (height=7.6cm, length and width=30.5cm) and one-way funnel door, will be placed at each end, and on alternating sides of drift fences (Lee 2009).

Annual monitoring of all sites will be conducted during the months when black pinesnakes are most active (i.e., April-July); although a subset of these sites should be monitored for the entire time that the snake is known to be readily active (i.e. March-October), so that a better understanding of the species phenology, fecundity, and rate of recruitment may be gleaned.

Monitoring during the overwintering period will not be necessary as snakes only rarely move during this time. All trapping locations and locations of individuals captured will be recorded using handheld GPS units and stored in the MSARNG GIS database for future resampling of these sites and for reference purposes. Critical habitat for the black pinesnake has been proposed within the areas covered by this INRMP on Camp Shelby; the critical habitat rules should be finalized FY19-FY20.

Specific Management Practices

1. Restore natural fire frequency, seasonality, and intensity, using prescribed fire.
2. Restore pine species to naturally occurring sites and at stocking densities consistent with open canopied forest structure.
3. Thin existing even-aged plantations, extend rotation age, consider uneven aged management (i.e., irregular shelterwood method).
4. Leave stumps, some logs, dead standing snags, and woody debris following timber harvests. Standing snags identified as safety hazards (e.g., along fire breaks, roads, areas of troop congregation) should be removed.
5. When conducting timber harvests, consider selective thinning, small group selection, or small clearcuts. In areas that are clearcut, retain some longleaf pine and oaks (e.g., relict trees, clumps of smaller trees, etc.).

6. Maintain connectivity of suitable habitats to facilitate dispersal and migration between larger forest stands.
7. Favor site preparation techniques that minimize soil disturbance, such as fire and chemical site prep when applicable.
8. Harvest during drier periods, and/or use low-pressure tires to minimize soil disturbance.
9. In areas where herbicides, pesticides, or fertilizers are used, carefully and precisely follow label instructions and give preference to individual stem treatment or spot application.
10. Control woody mid-story encroachment preferentially with prescribed fire, but when necessary consider additional alternatives (chemical and/or mechanical treatments).
11. Minimize fragmentation of large forest stands.
12. Do not bed the soil in areas with known black pinesnake populations
13. Consider the use of road closures, wildlife crossing signs, and/or culverts with drift fencing as a means of reducing road mortality.

Camp Shelby Burrowing Crayfish (*Fallicambarus gordoni*)

Rankings GLOBAL: G1 STATE: S1 FEDERAL: N/A USFS:

The Camp Shelby Burrowing Crayfish (CSBC) was a candidate for listing under the Endangered Species Act of 1973. The USFWS collected data to determine whether this species warrants federal protection, and determined that the CSBC will be sufficiently protected under a Candidate Conservation Agreement (CCA) (USFWS 2004). Documentation of the agreement and management plan is outlined in Appendix H. This action and the successful implementation of the management plan has precluded the species from being listed under the Act. A monitoring program and protocol have been developed and are implemented by the MSARNG, MDWFP, Nature Conservancy and the U. S. Forest Service (USFS). The CSBC is currently listed as a species of special concern for the state. This crayfish is a small burrowing crayfish measuring less than 30 millimeters in length (1.5 inches) that was described in 1987 (Fitzpatrick 1987). After extensive surveys in south Mississippi and Alabama, the CSBC was found to be restricted to a small area of DeSoto National Forest in central Perry County, Mississippi (Fitzpatrick 1987, 1991). Although CSBC were previously believed to be restricted to pitcher plant bogs, Welch (2002) observed CSBC in habitats characterized as pitcher plant savannas and palustrine wetlands (Fitzpatrick, 1991; Johnston and Figiel, 1995, 1997 and Leonard et al. 1999). In his study, CSBC distribution appeared to be strongly governed by soil hydrology and habitat condition, as burrow densities were higher in more open canopy habitats. Given the role fire plays in maintaining pitcher plant bogs and savannahs (Barker and Williamson, 1988; Folkerts, 1991), it was suggested that the highest quality CSBC habitat resulted from an interaction between frequent fire and vegetation structure within appropriate soils. USFS and MSARNG manage these wetlands. The geographic range of CSBC appears to be limited, however they are locally abundant in the open pitcher plant wetlands where they occur.

Challenges associated with the conservation of CSBC are its limited distribution and the vulnerability of pitcher plant wetlands to human perturbation and fire suppression. The CSBC is vulnerable to activities that would directly destroy its burrows, compact the soil, or alter the

hydrology of the wetland habitat. The primary activities occurring in areas surrounding CSBC habitat includes silvicultural activities and tank and troop maneuvers. Silvicultural activities that could harm the CSBC include upper canopy removal, site desiccation, soil compaction, rutting, and erosion from heavy equipment operation, and toxic run-off from herbicide and pesticide applications. MSARNG troop and tank maneuvers conducted within CSBC habitat can kill or entomb the animals, compact and disturb the soil, and affect hydrology through rutting. However these threats have been alleviated via the CCA.

All terrain vehicle (ATV) use by the public is high in the area where the CSBC occurs. ATV trails have been observed transecting pitcher plant wetlands inhabited by CSBC. ATV traffic may result in direct mortality to CSBC and destruction of the habitats that support them.

To provide protection for this species and its habitat, a candidate conservation agreement (CCA) has been developed cooperatively by the Mississippi Department of Wildlife, Fisheries, and Parks (MDWF&P), Mississippi Natural Heritage Program; Mississippi Army National Guard (MSARNG), Camp Shelby, Mississippi; USFS, DeSoto National Forest; and U. S. Department of Interior, Fish and Wildlife Service (USFWS), Region 4. The CCA, signed in the Spring of 2004, identifies conservation actions that are needed as follows:

Habitat Protection: Pitcher plant wetlands occupied by CSBC and appropriate buffers will be clearly marked and marking will be maintained to delineate protected areas. Troops will be instructed to stay out of these areas. Existing ATV trails through wetlands will be blocked and posted. Responsible parties in the implementation of protective measures are USFS and MSARNG.

Habitat Management: A habitat management plan for maintaining CSBC-occupied wetlands and associated buffers, including prescribed fire, has been developed cooperatively by USFS and MSARNG with each agency being responsible for management plans specific to its land (Appendix C)

Education and Information Transfer: Educational materials describing pitcher plant wetlands and sensitive species, including the CSBC, will be developed and implemented for targeted audiences, including National Guard troops, loggers, and ATV users. This initiative will be accomplished cooperatively by the USFS and MSARNG.

Monitoring: An annual CSBC monitoring plan has been developed and implemented (Appendix C). Monitoring will be accomplished through cooperative efforts between MSARNG and USFS.

Coordinating Conservation Activities: A CSBC Conservation Team (Team) has been formed and consists of one or more representatives from each cooperating agency and/or other advisors deemed necessary by cooperators. Authority of the Team is limited to developing and making recommendations for CSBC conservation. The Team will meet annually to assess conservation efforts, review conservation results and new study proposals, and make recommendations for modifying the CCA. Meetings will be open to the public and minutes will be kept and distributed to interested parties upon request.

Funding for Conservation Actions: Funding for conservation actions will be provided by a variety of sources, including but not limited to, federal sources, such as MSARNG, USFS, and

USFWS, and state sources, such as MDWF&P. In-kind contributions in the form of personnel, field equipment, and supplies will be provided by participating agencies as necessary.

Conservation Progress Assessment: An annual assessment of the CSBC conservation will be provided by the Team to determine effectiveness of the CCA and identify any needed revisions.

4.3.8 Wildlife Goals and Objectives

Goals:

1. Integrate natural resources conservation with the military training mission.
2. Integrate fish and wildlife recreation with the military training mission.
3. Protect state-listed flora and fauna.
4. Protect and restore federally threatened and endangered species and their habitats.
5. Contribute to national and international initiatives to protect sensitive species (migrant and resident birds, small mammals, and herpetofauna, and native pollinators) through ecosystem management and restoration.
6. Control native, non-native and invasive plant and animal species.
7. Coordinate and integrate land, recreation, and forestry management practices with flora and fauna conservation.
8. Protect stream/wetland habitats for native flora and fauna.

Table 9. Wildlife Objectives

Description "Objectives"	INRMP Reference	Date Accomplished	Cost	Status
Restoration of natural fire regime to a 1 to 3 year return interval.	4.3.8.4A 4.3.8.3A		$20,000	Ongoing
Survey, monitor and protect gopher tortoises and associated species.	4.3.8.4B 4.3.8.1A		In-house	Ongoing
Conduct environmental awareness briefs.	4.3.8.4C		In-house	Ongoing
Enhance habitat via mechanical methods.	4.3.8.4D 4.3.8.6A		$40,000	Ongoing
Enhance habitat via chemical methods.	4.3.8.4E 4.3.8.6B		$20,000	Ongoing
Manage fisheries at Lakes Walker and Dogwood.	4.3.8.2A		In-house	Ongoing
Complete annual migratory bird surveys.	4.3.8.5A		In-house	Ongoing
Develop deer management programs on the Cantonment Area.	4.3.8.2B		$20,000	Ongoing
Maintain various bird boxes.	4.3.8.5B		In-house	Ongoing
Control nuisance fauna.	4.3.8.6C		$30,000	Ongoing
Pollinator				
Establish and maintain SMZs.	4.3.8.8A		In-house	Ongoing

Monitor construction projects and training events for erosion.	4.3.8.8B		In-house	Ongoing

Appendix A

Natural Communities and Recommended Management

Black gum – Bay – Pine Swamp

- Protect from upstream and adjacent sedimentation through 165' SMZ. Maintain natural water flow and hydrology. Maintain diverse stand characteristics.
- Protect from forest fragmentation through limiting clearcutting. Small group selection or selective harvest only.
- Not suitable for most training activities due to wetland characteristics and sensitive species.
- Restrict vehicular activity in 200' protected buffer around wetland
- Retain living cavity trees and standing and downed deadwood.

Hardwood – Pine Bottomland

- Allow prescribed fires from adjacent uplands to burn into wetland edges. Maintain natural water flow and hydrology.
- Allow development of climax community.
- Limit forest fragmentation by prohibition of clearcutting and site conversion to pine.
- Maintain standing and downed deadwood, and cavity trees.
- Vehicular training should be limited as much as possible, especially during wet soil conditions.

Longleaf Pine – Blackjack Oak Forest/Woodland

- Prescribe burn at 1-3 year intervals, periodically during the growing season to reduce evergreen shrubs. Minimize ground disturbance.
- Control introduced pest plants.
- Regenerate high quality stands naturally, through selective harvest thinning of loblolly and slash pines and small group selection harvest. Limit forest fragmentation.
- Suitable for most low impact training activities.
- Maintain standing and downed deadwood and living cavity trees.

Longleaf Pine Clay Glade

- Prescribe burn at 1-3 years intervals, periodically during the growing season. Maintain natural hydrologic flow from adjacent uplands.
- Timber harvest and plantation establishment inappropriate.
- Not suitable for most training activities due to highly erodible soils and sensitive vegetation. Protect from rutting by ORVs, hiking trails, and other uses.

