SECTION 2
INSTALLATION MISSION AND ENVIRONMENTAL SETTING

2.1 GEOGRAPHIC LOCATION AND SIZE

CSSA, formerly known as Leon Springs Military Reservation, is located in Bexar County, Texas, northwest of downtown San Antonio (Figure 2.1 [figures are located at the end of the sections]). The post consists of 4,004 acres immediately east of State Highway 3351, approximately 0.5-mile east of Interstate Highway 10. Camp Bullis borders CSSA on the east and south. CSSA is a restricted-access installation, and currently, about 120 people work at the post, most of whom are present only during normal working hours. In the past, the number of people has ranged from 75 to 175 (Engineering Science 1993). CSSA is composed of approximately 4,004 acres, divided into an inner and an outer cantonment (Figure 2.2).

Since the l940's, various portions of the north pasture in the outer cantonment at CSSA have been used for demilitarization activities (*i.e.*, munitions burning) and for munitions testing. Currently, the only munitions testing carried out at CSSA is for munitions stored at the installation, and usually only for small ammunition (*e.g.*, grenades and land mines). There is currently no on-site disposal of munitions at CSSA. Explosive ordnance disposal previously took place at CSSA; however, these activities were discontinued in 1987 (Engineering Science 1993). Because of increasing urbanization, especially west of CSSA, future demilitarization of large munitions is not planned at the installation. CSSA currently transports unusable munitions to appropriate DoD/Army disposal facilities for evaluation and potential reuse.

2.2 MILITARY MISSION

The primary mission of the installation is receipt, storage, and issuance of ordnance materiel as well as quality assurance testing and maintenance of military weapons and ammunition. The management, administration, and functional operations of CSSA must comply with AR 740-1 and other applicable regulations, in support of the DoD Military Assistance Program and other missions as directed by military headquarters.

Operations conducted at CSSA require the use of both hazardous and nonhazardous materials which result in solid waste that is either hazardous or nonhazardous. CSSA is a conditionally exempt small quantity generator (CESQG – 100 kg or less of hazardous waste generated monthly) and the waste generated is largely dependent on workload. Depending on variables, CSSA could temporarily become a small quantity generator (SQG – between 100 kg and 1000 kg of hazardous waste generated monthly). These operations are of a batch type and are highly variable in duration and intensity. No changes to the CSSA mission and military activities are expected in the future.

2.3 LAND USE

2.3.1 Historical Land Use

The land on which CSSA is located was used for ranching and agriculture until the 1900s (Army 1990). During 1906 and 1907, six tracts of land were purchased by the U.S. Government and designated the Leon Springs Military Reservation. The reservation, which included campgrounds and cavalry shelters, was used for maneuvers by Army and National Guard units.

In October 1917, the post was designated Camp Stanley. United States involvement in World War I spurred extensive construction to provide housing for temporary cantonments and installation support facilities. In 1931, Camp Stanley was selected as an ammunition depot, and construction of standard magazines and igloo magazines began in 1938 under direction of the work progress administration (WPA). Camp Stanley was transferred to the jurisdiction of the Red River Army Depot in 1949. In addition to ammunition storage, CSSA lands were used to test, fire, and overhaul ammunition components.

2.3.2 Current Land Use

On-Site

The inner cantonment of CSSA, comprising 1,760 acres, is used for storage of ammunition in igloos, light industrial activities, such as maintenance and cleaning of weapons, warehouse storage, and offices. Eleven houses where personnel and their families live are located within the western inner cantonment. The 2,244 acres of the outer cantonment is used for munitions test ranges and wildlife hunting. Much of the east and north pastures are unimproved to provide a protection area around the firing range. Wildlife is hunted by military and civil service personnel, retired employees, and other authorized persons.

Off-Site

In accordance with the Texas Commission on Environmental Quality (TCEQ) Texas Risk Reduction Program, a land use survey was completed December 15 and 16, 1999, covering the area within a 1-mile radius of CSSA. Preliminary land use information was obtained from Texas highway maps, United States Geologic Survey topographic maps, and aerial photography. The surrounding area was surveyed on foot and by vehicle as accessible from public roads and CSSA property. Preliminary land use information was updated when discrepancies were observed.