Longleaf Pine – Hardwood Forest/Woodland

- Prescribe burn every 1-3 years, periodically during the growing season to reduce evergreen shrubs.
- Minimize ground disturbance.
- Control introduced pest plants.
- Limit forest fragmentation and maintain high quality longleaf and hardwoods

through natural regeneration. Small group selection and selective harvest are recommended for removal of loblolly and slash pine.
- Suitable for most low impact training activities.

Longleaf Pine – Saw Palmetto Scrub

- Prescribe burn every 1-3 years, periodically during the growing season.
- Where necessary, control hardwoods and "off-site" pines mechanically or chemically.
- Regenerate naturally if sufficient number of mature longleaf pines remain; plant longleaf at low densities otherwise.
- Defer from timber harvest where possible.
- Minimize soil disturbing activities, including recreation. Fragile (high priority) soils not appropriate for training.

Pine Flatwoods

- Prescribe burn at 1-3 year intervals to control evergreen shrubs and hardwoods. Maintain hydrology, prohibiting any drainage actions; repair drainage ditches and firebreaks if needed.
- Regenerate naturally, altering burning schedule where slash pine dominates to allow slash pine seedling survival. Clearcutting, which can result in high water table and ponding, is inappropriate.
- Suitable for nontracked vehicles activities when dry.
- Limit recreational vehicle use.

Pitcher Plant Wetlands

- Install >100' protective buffer where vehicles, equipment, ORVs, and livestock (horses) are prohibited. Prescribe burn every 2-3 years, periodically during the growing season.
- No construction of fire breaks, firelanes or ditches are recommended.
- Repair existing erosion problems near wetlands. Protect from sediment loads resulting from road turn-out terraces.
- Maintain natural hydrologic flow from adjacent uplands. Prohibit ditching or other drainage efforts. No timber harvest other than to chainsaw removal of planted slash pines when soil is dry. Restrict logging equipment. Protect wet soils from rutting by trucks, tanks, ORVs.
- Not suitable for most training activities due to wetland characteristics and sensitive species.

Ponds (Open and Wooded)

- Maintain hydrology, do not ditch or try to drain. Repair/restore old ditches. Allow native vegetation to develop around pond shorelines by limiting mowing of pond edges.
- Retain standing and downed deadwood and cavity

trees.
- Maintain vegetation protective buffers around ponds to protect from nonpoint source pollution.
- Timber harvest inappropriate.
- Too wet for military use.

Ephemeral and Vernal Pools

- Protect from drainage, point source pollution, and sedimentation. Maintain natural vegetation around pools.
- Retain downed and standing deadwood.

Slope Forest/Woodland

- Remove from timber harvest; if essential, selectively harvest and regenerate naturally, maintaining mixed hardwood-pine character by leaving some merchantable pines.
- Due to steep slopes, vehicular training activities, horseback riding, and ORV use are prohibited.

Manmade Habitats

Grasslands

- Maintain by mowing or burning. Limit mowing to periods between November 1 and April 1 for protection of ground nesting wildlife and seed/pollen production of native plants.
- If mowed, control of woody plants around burrow must occur
- No broadcast application of herbicides, scraping, or excavation of soil if sensitive species are present.
- Selective herbicide introduced pest plants. Suitable for most training activities.

Structures and Buildings

- Maintain and protect structure and buildings being used by wildlife.
- Maintain native vegetation, including forests, around structures and buildings.
- Gate roads and access points to limit disturbance to wildlife.

Appendix B

Specific Forest Management Recommendations

DEPARTMENT OF DEFENSE MANAGEMENT UNITS

DOD Tract 1 - The western (W) half of this 320-acre tract is a drainage area for Dogwood Lake and contains tributaries of Jacobs Creek and slopes with a diversity of mixed hardwoods. The eastern (E) half consists mostly of loblolly and slash pines. There are gopher tortoise colonies in the northern, western, and southern portions of this tract.

1. No silvicultural activity is recommended.

DOD Tract 2 - This 800-acre tract is a drainage area for Walker Lake, contains mixed hardwoods and tributaries of Weldy Creek, and borders unique areas of Ragland Hills. There are gopher tortoise colonies in the northern and southeastern portions of the tract.

2. No silvicultural activity is recommended.

DOD Tract 3 -This 40-acre tract contains the 25-acre Stand CS0301, which consists of longleaf and slash pines. The Illinois Central Railroad runs through a portion of the tract.

1. Tract was selectively harvested in ????. The harvest objective was to create a seed bed for longleaf pine. However, through the exclusion of prescribed fire, undesirable loblolly pine seedlings have established the understory.
2. The tract needs prescribed fire incorporated back into the area and to encourage longleaf revegetation

DOD Tract 4 - This 40-acre tract contains the 33-acre Stand CS0401 that consists of slash pines and mixed hardwoods.

1. No silvicultural activity is recommended.

DOD Tract 5 - This 32-acre tract consists of loblolly pines with a mixed hardwood understory. Two tributaries of Davis creek run through this tract.

1. No silvicultural activity is recommended.

DOD Tract 6 - This 130-acre tract contains longleaf/slash pines and mixed hardwoods. The Illinois Central Railroad runs through the middle of the tract. As a result of past harvesting practices, this tract has become unmanageable. Past practices resulted in a largely seedtree harvest and unaquately prepared seed bed. As a result, invasive species (Chinese privet and Cogongrass) have encompassed the understory. Recommendations are as follows:

1. Remove the remaining upland timber.

2. Conduct a site preparation herbicide application to eradicate invasive species and create suitable habitat for the gopher tortoise.

3. Conduct a site preparation burn.

4. Regenerate affected area with longleaf seedlings.

DOD Tract 7 - This 120-acre tract contains 30'-35' tall loblolly pines with a heavy shrub understory.

1. Thin pines by removing 33% of the pine pulpwood, reducing the BA to 70. Remove poorly-formed or diseased pines first.

2. Prescribe burn tract following harvest in late winter (January-February).

DOD Tract 8 - This 80-acre tract consists of 24 acres of permanent open fields, and strips of pines and shrub cover. There is a gopher tortoise colony on the western border.

1. No silvicultural activity is recommended.

DOD Tract 9 - This 40-acre tract is a permanent open field with gopher tortoises located in the southern half. This open field is required to remain open for military training and protection of the gopher tortoise.

1. No silvicultural activity is recommended.

DOD Tract 10 - This 250-acre tract is bisected by a road into E and W halves. It contains two timber stands CS1001 on the W half and CS1002 on the E side. The W half contains an open field and mixed pine and hardwood(s); the E half has had all merchantable timber removed with little to no desirable seedling recruitment. Undesirable recruitment includes Kudzu, Chinese privet, and off site hardwoods.

1. The open fields are required to remain open for military training.
2. Conduct a site preparation herbicide application to eradicate invasive species, off site hardwoods and create suitable habitat for the gopher tortoise.

3. Conduct a site preparation burn.

4. Regenerate affected area with longleaf seedlings.

DOD Tract 11 - Most of this 160-acre tract is contained in T-19; as a result, all but the NE 1/5 of this tract is a permanent opening required for training purposes. Tributaries of Denham Creek run throughout the NE 1/5. A gopher tortoise colony is located in the E half of the tract. This tract has had all merchantable timber removed with little to no desirable seedling recruitment. Undesirable recruitment includes Kudzu, Chinese privet, and off site hardwoods.

1. Conduct a site preparation herbicide application to eradicate invasive species, off site hardwoods and create suitable habitat for the gopher tortoise.

2. Conduct a site preparation burn.

3. Regenerate affected area with longleaf seedlings.

DOD Tract 12 - This 40-acre tract contains pines on the slopes and mixed hardwoods in the bottom. A tributary of Denham Creek divides this tract into E and W portions. It has a open training area in the northwest corner of the tract. There is a gopher tortoise colony in the NW 1/4 of the tract.

1. Install a 200' buffer strip around gopher tortoise burrows in which no silvicultural or vehicular activity will occur.

2. Install a ≥100' buffer on each side of creek in which no silvicultural or vehicular activity will occur.

3. Conduct harvesting operations in stand CS1302 to support CAA. A 30 x 30 ft. spacing of timber will be maintained throughout the tract to support wheeled and tract vehicle movements. Prescribed fire will be implemented annually to promote T/E species habitat and maintain line of sight.

DOD Tract 13 - This 160-acre tract is comprised of three stands (CS1301, CS1302, and CSD1310). It is bisected by the North Tank Trail into NE and SW halves and areas have been selectively thinned in the past three years. There is a gopher tortoise colony and on the southern border of the tract. (See end of DOD Tract 13 recommendations for Proposed CAA actions).

1. No silvicultural activity should occur at this time in the stand CS1301 in the NE half due to hardwood composition and steep slopes that are close to two tributaries of Milky Creek. Erosion and sedimentation will result if these trees are cut.

2. Stand CS1310 is predominantly a hardwood drain. It will be managed as streamside management zones to protect water quality.
    A. Conduct harvesting operations in stand CS1302 to support CAA. A 30 x 30 ft. spacing of timber will be maintained throughout the tract to support wheeled and tract vehicle movements. Prescribed fire will be implemented annually to promote T/E species habitat and maintain line of sight.

The original proposed CAA Timber Actions in DOD Tract 13 have been modified to protect sensitive ecosystems that are north of the North Tank Trail

These modifications were implemented due to the high incidence of rare fauna and flora on the property proper, downslope, and downstream; high on-site soil erodibility, potential long term impacts to site productivity; degradation of water quality; and potential impacts to adjacent private property and USFS property. Clearcutting on ridges upslope and the associated site disturbance will immediately degrade slope and creek habitats. Reconsideration of this action a prioritized to accomplish DOD initiatives of conservation of biological diversity, ecosystem management and landscape considerations. Thinning of timber that is located SW of the North Tank Trail will be conducted.

DOD Tract 14 - This 160-acre tract contains two timber stands (CS1401 and CS1402). Portions of the northern 1/3 and eastern 1/3 of this tract contain significant drainage areas and should be retained due to proximity to Coleman Creek and its hardwood composition. (See end of DOD Tract 14 recommendations for Proposed CAA actions).

Proposed CAA Timber Actions in DOD Tract 14:

a) Clearcut 82 acres in the center, and southern section, of the tract
b) Thin 60 acres in the northern half
c) No action on 23 acres bordering streams

DOD Tract 15 - This 40-acre tract contains timber stands CS1501 and CS1510. Stand CS1501 has been marked for a selection thinning to remove Loblolly and Slash components and retain a basal area of 60.Stand CS1510 contains a tributary of the Leaf River through the center of the tract, dividing it into southeastern and northwestern halves. No silvilcultural activity will be conducted in CS1510 to serve as a SMZ and protect scattered pitcher plants within the stand.

DOD Tract 16 - This 40-acre tract contains 40 year old pines and mixed hardwoods. A tributary of Davis Creek runs through the S half.

1. Due to the age of the stands and desired basal area, no silvicultural activities are recommended.

DOD Tract 17 - This tract has contains stands CS1701, CS1702, and CS1710. There is a gopher tortoise colony in the southwestern half.

1. No silvicultural activities are recommended.

DOD Tract 18 - Portions of this 280-acre tract are located in T-25, T-33, PL-9, and PL-10, and as a result were cleared and are required to remain cleared for training purposes. One timber stand remains (CS1801). There is a gopher tortoise colony on the NW border.

1. No silvicultural activities are recommended.

DOD Tract 19 - This 191-acre tract contains a cemetery, a pond, Redhill Branch Creek, and tributaries of Milky and Sweetwater Creeks.

1. No silvicultural activities are recommended.

DOD Tract 20 - This 240-acre tract contains threestands (CS2001, CS2001, CS2003) , with tributaries of Sweetwater Creek running throughout (See end of DOD Tract 20 recommendations for Proposed CAA actions). CS2002 and CS2003 require no silvicultural activity.

1. Install a ≥100' buffer strip on each side of streams in which no silvicultural will occur.

2. Reduce the 65-acre Stand CS2001 to 60 ft^2 of basal area per acre (BA).

Proposed CAA Timber Actions in DOD Tract 20:

a) Clearcut 95 acres in the eastern and northern sections
b) Thin 58 acres in the southern and western sections
c) No action on 33 acres bordering streams

DOD Tract 21 - This 40-acre tract contains mixed and bottomland hardwoods, and 53-year-old longleaf and 48-year-old slash pines. Tributaries of Sweetwater Creek run throughout.

1. Stand CS2101 will be selectively thinned to a basal area of 60 to improve habitat for gopher tortoise.

2. Install a ≥100' buffer strip on each side of streams in which no silvicultural or vehicular activity will occur.

DOD Tract 22 - This 115-acre tract is located in the MPRCH Box and Safety Fan, and Impact Area buffer zone and assumed to contain contaminated timber [*EA for Forest Resources Management Activities - CSTS* (1996)]. There are gopher tortoise colonies in the southern half, and northwestern corner.

1. No silvicultural activities are recommended.

DOD Tract 23 - This 640-acre tract is located in the MPRCH Box and Safety Fan, and the Impact Area and it's buffer zone are assumed to contain contaminated timber [*EA for Forest*

Resources Management Activities - CSTS (1996)]. There are gopher tortoise colonies in the northwestern and southeastern portions, and along the northeastern border.

1. This tract is to be managed for the gopher tortoises already present, and as a possible gopher relocation site in the future.

2. Prescribe burn gopher tortoise colony sites as needed to maintain herbaceous cover(Refer to Section 8.6.1.1- Gopher Tortoise Management Recommendations).

3. Determine management needs, including midstory control (chemical and mechanical) and prescribe burning needs to enhance areas where tortoises may be relocated.

DOD Tract 24 - The southern 2/3 of this 80-acre tract is located in the Impact Area buffer zone and assumed to contain contaminated timber. There are gopher tortoise colonies in the west-central portion of this tract, and along the eastern and southwestern borders.

1. Due to land in Impact Area buffer zone, presence of gopher tortoises, and area small portion of land outside of Impact Area buffer zone, no silvicultural activities are recommended.

DOD Tract 25 - The southwestern 1/4 of this 480-acre tract is in the Impact Area buffer zone. There are tributaries of Redhill Branch and Pearces Creeks in this tract. Gopher tortoise colonies are in the southern 1/4 of the tract, with isolated burrows scattered in the southern half.

1. Install a ≥100' buffer strip on each side of streams in which no silvicultural or vehicular activity will occur.

2. Install a 200' buffer strip around gopher tortoise burrows in which no silvicultural or vehicular activity will occur.

3. Conduct harvesting operations on tract to support CAA. A 30 x 30 ft. spacing of timber will be maintained throughout the tract to support wheeled and tract movements. Prescribed fire will be implemented annually to promote T/Especies habitat and maintain line of sight.

DOD Tract 26 - The entire 200-acre tract is located in T-33, with the vast majority also located in PL-11. As a result, it has been cleared and is required to remain cleared for training purposes.

1. Install a ≥100' buffer strip on each side of streams in which no silvicultural or vehicular activity will occur.

2. Install a 200' buffer strip around gopher tortoise burrows in which no silvicultural or vehicular activity will occur.

3. Conduct harvesting operations on tract to support CAA. A 30 x 30 ft. spacing of timber will be maintained throughout the tract to support wheeled and tract movements. Prescribed fire will be implemented annually to promote T/Especies habitat and maintain line of sight.

DOD Tract 27 - The entire 40-acre tract is located in T-33, with the northwest 1/4 also in PL-10.

1. Install a ≥100' buffer strip on each side of streams in which no silvicultural or vehicular activity will occur.

2. Install a 200' buffer strip around gopher tortoise burrows in which no silvicultural or vehicular activity will occur.

3. Conduct harvesting operations on tract to support CAA. A 30 x 30 ft. spacing of timber will be maintained throughout the tract to support wheeled and tract movements. Prescribed fire will be implemented annually to promote T/Especies habitat and maintain line of sight.

DOD Tract 28 - The majority of this 80-acre tract is a 35 year old pine plantation.

1. No silvicultural activities are recommended.

DOD Tract 29 - This 101-acre tract contains a mixture of pines and hardwoods with heavy understory. Tributaries of Cypress Creek run through this tract, creating marshy areas throughout. (See **Biologically-Significant Areas)**.

1. No silvicultural activities are recommended.

DOD Tract 30 - This 720-acre tract has tributaries of Cypress Creek running throughout, marsh areas, and is in the Impact Area for air-to-ground fire. It is assumed to contain contaminated timber [*EA for Forest Resources Management Activities - CSTS* (1996)]. This a portion of this tract (220) is mitigation area for the MPRCH, and is within the Biologically Sensitive Area known as Cypress Creek. See Section **Biologically-Significant Areas**.

1. No silvicultural activities are recommended.

DOD Tract 31 - This 40-acre tract was cleared due to its location in the NW corner of T-43 and is required to remain cleared for training purposes. There is an isolated gopher tortoise burrow in the northwestern corner.

1. No silvicultural activities are recommended.

DOD Tract 32 - This 40-acre tract is a 70' tall loblolly pine plantation.

1. No silvicultural activities are recommended.

DOD Tract 33 - The western 1/4 of this 80-acre tract is in T-38 and PL-12.

1. No silvicultural activities are recommended.

DOD Tract 34 - Most of this 70-acre tract is in pine. Tributaries of Richland Creek run throughout the southwestern half.

1. No silvicultural activities are recommended.

DOD Tract 35 - The majority of this 240-acre tract was recently cleared and is required to remain cleared for training purposes. There is a gopher tortoise colony in the southwest corner and a gopher tortoise burrow in the east-central part of the tract.

1. No silvicultural activities are recommended.

DOD Tract 36 - This 80-acre tract is located in the Impact Area buffer zone and assumed to contain contaminated timber [*EA for Forest Resources Management Activities - CSTS* (1996)].

1. No silvicultural activities are recommended.

DOD Tract 37 - This 80-acre tract in Section 31, Township 2 North, Range 11 West contains longleaf and loblolly pines with scattered young miscellaneous hardwoods and a thick, shrubby understory. A tributary of Clear Creek runs through this tract. The endangered Louisiana quillwort has been located on this tributary, inside the tract's southern boundary. There is a gopher tortoise colony on the northeastern border.

DOD Tract 38 - This 60-acre tract is in T-44 (Gopher tortoise refuge) and contains Firing Point 116. As a result, a portion of it has been cleared and is required to remain cleared for training purposes. There are gopher tortoise colonies located throughout this tract.

1. No silvicultural activities are recommended.

DOD Tract 39 - This 100-acre tract is located in the impact area and assumed to contain contaminated timber [*EA for Forest Resources Management Activities - CSTS* (1996)].

1. No silvicultural activities are recommended.

DOD Tract 40 - This 56-acre tract in Township 1 North, Range 11 West (referred to as Unit 12 in 1992 inventory) contains miscellaneous hardwoods, and longleaf and loblolly pines. A small pond is adjacent to the eastern border and a tributary of Long Branch Creek runs through the northwestern corner of this tract.

1. No silvicultural activities are recommended.

DOD Tract 41 - The majority of this 120-acre tract is located in T-40. It consists of young pines and hardwoods.

1. Due to young age and low basal area, no silvicultural activities are recommended.

DOD Tract 42 - This 480-acre tract is a mixture of hardwoods and loblolly, slash, and longleaf pines. Over 180 acres of merchantable timber has been completely removed with a salvage operation following hurricane Katrina. The remaining timber stands are located within Cypress Creek and tributaries of Ashley and Shut Eye Creeks run along the northern, western, and southern parts of the tract. There are gopher tortoise burrows inthe tract. The western portions of the tract are in the Biologically Significant Area known as Howard Reed Break (Refer to Section **Biologically-Significant Areas**).

1. No silvicultural activities are recommended.

DOD Tract 43 - This 160-acre tract contains pines and miscellaneous hardwoods and a large cleared firing training area on the southeastern side. There are tributaries of Shut Eye Creek running throughout the remaining forested area.

1. No silvicultural activities are recommended.

DOD Tract 44 – This tracts contains 187 acres. The western portion contains a stand approximately 90 acres in which all merchantable timber was removed with a salvage operation following hurricane Katrina. The affected area was replanted with longleaf pine in 2008.