Land use is primarily single-family residential, with a smaller amount of commercial use. Although the area surrounding CSSA is primarily rural, the density of residential development to the west and south of the installation is increasing. Adjacent and nearby communities include Fair Oaks, a large-lot single-family subdivision to the west and northwest, Leon Springs to the south, and the Dominion, another large-lot single-family subdivision towards the southeast. Two new subdivisions, the Heights of Lost Creek and Lost Creek Development, are currently under construction by Centex Homes across Ralph Fair Road adjacent to the west side of CSSA. CSSA is bordered to the west by Ralph Fair Road. Fair Oaks Elementary School is located on Ralph Fair Road just northwest of CSSA. The northern boundary of CSSA is bordered by commercial property, vacant land, an electrical substation, and a remote portion of Camp Bullis. Camp Bullis also forms the entire eastern boundary and part of the southern boundary. Camp Bullis serves as the field training installation in support of all military activities in south Texas.

Eleven major training areas are located on Camp Bullis. Activities are conducted for weapons training, field training, and maneuvers.

The mission of CSSA is not anticipated to change; therefore, land use changes on the facility are not anticipated. Land use in the surrounding area is not anticipated to change, except for increased residential development in undeveloped areas west and north of CSSA. Increased residential development is anticipated to result in increased demand on the public water supply, which is supplied from local wells.

2.4 FACILITIES AND INFRASTRUCTURE

There are approximately 200 buildings at CSSA, including 120 munitions igloos housing conventional weapons and ammunition (Figure 2.2). Most of the present buildings at CSSA were constructed between 1939 and 1952, although some were built as early as 1917. An unknown number of temporary structures were removed in the past.

The magazine and igloo storage areas are located in the inner cantonment. The magazine storage areas are built of reinforced concrete and have loading docks. The igloos are mounded with an earthen blanket and sodded with native grasses. The magazine and igloo areas were constructed in 1939 and 1940.

Eleven quarters for personnel are located on CSSA. Other current uses for buildings include administration, offices, engineering, storage, hazardous materials storage, shipping and receiving ammunition, weapons rehabilitation, surveillance, vehicle storage and maintenance, utilities, water and waste testing, a guard shelter, and several vacant buildings.

A large active firing range in the East Pasture is known as the East Range. It is used to fire small arms ammunition, grenades, mines, pyrotechnics, and demolition items during testing and training activities. A new firing range was recently built at Building 90. Building 90 is used for weapons rehabilitation.

The road system at CSSA was originally built to serve cavalry operations. Additional roads were added over time, and the current road system includes asphaltic concrete roads, hard surface gravel roads, various well-maintained roads, and several low water crossings and concrete bridges.

Electricity at CSSA is supplied by City Public Service of San Antonio. Three groundwater wells can be used to supply potable water for CSSA. These are wells CS 9 and CS 10 on the west-central side of CSSA, and back-up well CS 1 just southeast of CSSA on Camp Bullis. Water treatment is through a wastewater treatment plant located in the southwest portion of CSSA with discharge into a tributary of Leon Creek at the southern boundary of the installation.

2.5 CLIMATE

Climate at CSSA is a modified subtropical climate, predominantly marine during the summer months and continental during the winter months. The resulting weather is characterized by hot summers with daily temperatures above 90 degrees Fahrenheit (°F) over 80 percent of the time and mild winters with below-freezing temperatures occurring on an average of only about 20 days per year. The first occurrence of 32°F is in late November and the average last occurrence is in early March. Average annual temperature is 69°F. The highest average daily maximum temperature is 95°F in July, and the lowest average daily minimum

temperature is 39°F in January. Temperature extremes for the period of weather records range from 0°F to 108°F (NOAA 2002).

CSSA is situated between a semi-arid region to the west and the coastal area of heavy precipitation to the east. The 30-year record (1971-2000) shows a mean annual rainfall average of 37.36 inches in Boerne, Texas (NOAA 2002). Precipitation is fairly well distributed throughout the year, with the heaviest amounts occurring in May and September. Approximately 61 percent of the rainfall occurs over the period from April through September and is primarily due to thunderstorms. Damaging hail seldom occurs, but light hail is common with springtime thunderstorms. Since CSSA is only 140 miles from the Gulf of Mexico, tropical storms occasionally affect the installation with strong winds and heavy rains. Measurable snowfall occurs only once every 3 or 4 years.