1. No silvicultural activities are recommended.

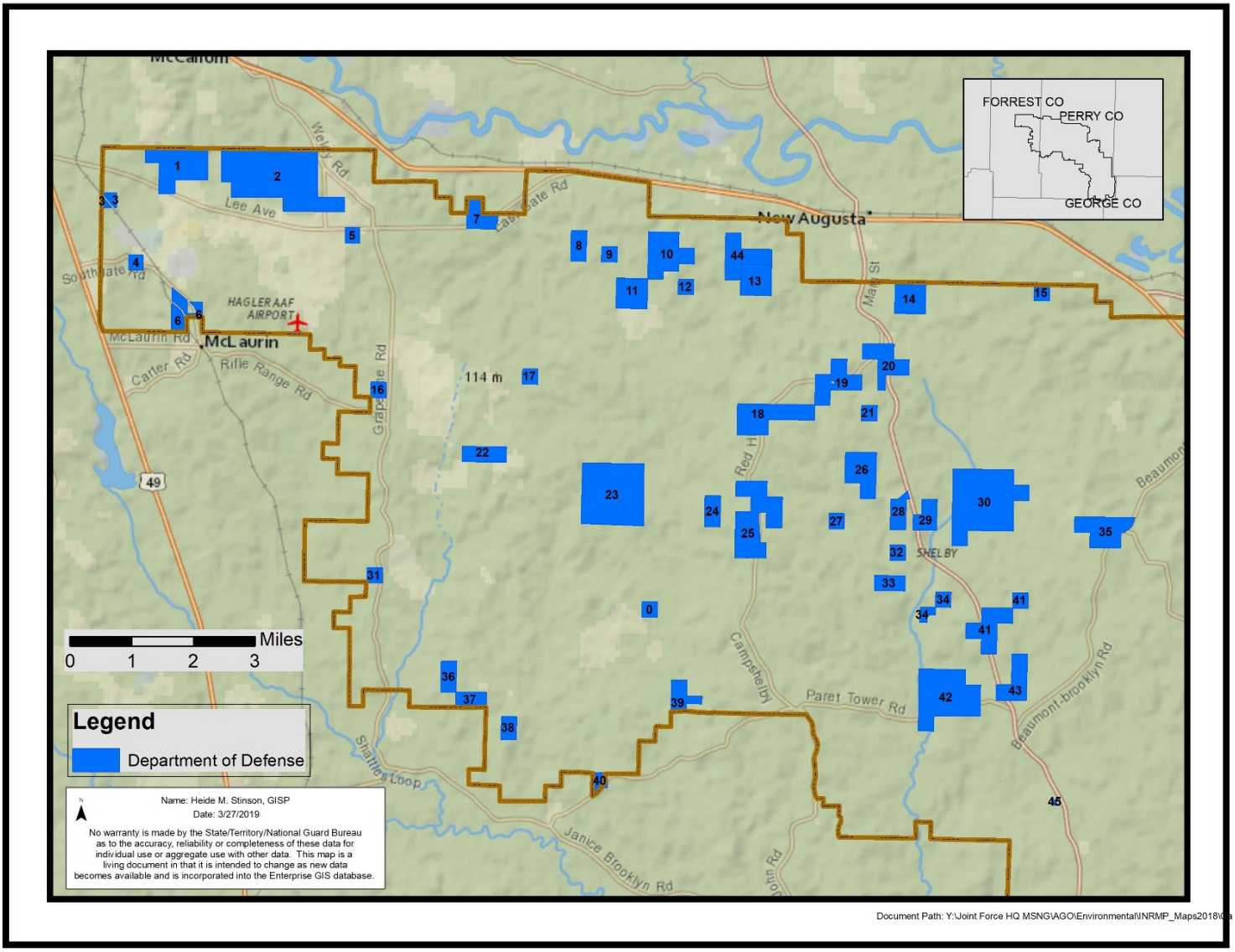


Figure 6. Camp Shelby DoD Blocks

13 December 2018
Timber Management Plan
State Lands
Camp Shelby Joint Forces
Training Center

The state-owned lands at Camp Shelby consist of approximately 7405 acres. They are managed and maintained by the Adjutant General of the Mississippi National Guard or his designee under authority of the Mississippi Code of 1972 Annotated § 33-11-18. This gives the military the flexibility to manage the state timber resources for immediate and long-term military needs, incorporate the resource into ecosystem restoration and management goals, and thereby supporting associated flora and fauna communities for multiple uses, protection, and conservation.

The state-owned acreage is broken down into 14 separate management units based on timber type, age, topography and natural boundaries such as roads, streams and military training areas. The following is a break-down of these timber management units and their prescribed metrics and management recommendations:

Dry & Mesic Longleaf Pine Woodlands Metrics:

	Excellent	good	fair
Pine Basal Area	30-80%	20-90%	10-105
Pine Canopy Cover	30-65%	20-75%	10-85%
Mid-story Cover	<20%	20-30%	30-40%
Nat. Herb Ground Cover	40-98%	30->98%	20-30%
Invasives	<1%	1-5%	5-10%

Xeric Longleaf Pine Barrens Metrics

	Excellent	good	fair
Pine Basal Area <100	25-80	>15-90	10 or
Pine Canopy Cover >80%	>20 to 55%	>15 -70%	<5% or
Midstory Cover	<20%	20-<30%	30-40%
Nat. Herb Ground Cover	40-100%	>25 to <40%	15-25%
Invasives	<1%	1-5%	5-10%

Unit 1: This unit contains approximately 245 acres. It primarily consist of a mixture of mature longleaf, loblolly and slash pine. It has been thinned on 4 separate occasions over the past 25 years, including a large Hurricane Katrina damage salvage timber sale. This hurricane left this unit with large areas of no timber stocking. It is currently being cut to its final harvest and will be replanted with containerized longleaf pine seedlings in the winter of 2018-19.

Unit 2: This unit contains 311 acres. This unit was 80-90% totally destroyed by Hurricane Katrina. It was salvaged harvested in and replanted with longleaf pine in 2005-2006. It is currently growing well and should be ready for a first thinning in 2020-2021.

Unit 3: This unit has a total of 636 acres. Approximately 210 acres are occupied by the C-17 airstrip and approach flight path. 180 acres just south of the airstrip are planted in longleaf pine that are 12 years old. These pines are growing well and should be ready for a first thinning by 2024-25. 110 acres just north of the airstrip are planted in loblolly pine that are 13 years old. This acreage has already been thinned once in 2015 and should receive another light thinning in 2020-21 to removetrees of undesirable growing stock and also some chip-n-saw. The remaining 136 acres to the north of the airstrip is in the Ragland Hills natural area. This is an area of steep terrain and many diverse plants, streams and wildlife. This area is not

actively managed for timber production but rather is left as natural as possible for the study and preservation of the T&E species found there.

Unit 4: This area contains 288 acres. Approximately 80 acres are in the previously mention Ragland Hills area and should be managed as such. The remaining 208 acres consist of a mixture of loblolly, slash, shortleaf and longleaf pine, all of varying ages. The area has been damaged by a tornado and Hurricane Katrina. Mature timber was salvaged and the residual stand has been allowed to grow to maturity. No immediate cutting is planned in this area and the stand should be allowed to grow and thinned at a time more desirable as dictated by their growth and stocking per acre.

Unit 5: This unit contains 709 acres. It is a diverse unit of training areas and roads. 135 acres between Forrest and Lee Avenues was planted in longleaf pine in 2006. It is growing well and no immediate management is required here other than prescribed fire. 80 acres at the end of Forrest Avenue contains a mixture of scattered mature pines that have been allowed to seed in naturally. The mature timber on this stand is periodically harvested and the residual stand is thinned as needed. 210 acres south of Forrest Avenue and west of Grapevine Road contains mixtures of pine species of varying ages. This area was hit hard by Hurricane Katrina and was salvage harvested in 2005. It has seeded in well from the residual mature pines. It should be allowed to grow and thinas

needed. The remaining 284 acres are occupied by military training areas.

Unit 6: This unit contains a total of 559 acres. Approximately 55 acres are occupied by the Camp Shelby Range Control Complex and training areas. The remaining 504 acres was cut to a final harvest in 2008 and replanted with longleaf pine in that same year. These pines are growing well and prescribed fire should be introduced at 1-3 year intervals to enhance growth and control undesirable species. This area should be ready for a first thinning by 2024-25.

Unit 7: A total of 613 acres are on this unit. Of this, 273 acres are occupied by Hagler Army Airfield and gravel pits. This entire unit was hit by a tornado in 1997 and any mature timber was salvage harvested at that time. It has naturally seeded in well with longleaf and loblolly pines. Many areas are overstocked with pine and should have a first thinning performed as soon as trees reach merchantable size.

Unit 8: This unit contains 545 acres. Approximately 50 acres are occupied by motor pools and salvaged materials dumping area. The remaining 495 acres had been planted in slash pine by the Mississippi Forestry Commission in approximately 1980. These pines had done very poorly and no appreciable growth was observed for several years. This acreage was clear cut in 2015-16 and converted to longleaf pine in that sametime.

These pines are growing well but many other pine species have naturally seeded in are competing with and overcrowding the longleaf pines. Prescribed fire should be introduced as often as possible to control this competition and the longleaf pines be allowed to reach a height of dominance.

Unit 9: This unit contains a total of 454 acres. Of this, 10 acres are occupied by buildings and motor pools. The remaining 444 acres contains natural longleaf pines. This area was cut to a seed tree harvest in 1994. 8-10 longleaf seed trees per acre were left to produce a natural stand. The area seeded in well and the remaining seed trees were harvested in 1996. This acreage is overstocked with longleaf pines and a first thinning is scheduled for 2020.

Unit 10: This unit is similar to unit 9. It has a total of 215 acres. It consist of a longleaf pine stand that has naturally seeded in over the years and is growing well. Mature seed trees were removed for revenue in 2008. Prescribed fire should be utilized on a three year rotation to enhance growth and reduce competition.

Unit 11: Contains a total of 534 acres. This is a naturally occurring stand of longleaf pine. The entire area was cut to a seed tree sale in 1995, leaving 8-10 longleaf seed trees per acre. The area seeded in very well and seed trees were removed in 1998. A first thinning was performed on this stand

in 2016, cutting the stand to an approximate basal area of 60. Fire should be used on a three year rotation to enhance growth and gopher tortoise habitat.

Unit 12: Containing a total of 1963 acres, this unit is primarily composed of the buildings, motor pools and training areas of the Camp Shelby Cantonment Area. The mostly mixture of mature pines and hardwoods are managed for training and building requirements. There is an area on the east side of this unit of naturally occurring longleaf that contains 90 acres. It was thinned in 2015 and should be burned and allowed to grow to chip-n-saw size for a second thinning in approximately 2025.

Unit 13: This area is located at Barron Point and contains 288 acres. The old Range Control complex and training areas occupy 180 acres east of Grapevine Road. The remaining 108 acres west of the road was planted in loblolly pine in 2014. They have obtained a good survival rate and should be ready for a light first thinning in 2025-26.

Unit 14: Contains 45 acres and is located on Lee Avenue on the eastern end of Post. It was hit hard by Hurricane Katrina in 2005. An effort was made to try to establish a stand of longleaf pine with the few remaining seed trees but did not seed in well enough and the area was hand planted with longleaf pine in2016. Prescribed fire should be used on this acreage no less than every three years until competition is controlled and the

longleaf seedlings can reach a height of dominance.

Randy Caldwell
Timber Fund Activities Manager
Joint Forces Training Area Camp Shelby
MS Registered Forester
License #1071
Date of License: July 20, 1983

Appendix C

Camp Shelby Burrowing Crayfish

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Review of Native Species That Are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of review.

SUMMARY: In this Candidate Notice of Review (CNOR), we, the U.S. Fish and Wildlife Service (Service), present an updated list of plant and animal species native to the United States that we regard as candidates or have proposed for addition to the Lists of Endangered and Threatened Wildlife and Plants under the Endangered Species Act of 1973, asamended. Identification of candidate species can assist environmental planning efforts by providing advance notice of potential listings, allowing resource managers to alleviate threatsand

thereby possibly remove the need to list species as endangered or threatened. Even if we subsequently list a candidate species, the early notice provided here could result in more options for species management and recovery by prompting candidate conservation measures to alleviate threats to the species.