The highest relative humidity occurs during the early morning hours (0600 hours) and averages about 84 percent over the year. Monthly averages range from 79 to 88 percent. Between 1200 and 1800 hours, relative humidity averages about 53 percent, with monthly averages ranging from 45 to 59 percent.

Northerly winds prevail during most of the winter. Strong northerly winds occasionally occur in conjunction with "northers," cold southward flows produced by an area of high pressure that invades the United States from Canada. Southeasterly winds from the Gulf of Mexico are predominant in the summer but also occur frequently during the winter. The average annual prevailing wind direction is from the southeast, and the average annual wind speed is 9 miles per hour (mph) with monthly averages ranging from 8 mph to 10 mph. The windiest months are typically March and April; September and October have the least wind.

Skies are clear to partly cloudy on average about 225 days per year, or more than 60 percent of the time, and cloudy conditions occur less than 146 days per year, or less than 40 percent of the time. CSSA has more than 70 percent of the possible sunshine during the summer months, and about 50 percent during the winter months.

CSSA maintains two weather stations to monitor rainfall, wind speed and direction, relative humidity, and temperature. Efforts are underway to link weather station data through a Supervisory Control And Data Acquisition (SCADA) system to environmental staff computers.

2.6 GEOLOGICAL RESOURCES

2.6.1 Geology

Figure 2.3 is a map of surface geology at CSSA. The oldest and deepest known rocks in the CSSA area are Paleozoic age (225 to 570 million years ago) schists of the Ouachita structural belt. They underlie the predominant carbonate lithology of the Edwards Plateau. Cretaceous age sediments were deposited as onlapping sequences on a submerged marine plain and, according to well logs and outcrop observations, thicken to the southeast. These sediments represent the Trinity Group Travis Peak Formation shallow marine deposits. The Travis Peak Formation attains a maximum thickness of about 940 feet and is divided into five members, in ascending order: the Hosston Sand, the Sligo Limestone, the Hammett Shale, the Cow Creek (CC) Limestone, and the Hensell Sand. Overlying the Travis Peak Formation, but still a part of the Cretaceous age Trinity Group, is the Glen Rose Limestone.

The Hosston Sand is generally composed of conglomerate, sandstone, and claystone, becoming increasingly more dolomitic and shaley downdip to the southeast. The Sligo Limestone exists downdip where the Hosston grades into a sandy limestone. Overlaying the Sligo is the Hammett Shale, which has an average thickness of 60 feet. It is composed of dark blue to gray fossiliferous, calcareous, and dolomitic shale. It pinches out north of CSSA and attains a maximum thickness of 80 feet to the south.

Above the Hammett Shale is the CC Limestone. It is a massive fossiliferous, white to gray, shaley to dolomitic limestone that attains a maximum thickness of 90 feet downdip in the area. At CSSA, it averages about 80 feet in thickness.

The youngest member of the Travis Peak Formation is the Hensell Sand, locally known as the Bexar Shale. The shale thickness averages from 80 to 150 feet. It is composed of silty dolomite, marl, calcareous shale, and shaley limestone, and thins by interfingering into the Glen Rose Formation.

The upper member of the Trinity Group is the Glen Rose Limestone. The Glen Rose Limestone was deposited over the Travis Peak Bexar Shale and represents a thick sequence of shallow water marine shelf deposits. This formation is divided into upper and lower members. At CSSA, the Glen Rose is exposed at the surface and in stream valleys. Figure 2.3 shows the surface locations of the various Glen Rose members at CSSA and the surrounding area.

The Upper Glen Rose (UGR) consists of beds of blue shale, limestone, and marly limestone with occasional gypsum beds (Hammond 1984). Based on well log information, the thickness of the upper member reaches 500 feet in the Bexar County. The thickness of this member at CSSA has not been determined, but it is estimated from well logs to be between 20 and 150 feet.

The Lower Glen Rose (LGR), underlying the UGR, consists of a massive fossiliferous limestone, grading upward into thin beds of limestone, marl, and shale (Ashworth 1983). The lower member, according to area well logs, is approximately 300 feet thick in the CSSA area. Based on published maps of the region, only the UGR was thought to outcrop at CSSA; however, it is believed the LGR also outcrops at CSSA.