The CNOR summarizes the status and threats that we evaluated in order to determine that species qualify as candidates and to assign a listing priority number to each species. Additional material that we relied on is available in the Species Assessment and Listing Priority Assignment Forms (species assessment forms, previously called candidate forms) for each candidate species.

We request additional status information that may be available for the 286 candidate species. We will consider this information in preparing listing documents and future revisions to the notice of review, as it will help us in monitoring changes in the status of candidate species and in management for conserving them. We also request information on additional species that we should include as candidates as we prepare future updates of this list.

This document also includes our findings on resubmitted petitions and describes our progress in revising the Lists of Endangered and Threatened Wildlife and Plants during the period May 5, 2004, through May 2**,** 2005.

DATES: We will accept comments on the Candidate Notice of Review at any time.

ADDRESSES: Submit your comments regarding a particular species to the Regional Director of the Region identified in SUPPLEMENTARY INFORMATION as having the lead responsibility for that species. You may submit comments of a more general nature to the Chief, Division of Conservation and Classification, U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, Room 420, Arlington, VA 22203 (703/358-2171). Written comments and materials received in response to this notice will be available for public inspection by appointment at the Division of Conservation and Classification (for comments of a general nature only) or at the appropriate Regional Office listed in SUPPLEMENTARY INFORMATION.

Species assessment forms with information and references on a particular candidate species' range, status, habitat needs, and listing priority assignment are available for review at the appropriate Regional Office listed below in SUPPLEMENTARY INFORMATION or at the Division of Conservation and Classification, Arlington, Virginia (see address above), or on our Internet website (http://endangered.fws.gov/candidates/index.html).

Background

The Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act),

requires that we identify species of wildlife and plants that are endangered or threatened, based on the best available scientific and commercial information. Through the Federal rulemaking process, we add these species to the List of Endangered and Threatened Wildlife at 50 CFR 17.11 or the List of Endangered and Threatened Plants at 50 CFR 17.12. As part of this program, we maintain a list of species that we regard as candidates for listing. A candidate species is one for which we have on file sufficient information on biological vulnerability and threats to support a proposal to list as endangered or threatened, but for which preparation and publication of a proposal is precluded by higher-priority listing actions. We maintain this list for a variety of reasons: to notify the public that these species are facing threats to their survival; to provide advance knowledge of potential listings that could affect decisions of environmental planners and developers; to provide information that may stimulate conservation efforts that will remove or reduce threats to these species; to solicit input from interested parties to help us identify those candidate species that may not require protection under the Act or additional species that may require the Act's protections; and to solicit necessary information for setting priorities for preparing listing proposals.

Table 1 includes 286 species that we regard as candidates for addition to the Lists of Endangered and Threatened Wildlife and Plants (Lists), as well as 21 species for which we have published proposed rules to list as threatened or endangered species. Most of these proposed species were previously identified in the 2003 CNOR (69 FR 24876, May 4, 2004). We encourage consideration of these species in conservation planning, as well as other environmental planning, such as in environmental impact

analysis done under the National Environmental Policy Act of 1969 (implemented at 40 CFR parts 1500-1508) and in local and statewide land use planning. Table 2 contains eight species we identified as candidates or as proposed species in the May 4, 2004, CNOR that we now no longer consider candidates. This includes two species that we listed as threatened since May 4, 2004, one species that we withdrew the proposed rule, one species that we removed from candidacy through a notice published on August 18, 2004 (69 FR 51217), and four species that we are removing from candidacy through this notice. The Region having lead responsibility for the particular species maintains updated records of information on candidate species.

Crustaceans

Camp Shelby burrowing crayfish (Fallicambarus gordoni) – The Camp Shelby burrowing crayfish (CSBC) is found in pitcher plant wetlands of southern Mississippi. CSBC has a small, naturally limited range in a localized portion of the Leaf River watershed in central Perry County, Mississippi, within the Desoto National Forest. All of this area is currently under lease to the Mississippi Army National Guard's Camp Shelby for troop and tank training grounds. A Candidate Conservation Agreement (CCA) was developed and is being implemented by the Mississippi Army National Guard, U.S. Forest Service, Mississippi Department of Wildlife, Fisheries and Parks, and the Service. This CCA addresses all threats known to the species (silviculture, troop and tank maneuvers, and ATV use) and implements an aggressive habitat management and

monitoring program. This signed CCA has removed threats to the CSBC and its habitat to the point that the species no longer meets the criteria for candidate status. We are removing this species from the candidate list primarily as a result of the conservation efforts outlined in the CCA.

The CSBC CCA expired in 2014 and was deemed unnecessary to renew due to the species current status (P. Hartfield pers comm. 2014). Ten years of data support that threats to the species have been minimized or eliminated through best management practices and adaptive management. All management practices from CSBC CCA have been incorporated into the Camp Shelby INRMP.

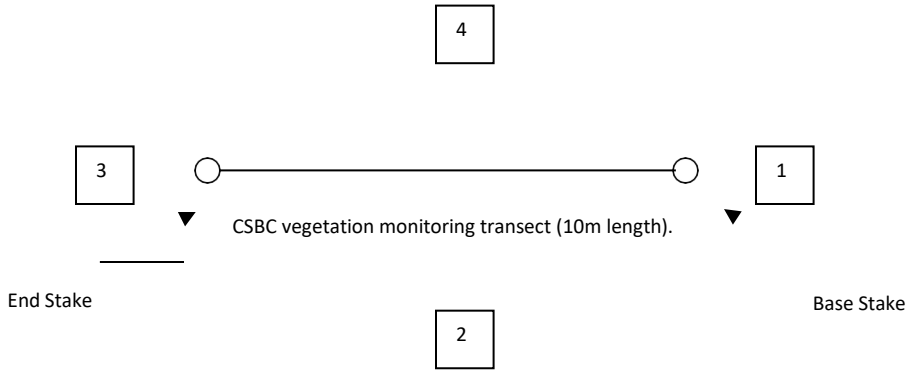
*Camp Shelby Burrowing Crayfish (*Fallicambarus gordoni*) Monitoring Protocol*

3 March 2005

Jim Lee

-Orange squares spray-painted on the trees indicate the trail to a particular Camp Shelby Burrowing Crayfish (CSBC) monitoring plot and vegetation transect. Two squares on a particular tree denote the start and end of the trail, respectively.

-Camp Shelby Burrowing Crayfish monitoring quads ($1m^2$) are located 2m from the CSBC vegetation monitoring transect base stake, end stake and one on either side of the transect midline (i.e. 5m). See diagram below. Note the base stake of the vegetation transect is the stake closest to the tree with two painted orange squares (i.e. end of trail mark).



-Each CSBC monitoring quad corner is marked with pin flags.

-Within each quad the number of chimneys and burrows are counted separately, although in the database (see below) they are combined (see field notebook for burrow and chimney data). A CSBC chimney is a mound (see below), whereas a burrow is a mere hole (or what is observed when a chimney is removed). Because quantifying the number of mounds and burrows within the quads may be biased by the observer's interpretation, it is recommended that at least two people perform a count per quad and the average is taken.

-The best time of year to monitor CSBC burrows is during the months of February and March (Shane Welch, Pers. Com.).

Important numbers needed when monitoring CSBC quads:

Range Control: 601-558-2709 or 601-558-2710

East Air to Ground: 601-598-2350

*Maps to all CSBC monitoring plots can be found in the folder entitled “CSBC Plots”, currently located on CJ Sabette’s desk. Data can be entered into the file entitled “CSBC monitoring.xls” (GPS data recorded in NAD83).

Habitat Monitoring Plan for Camp Shelby Burrowing Crayfish

Assumptions:

Areas with fairly high herbaceous groundcover, low woody cover, poorly developed midstory and low basal area and tree cover provide better habitat for CSBC. CSBC are generally associated with current or historical pitcher plant wetlands. Therefore decreases in herbaceous abundance and increases in woody abundance are indicators that the habitat quality is declining.

Abundance and condition of pitcher plants would also be an indicator of habitat quality.

Select 30 locations where Camp Shelby Burrowing Crayfish (CSBC) have been documented. Locations will be selected so that they include outermost sites where CSBC have been documented. Orient a 10 m transect to cross wetland habitat at each location and permanently mark ends of transects with rebar painted orange. Sampling will occur in late summer each year.

We will measure the following variables to evaluate habitat condition at each location:

1. Groundcover (herbaceous and woody vegetation < 1 m in height)

-- Bareground

-- Total Herbaceous Cover

-- Forb Cover

-- Grass and Grasslikes Cover

-- Vine Cover

-- Shrub Cover

-- Litter Cover

-- Pitcher Plant Cover

Record "hits" for the above variables every ½ m along transect. If no pitcher plants are recorded along the transect, but they are present in the area make a note of it and describe abundance and condition (evidence of shade effects-compressed tube, poorly developed hood, light green color with no red streaks, etc.)

2. Midstory

-- Woody cover

Record woody cover of shrubs/trees between 1 and 3.5 m in height along the transect.

3. Overstory

-- Basal Area

-- Canopy Cover

Record at 5 m point along the transect using prism and spherical densiometer

4. Other

-- Photograph sample location at plot.

-- Note evidence of soil disturbance (ATV use, etc.), sedimentation, fire, water status of area

Appendix D

Annual Section 7 Consultation

2019 Rare Species Inspection Tour &
Stewardship Area Meeting Agenda
Camp Shelby Joint Forces Training Center
March 20, 2019

CSJFTC Environmental Building
Avenue C
Room 105 (Conference room)

Presentations & Discussion

0900 – 0915	**Introductions**
0915 – 0930	**Gopher Tortoise Headstart Project/Black Pinesnake Updates** (Jim Lee – TNC)
0930 – 0945	**Camp Shelby Burrowing Crayfish and Habitat Monitoring Updates** (Melinda Lyman – TNC)
0945 – 1000	**Louisiana Quillwort Monitoring and Census Updates** (Melinda Lyman – TNC)
1000 – 1015	**USFWS T&E Species Updates** (Matt Hinderliter-USFWS)
1015 – 1030	**Cogongrass Management** (Maureen Schwer-TNC)
1030 – 1045	**Camp Shelby Stewardship Project Updates** (Lisa Yager-USFS)
1045 –1100	**Break**
1100 – 1200	**Field Trip:** Gopher Tortoise Headstart Facility and/or Stewardship Areas (Please bring a water bottle and snacks if you require them)

The Nature Conservancy
Protecting nature. Preserving life."

2019 Rare Species Inspection Tour/Stewardship Area Meeting
Camp Shelby Joint Forces Training Center

Signature of your attendance below acknowledges your participation in the annual Rare Species Inspection Tour held at CSFJTC Environmental Building 6530, C Avenue, Room 105 on March 20, 2019. This meeting includes evaluation of habitat altering projects and their impacts (if any) to federally listed species as part of the annual USFWS Section 7 Consultation.

Name (print	Signature	Agency/Org.
Becky Stone	Becky Stone	[illegible]
Shad Salyers	Shad E. Salyers	USFS
Christina Vaughn	Christina Vaughn	USFS.
M[illegible] Wiggins	[illegible]	[illegible]
Max Ellison	Max Ellison	NRCS
Mike Reid	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Lisa Yager	Lisa Yager	USFS
Nicole Hodges	Nicole Hodges	MDWFP
Bryan Fedrick	Bryan Fedrick	[illegible]
Heather Sullivan	Heather Sullivan	MDWFP
Kathy [illegible]	Kathy [illegible]	[illegible]
Matt [illegible]	Matt [illegible]	[illegible]
[illegible]	[illegible]	[illegible]

	Signature	
[illegible]	Tony Crowe	Shelby ENV
[illegible]	[illegible]	Shelby ENV
[illegible]	Tamara Campbell	
[illegible]	Manu [illegible]	
[illegible]	Carl Gaither	
Shad [illegible]	Shad Salyers	
Bobb[illegible]	[illegible]	
Gary [illegible]	Gary [illegible]	
J[illegible]	[illegible]	
Mel[illegible]	[illegible]	

Appendix E

Management Plan for WWTF Relocation Area

Habitat Management Plan for the 2006 Waste Water Treatment Facility Gopher Tortoise (*Gopherus polyphemus*) Relocation Site

James R. Lee, Chris Potin, and Bryan Fedrick

15 March 2017

BACKGROUND

The 18 May 2006 Fish and Wildlife Service's biological opinion (BO), regarding the proposed construction of a new wastewater treatment facility (WWTF) on the Camp Shelby Joint Forces Training Center (CSJFTC), determined it prudent and reasonable to move five adult Gopher Tortoises (*Gopherus polyphemus*) from the proposed "Action Area" to a relocation site. The relocation site, located in the northwest corner of the Cantonment Area (west of Dogwood Lake; Figure 1), is approximately 39.3 ha (97.1 acres) and consists of two CSJFTC state timber management units, 11a (19.0 ha) and 11b (20.3 ha). Lee Avenue borders the relocation site to the north, private property to the west, a power line right away to the south, and a partially paved (part gravel) road to the east. A second gravel road transects the site (Figure 1). This area was selected as a relocation site because no development plans were/are proposed for the site, military training is limited to foot traffic, and a large colony of tortoises were residents of the site. A conservation strategy for the relocation site, outlined in the BO, stated that a prescribed fire would be conducted between February and April 2006 (pre-relocation) and thereafter every two years, and that invasive plant species would be controlled through the application of herbicide (as outlined in the 2001 Integrated Natural and Cultural Resource Management Plan). Despite implementation of these conservation practices over the past 11 years, habitat conditions within the wooded portions of the relocation site appear to have declined, such that most of the tortoises have moved onto the more open (in terms of canopy) power line right away. However, the number of tortoises in the overall area remains virtually unchanged [2003 burrow surveys yielded 19 occupied burrows + the five relocated individuals in 2006 = 24 individuals. 2015 burrow surveys yielded 25 occupied burrows (and four additional adult tortoises immediately adjacent to the area defined as the relocation site)]. The BO also states (page 42-43), "…a management plan that outlines the long-term management for the relocation area" should be developed. According to the BO four topic areas should be addressed within the management plan: 1). Habitat Restoration and Management, 2). Forest and Timber Management, 3). Monitoring (of the habitat and tortoise population), 4). Identify funding for long-term management of the property. A management plan was not developed in 2006, but a plan for the relocation site is outlined below.

To gain a better understanding of how the habitat should be managed for *G. polyphemus* in the future, and to satisfy a portion of the monitoring requirement (#3.) outlined in the BO, we (MSARNG and TNC staff) developed a general habitat monitoring protocol (Appendix 1) and collected baseline data on 10 February 2017 (Table 1).

MANAGEMENT

Habitat needs/requirements for *G. polyphemus* are well documented in the primary and grey literature (Diemer 1986, USFWS 1990, Nussear and Tuberville 2014). To that effect, the Florida Fish and Wildlife Conservation Commission (FWC) developed a Gopher Tortoise Management Plan for their state in 2007 and revised the document in 2012 (FWC, 2012). The plan (page 42) provides general characteristics for plant communities commonly used by the Gopher Tortoise, recommended fire frequency intervals, and specific parameters that can be used to define optimal tortoise habitat conditions. We have chosen to utilize the FWC's "upland pine" community

recommendations (Table 1); as this habitat type is the most reflective of that found at the relocation site.

1). Habitat Restoration and Management

Clear targets for a number of specific parameters are outlined in Table 1. At present, the average canopy closure, basal area, and percent shrub cover are too high and need to be reduced within the relocation site (See Table 1). On the contrary, average percent grass (observed % cover = 19.36; Target >25%) and forb (observed % cover = 0.04%; Target = >50%) need to be increased significantly. While the current observed percent cover of litter within the relocation site is extremely high (59.2%), the FWC (2012) Gopher Tortoise Management Plan provides no target value for this cover type (Table 1). Percent litter should be a good indicator of how well a prescribed fire may move across the landscape, as it is indicative of receptive fuel availability (i.e., most of the litter within our 25 plots were pine needles). In addition to Table 1, a brief summary of the current state of the relocation site is provided below (based upon our 25 monitoring plots; See Appendix 1 and Figure 1).

-Only 12 (48%) of the 25 plots contained Grass, average % cover for these 12 plots = 40.3%; Average of 25 plots = 19.36%

-Only 1 (4%) of the 25 plots contained Forbs, average % cover for this 1 plot = 1%; Average of 25 plots = 0.04%

-18 (72%) of the 25 plots contained Shrub, average % cover for these 18 plots = 23.3%; Average of 25 plots = 16.8%

-25 (100%) of the 25 plots contained Litter, average % cover of these 25 plots = 59.24%; Average of 25 plots = 59.24%

-12 (48%) of the 25 plots contained Vine, average % cover of these 12 plots = 5.7%; Average of 25 plots = 2.72%

-2 (8%) of the 25 plots contained Moss, average % cover of these 2 plots = 5%; Average of 25 plots = 0.2%

-No Red Imported Fire Ants (RIFA; *Solenopsis invicta*) mounds were observed w/in any of the 25 plots; However, RIFA mounds were observed in visual proximity of 14 (56%) of the 25 plots

-No tortoise burrows were observed w/in any of the 25 plots; However, tortoise burrows were observed within visual proximity of 8 (32%) of the 25 plots

2). Forest and Timber Management

In order to achieve the target values identified in Table 1, a number of management techniques will need to be implemented to restore the relocation site to a maintenance condition. The use of

prescribed fire alone will not result in the desired habitat conditions necessary to support a *G. polyphemus* population. Thinning (mechanized) of the canopy trees is required to reduce the canopy closure and basal area currently observed within the relocation site. Mulching and mowing of the sub-canopy trees and shrubs is strongly recommended to reduce the percent shrub observed within the monitoring plots and will decrease the sub-canopy closure (allowing more light to penetrate to the forest floor and encourage grass and forb germination and growth). Additionally, herbicide treatments post-mulching and mowing will be required to control re-sprouting of sub-canopy shrubs (*Ilex* sp.) and trees (*Quercus* sp.). Infestations of cogongrass (*Imperata cylindrical*) and other invasive plant species will be controlled via herbicide treatments (as is currently done throughout the Cantonment Area and elsewhere on the CSJFTC). Native grass and forb seed may need to be planted in areas throughout the relocation site, but this will be dependent on the availability of seeds present in the seedbank (this will be evaluated after the canopy and sub-canopy has been opened and following at least two prescribed fires). Fire return interval should be within the range of 1 to 3 years. Management suggestions for restoring the overstory and understory of degraded longleaf pine (*Pinus palustris*) forests can be found in Johnson and Gjerstad (2006), and Walker and Silletti (2006), respectively.

3). Monitoring (of the habitat and tortoise population)

A habitat monitoring protocol has been developed for the relocation site (Appendix 1) and set target values for a number of habitat parameters are identified (Table 1). A *G. polyphemus* burrow scoping survey will be conducted every five years in order to assess the tortoises' response to habitat modifications/ improvements. The last burrow scoping survey of this area was conducted in 2015, and the next should take place in 2020.

4). Identify Funding for Long-term Management of the Property

The state forester will conduct initial thinning of the relocation area. Mulching, prescribed fire, cogongrass treatments, and monitoring (including people power) will be conducted using "In house funds" and by the MSANG ENV office and associated staff (TNC). If additional funds are needed for herbicide contracts (e.g. brush/shrub control), herbaceous plug planting or seeding, additional funds will be requested from the National Guard Bureau during the annual budget process.

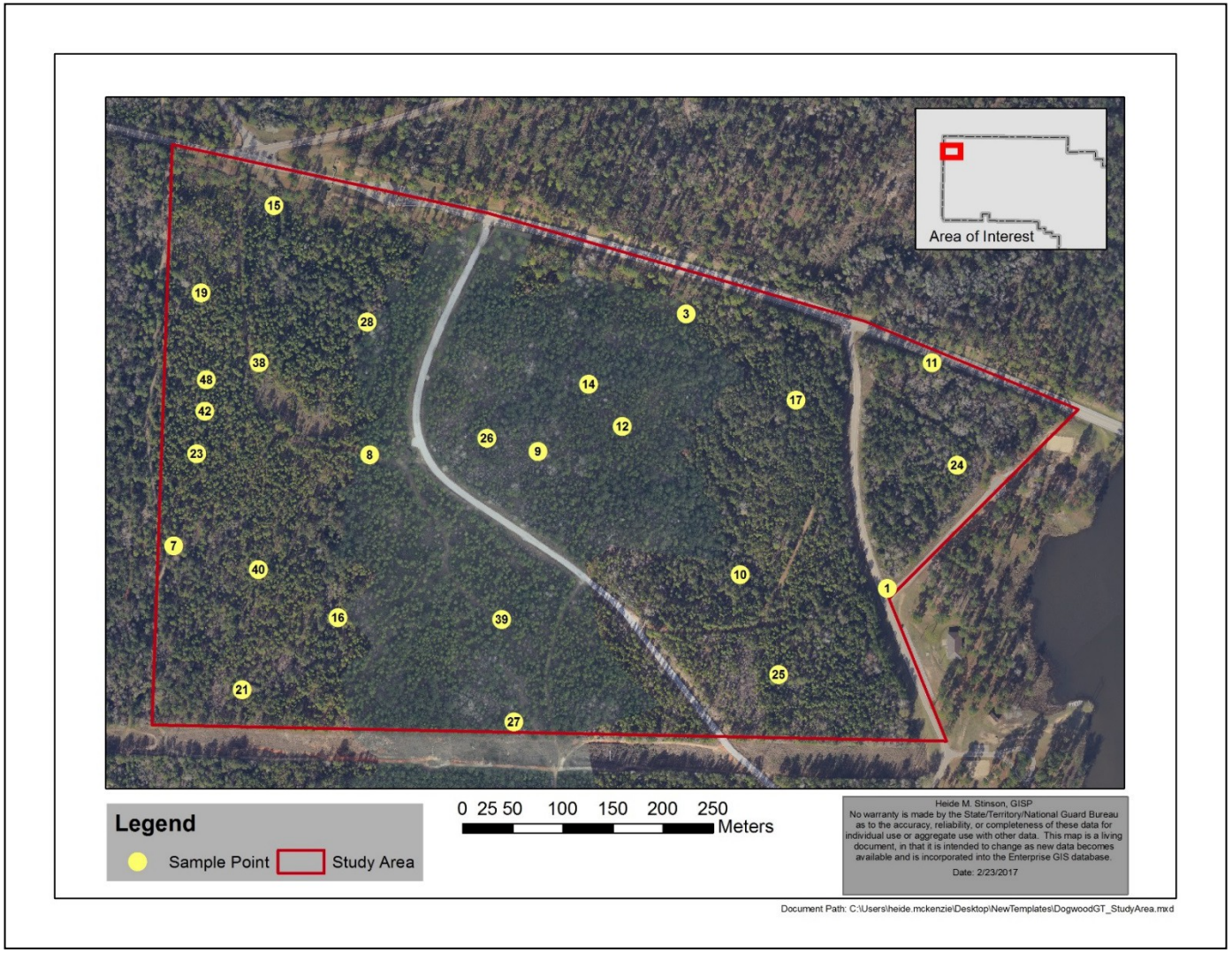


Figure 1. Relocation site for the five *Gopherus polyphemus* moved from the Waste Water Treatment Facilities proposed "Action Area" in 2006. Image shows the location of 25 habitat monitoring plots that will be used to guide adaptive management practices so that the habitat can be properly managed to suit the needs of *G. polyphemus*.

Table 1. Recommended target values for "Upland Pine" habitat that contain Gopher Tortoise (*Gopherus polyphemus*) populations, and values observed when collecting baseline habitat data within the 2006 Waste Water Treatment Facility *G. polyphemus* Relocation Site (10 February 2017). Camp Shelby Joint Forces Training Center, Forrest County, Mississippi.

METRIC	Recommended Upland Pine (FWC 2012) Target Value	CSJFTC Relocation Site Actual Value (10 Feb 2017)
Basal Area of Pine (sq ft per acre)	20-80 [a]	92.8 ±36.57
Maximum Canopy Cover (%)	50	71.6 ±22.72
Bare Ground (%)	<5	0.80
Herb Cover (%)	>50	0.04
Grass Cover (%)	>25	19.36
Average Maximum Palmetto Height (ft)	<3	0.00
Palmetto Cover (%)	<5	0.00
Average Maximum Shrub Height (ft)	<2	–
Shrub Cover (%)	<10	16.8
Moss (%)*	–	0.20
Vine (%)*	–	2.72
Litter (%)*	–	59.24
Log (%)*	–	0.40
Tree Base (%)*	–	0.44
RIFA Mound in Quad (# out of 25 quads)*	–	0
RIFA Mound(s) Adjacent to Quad (# out of 25 quads)*	–	14
Tortoise Burrow(s) Adjacent to Quad (# out of 25 quads)*	–	8
Fire Return Interval (years)[1]	1 to 3	–

– Value not reported or recorded.

[a] Upper limit of Basal Area (BA) in FWC 2012 is higher than what USFWS (2009) recommends for tortoises in the listed portion of their range. Upper limit should not exceed 70.

* Not reported in FWC 2012, but recorded when collecting baseline data at the Relocation Site on the CSJFTC

[1] Fire return interval will help to maintain desired conditions; however, degraded habitats may need more than the application of fire (e.g. mechanized treatments) to restore an area to the maintenance condition.

APPENDIX 1

Habitat Monitoring Protocol Establishment and Implementation for the 2006 Waste Water Treatment Facility *Gopherus polyphemus* Relocation Site

Fifty points were randomly generated within the 39.3 ha relocation site in February 2017. Points were visited on 10 February 2017 by staff from the CSJFTC ENV and TNC office. The number of points were reduced to 25 via stratified sampling, as not all points were reflective of tortoise habitat (e.g., wetland, creek, etc.). One-meter square quadrats were centered at each point location, quadrat corners were marked with pin flags, and the center marked with a 1-m tall painted (orange) piece of conduit. The following data were collected at each of the 25 monitoring plots:

Within the Quadrat:

-**Average Shrub Height** (note this was not measured during baseline data collection, but will be monitored in the future using a tape measure and ocular estimate of the mean height).[a]

Percent Cover of:
(using ocular cover estimate method)

-Grass	**-Litter**	**-Tree**
-Forb	**-Moss**	**-Bare Ground**
-Shrub	**-Vine**	**-Log**

Presence/Absence:
-**Red Imported Fire Ant Mound(s)**
-**Tortoise burrow**

Outside the Quadrat:

-**% Canopy Closure** (using a desiometer). This was measured from the south side of each quadrat.
-**Basal Area** (BA factor of 10). This was measured from the north side of each quadrat.

Presence/Absence:
-**Red Imported Fire Ant Mound(s)**. If observed within visual distance of the quadrat.
-**Tortoise burrow**. If observed within visual distance of the quadrat.

-**Photographs** were taken from each cardinal direction at each plot.

NOTE: Baseline data were initially collected in February 2017, in advance of a thinning operation that was supposed to be conducted within the relocation site. **Annual data collection will take place in June of each year**.

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Appendix F

USFWS Approved Gopher Tortoise Trapping/Translocation Guidelines

Gopher Tortoise Trapping and Translocation Guidelines

DISCLAIMER: Gopher tortoise trapping and translocations must be done following proper permitting authority and guidelines from the appropriate regulatory agency. For additional information or assistance please contact the U.S. Fish & Wildlife Service or your state wildlife agency.

Timing

Tortoises shall only be translocated when the low temperature at the recipient site is forecasted by the National Weather Service (www.nws.noaa.gov) to be above 50˚ Fahrenheit for three consecutive days after release (including the day of translocation). This three-day window of milder overnight temperatures is required to allow the tortoises to settle into the recipient site and to reduce the chance of cold-related stress or mortality. These conditions typically correspond with dates between April 1 and October 15 throughout most of the species' range. Additionally, during summer months, releases should not be made during the hottest part of the day at sites where shade is limited. Heat stress on gopher tortoises being captured and transported for translocation can be reduced or eliminated by assuring that captured tortoises and those tortoises being transported for release are continually in shaded or climate-controlled conditions. Any tortoises injured or killed during capture, handling, or transport must be reported to the appropriate regulatory agency immediately.

Inspection and handling of nests

Before any activities take place during the nesting season (early May through mid-September), the apron in front of each burrow should first be examined for eggs. Nest chambers may be 6-10" below the surface, so thorough inspection is required by manually digging through the soil (no tools). Care must be taken throughout digging and removal of eggs from the nest chamber as gopher tortoise eggs are fragile. As soon as a nest is located, but before excavation begins, fill a container with sand/soil from near the eggs and make egg-sized depressions into the sand. Prior to moving them, and as new eggs are uncovered, use a pencil to place a small "x" on top of each egg to help maintain its orientation throughout the process. Maintaining each egg's orientation is critical because the developing embryo attaches to the inside of the top of the eggshell; either rotating or agitating the egg may dislodge the embryo and kill it. Carefully place each egg in a depression in the container with the "x" facing up, make sure to remove all eggs from the nest (measuring the approximate depth of the bottom of the nest when completed), and then cover the eggs with more sand. During all transport, minimize sun

exposure/overheating and agitation of the container. At the recipient site, locate an existing burrow apron in an open, sunlit area (with no nest present) within the release pen (described below) and excavate to the approximate depth of the original nest. If no burrows exist, dig the nest chamber by hand to the appropriate depth in an open, sunlit area. Place the eggs "x" side up in the new nest in approximately the same orientation as they were originally located, and re-bury them.

Choosing a capture method

Tortoises may be captured via bucket traps, cage traps, hand-capture outside burrows, and excavation by hand shovel or backhoe. Capturing gopher tortoises using mechanical excavation (backhoe) is often preferred because typically it is quicker than other capture methods and often leads to lower costs; however, it comes with an increased level of risk to the tortoises. Backhoe excavation of gopher tortoise burrows must be conducted by at least two individuals at all times; the backhoe operator and another person on the ground monitoring the gopher tortoise burrow. All other capture methods can be performed by one person, but may take weeks to complete if the tortoise does not immediately go into the trap; however, many traps can be set at the same time. Prior to any method of capture, examine the burrow with a burrow camera to try to ascertain occupancy. While this is not a definitive method to confirm vacancy, presence of a tortoise can be verified if seen with the camera. Additionally, whichever capture method is used, the burrow should be re-scoped with a burrow camera after a tortoise is captured to check for additional tortoises or commensals still present in the burrow. To minimize the risk of disease transmission, all material used during the trapping and handling of gopher tortoises from the original site (*e.g.*, traps, shovels, burrow cameras, etc.) should be disinfected with a dilute chlorine solution before moving to the next site or recipient site. A 1:20 dilution of 5-6% household bleach is a recommended disinfection solution and must be made fresh weekly.

Mechanical excavation

To prevent injury to tortoises during backhoe excavation, the backhoe bucket must have a smooth cutting edge that lacks teeth (long prongs). It is recommended that burrow excavations be performed by a backhoe operator with previous experience or training in excavating gopher tortoise burrows. A flexible tube or hose must be inserted into the burrow to ensure that the burrow path is not lost and to indicate the distance to the end of the burrow or to the tortoise. Throughout the excavation process, the burrow will be frequently inspected to ensure that the tortoise has not moved to a position where it might be injured by the backhoe or shovel. The last 1-2 feet of the burrow will be excavated by hand using shovels and small hand spades. Burrow excavation is not complete until the burrow terminus is reached and all side chambers are found and completely excavated. If the end of a burrow is reached without capturing a tortoise, the soil must be thoroughly

probed in all directions to try to locate a tortoise that may have dug beyond the end to escape capture. If the excavation of a burrow is interrupted for any reason before the tortoise is captured and excavation cannot resume that day, an open burrow tunnel path must be left so the tortoise can exit the trench or a bucket or cage trap must be set at the entrance to the burrow at the bottom of the trench. The excavation should be resumed as soon as safely possible to lessen the possibility of a newly created burrow or a roaming tortoise. Hatchling and juvenile burrows (burrow width <5") may be hand excavated or carefully mechanically excavated.

Traps

If bucket or cage traps are used, the traps must be shaded and checked twice per day—once in the morning and once in the late afternoon, and they must remain in place for at least 28 consecutive days or until the resident tortoise is captured, whichever occurs first. All traps must be closed if at any time during the 28-day trapping period the forecasted low temperature is below 50˚ F, and the trapping period shall restart at day 1 when a trap is closed for any reason. For bucket traps, dig a hole just outside of the burrow entrance that is large enough to accommodate a 5-gallon bucket placed flush with the ground level. Drainage holes must be drilled into the bottom and lower sides of bucket traps to prevent rainwater from accumulating in the bucket and potentially drowning the tortoise. Cover the bucket opening with paper or cloth and a small amount of soil (for camouflage) to create a pitfall trap for a gopher tortoise. Alternatively, a mesh wire cage trap may be used, either homemade (*e.g.*, "flap trap") set over the burrow entrance; or commercially available (*e.g.*, Havahart ®) that is set directly in front of a burrow to capture the resident tortoise. Both pitfall and cage traps must be completely shaded (using burlap, other cloth, plywood, and/or vegetation). It is possible that other state- or federally-listed, or at-risk species may be encountered during trapping activities. Any of these species found in traps should be photographed to provide unequivocal identification, and if no guidance already exists regarding appropriate disposition of these animals, the Service and/or appropriate state agency should be contacted immediately.

Marking and data collection

All trapped or excavated gopher tortoises must be individually marked, measured, weighed and given a health assessment. Care should be taken to clean all marking and measuring instruments with a dilute chlorine solution (as described above) to prevent transmission of pathogens between animals. Marking is performed by drilling holes in, or using a triangular file to notch, one or a combination of the eight rear-most marginal scutes (the four right ones and the four left ones) and the two right and left front marginal scutes, following a numbering system approved by the permitting/management authority (see Figure 1). Drilling or notching should be carefully undertaken to avoid injury to the limbs or head.

Also, holes should be drilled closer to the marginal edge (without breaking through the edge) rather than higher up on the scute. For adult tortoises, Passive Integrated Transponder (PIT) tags may be used as a different method for uniquely marking individuals. PIT tags are small microchips that can be injected into a tortoise's hind leg using a clean, hand-held applicator and following manufacturer's guidelines. Alternatively, PIT tags may be affixed to the carapace of tortoises (any age) using epoxy, trying to avoid applying epoxy across the gap between adjacent scutes. Juveniles (<130 mm carapace length) cannot be marked using a drill because of their pliable shells; instead, a triangular file or sharp scissors must be used to carefully notch the appropriate scutes.

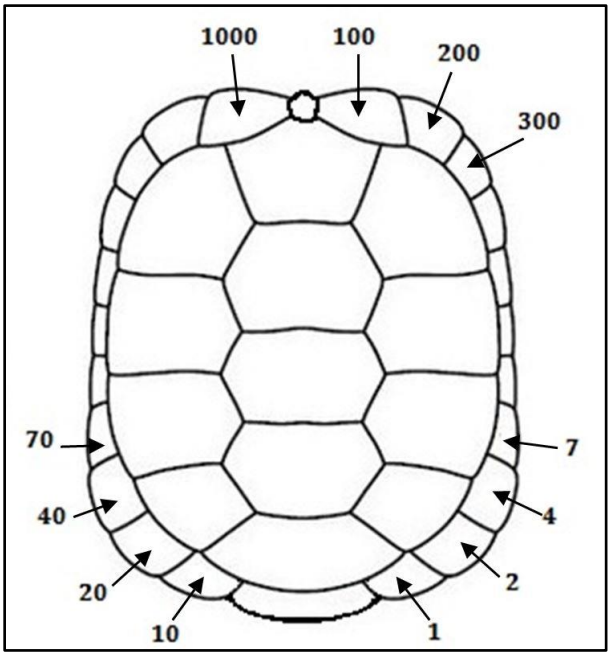

Figure 1. Sample gopher tortoise marking system

Data collected should include the age class, sex (if determinable), and identification number of the tortoise, as well as straight-line carapace length, plastron length, width, weight, and photographs of the carapace and plastron. Additional measurements may be taken (see Figure 2). As a general rule, tortoises <130mm carapace length should be considered juveniles; those with carapace length 130-220mm should be considered subadults; and those with >220mm carapace length are considered adults (mature). Adult male tortoises, in comparison to females, have a concave plastron, a wider anal width relative to the anal notch, and a longer gular projection (see Figure 2). On the data sheet(s), the project site and recipient site should be recorded along with the results of a basic health assessment. The health assessment should consist of a basic physical examination of the posture/behavior of the tortoise, any apparent injuries or trauma, and an examination of the eyes, nostrils, skin, muscle mass, and shell.

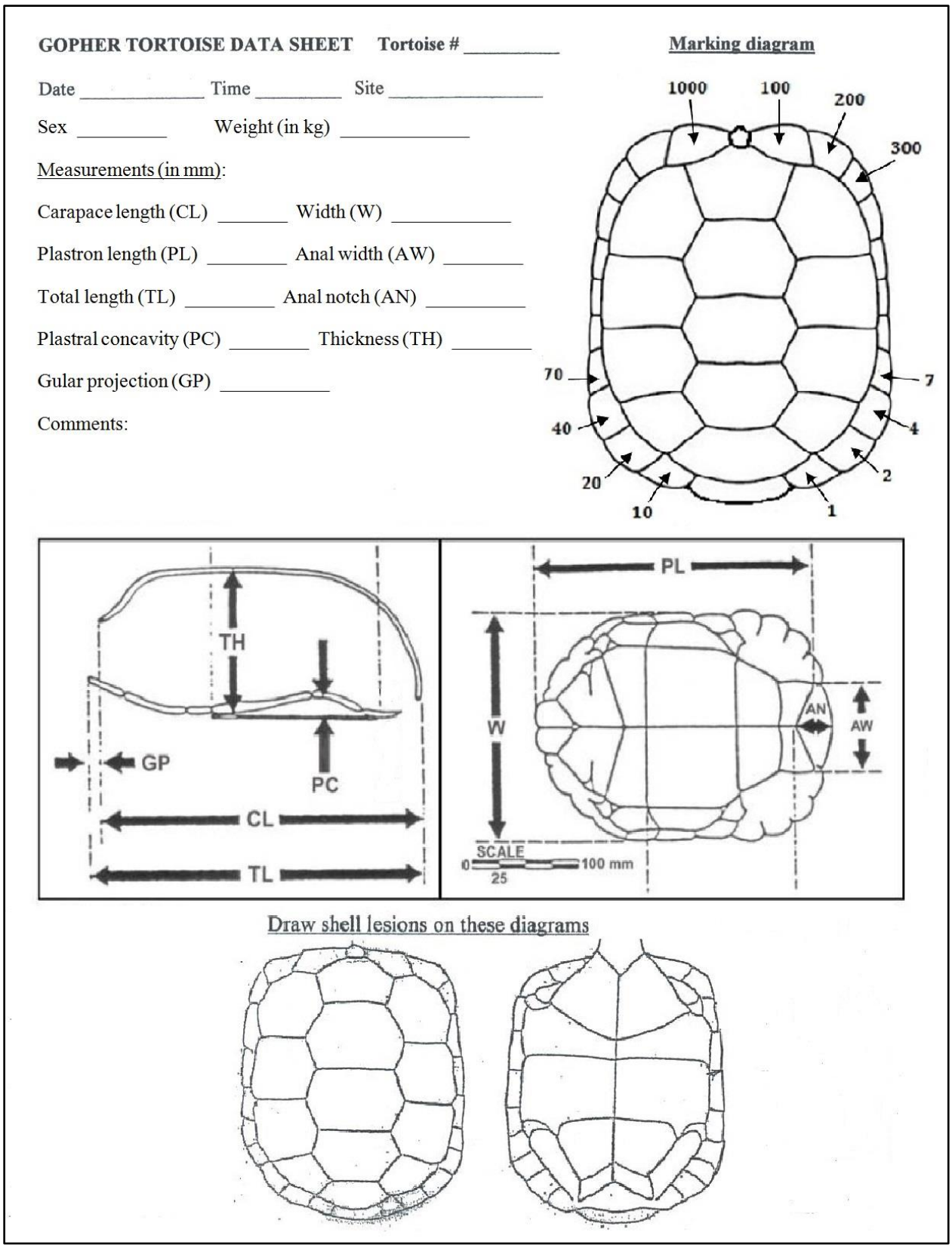

Figure 2. Sample gopher tortoise trapping/capture data sheet.

Some clinical signs of upper respiratory disease to watch for include: nasal discharge; congested breathing; severely eroded nostrils (nares); sunken eyes; eyes/eyelids severely swollen or reddened, with discharge; poor muscle mass and emaciated (abnormally thin) appearance (see Wendland *et al*. 2009 for additional health evaluation procedures). If a potentially-ill or injured tortoise is discovered, that tortoise must be isolated from other tortoises; and a wildlife rehabilitation facility/veterinarian must be contacted, as well as, the appropriate regulatory agency to discuss further action.

Holding and Transport

Gopher tortoises must be held in shaded conditions and in individual containers that are large enough to allow the tortoise to turn around. To help prevent dehydration, especially during times of drought, tortoises should be soaked for 20-30 minutes before transport in just enough water to cover the container bottom and to allow the tortoise to easily drink or soak. Moist soil from the burrow may be used to cover the bottom of the bin. Hay, straw, or shredded paper are other acceptable materials to place in the bin. Gopher tortoises must not be held more than 72 hours after capture—and preferably not more than 24 hours. Tortoises must be transported within covered, well-ventilated areas of vehicles (not in open trucks) and should be kept at moderate temperatures (*i.e*., 70-85˚ F). Containers should be marked with the identification number and sex of the tortoise, and should be disinfected with a dilute chlorine solution after each use.

Release

To ensure successful translocation, gopher tortoises must be released into secure enclosures containing appropriately-managed habitat on suitable soils at the recipient site. All enclosures must provide abundant open, sunlit areas; areas with full shade; and plentiful, diverse, herbaceous forage. Enclosures should be designed in a way and constructed of a material that prevents the passage of all sizes of tortoises (such as silt fencing or flashing) and without 90 degree corners (circular design is preferable). The enclosure must be large enough to allow for stocking rates of up to 4 gopher tortoises per acre (including any resident tortoises and taking available ground cover into consideration). Tortoises must be released into either existing abandoned burrows or excavated starter burrows. Naturally-occurring burrows will be inspected with a burrow camera to confirm (to the greatest extent possible) that they are unoccupied before releasing tortoises. Where no abandoned burrows exist, starter burrows should be dug at a 30-40˚ angle in suitable soils with (sharpshooter) shovels, post hole diggers, or power augers to the greatest distance possible (ideally 3 feet or longer). It is important that the roof of the starter burrow should be close to the same height as the depth of the shell of the animal to be placed therein. This can be difficult to do with post-hole diggers, so sharpshooter shovels are recommended over conventional shovels for creation of broad,

relatively flat tunnels. Enclosures shall be monitored at least once a week for the first month and at least once a month afterward to check for structural integrity and for any issues regarding the safety and welfare of resident tortoises. In rare cases, enclosures may be constructed that are large enough to be a permanent home to the resident tortoises and will not need to be opened. In all other cases, tortoises must remain in the enclosure for 9 to 12 months; at the end of the confinement period, the enclosure fencing will be removed or otherwise opened to allow for free movement of tortoises across the site.

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