The boundary between the upper and lower members of the Glen Rose Limestone is defined by a widespread fossil stratigraphic market known as the Corbula bed, or interval E on Figure 2.3 (Whitney 1952). The Corbula bed is 0.5 to 5 feet thick and contains small pelecypod clamshells, which are 3 to 5 millimeters in diameter. Presence of the Corbula fossil indicates a slightly more saline depositional environment than fossils found above and below the Corbula bed. A gypsum bed has also been identified close to the Corbula bed.

Fredericksburg Group sediments, including the Edwards Formation, overlie the Glen Rose Formation in many areas as erosional remnants outcropping as topographic highs. For this report, the Fredericksburg Group limestones will not be discussed because of the lack of outcrop in the immediate vicinity of CSSA.

Normal faulting has occurred near the central area and the southeastern boundary of the installation. Regionally however, two major trends of fractures extend northwest-southeast and northeast-southwest. Faulting in the limestone units has juxtaposed strata of different ages, but fault scarps and traces are almost absent because the similar calcareous lithologies weather similarly. The faults are northeast-southwest trending, but most are not as continuous as the fractures.

2.6.2 Karst Features

Sinkholes and caverns are present on the surface and in the subsurface, primarily in areas where porous and fractured limestone formations are exposed. The sinkholes and caves result from dissolution of limestone and gypsum by infiltrating surface water. There is evidence of karst development along some of the streams on post. Estavelles, vertical karst conduits, are present in the Salado Creek streambed at several locations in the northern portion of the inner cantonment. These karst features provide a direct pathway for stream flow to recharge the shallow groundwater and can contribute to the rapid recharge response observed in the on-post wells. Figure 2.4 is a map of karst features at CSSA (Veni 2002).

2.6.3 Soil

In general, soil at CSSA is thin, dark-colored, gravely clay and loam. The soil types are strongly influenced by topography and the underlying limestone. All soil classifications used for this report are taken from the USDA Soil Conservation Service (now the Natural Resource Conservation Service [NRCS]) soil survey series for Bexar County, Texas (USDA 1991). Figure 2.5 shows the eight soil types occurring at CSSA, as well as the spatial distribution of each soil type.

Brackett Soil

Brackett (BrE) soil occurs over 12.8 percent (512.5 acres) of CSSA lands. This soil covers a large portion of the East Pasture and the inner cantonment at CSSA. The soil occurs on slopes of 12 to 30 percent, such as those found on Steele, McFarland, and Schasse Hills, as well as Taylor Ridge. This loamy and clayey soil is thin (about 4 inches deep), grayish-brown, and strongly calcareous. Gravel and cobblestone lithics occur at the surface and shallow subsurface. The soil can develop over soft limestone and is underlain by hard limestone, which gives the slopes a stairstep appearance. Topographic relief associated with Brackett soil is expressed as steep, cone-shaped hills with "saddles" between them. Brackett soil is nonarable and best suited to native grasses.

Tarrant Soil

At CSSA, Tarrant soil occurs along the outer edges of the Salado Creek floodplain. The soil is thin and forms over hard, fractured limestone. The surface layer is usually about 10 inches thick and is a dark grayish-brown, calcareous, clay loam with scattered gravel and cobblestones within, and on the surface layer. Two types of Tarrant soil occur at CSSA: Tarrant Association, gently undulating, and Tarrant association, rolling.

The Tarrant association (TaB), gently undulating, areas are typical of prairie and plateau topography. It occurs primarily in areas not occupied by streams, such as the north-central area of the inner cantonment, as well as the west sides of Steele and Wells Hills and the hills north of the inner cantonment. This soil type covers 14.3 percent (572.6 acres) of CSSA. The soil is dark colored, very shallow, calcareous, and clayey, and is best suited for native grasses and range use.

Tarrant association (TaC), rolling, is found on the eastern sides of Anderson and Schasse Hills, in areas not occupied by streambeds. This soil type occurs over only 1.3 percent (52.1 acres) of CSSA lands. The slopes tend to have a gradient of 5 to 15 percent. The soil is dark colored, very shallow, clayey, weakly calcareous, and typically more stony than Tarrant association, gently undulating.

Brackett-Tarrant Association

Brackett-Tarrant association soil (Bte) covers 24.9 percent (997.0 acres) of CSSA. The soil is formed on hills with 8 to 30 percent slopes and consists primarily of soil that developed over limestone. At CSSA, this soil type is found north of the inner cantonment, in the north pasture. The slopes of ridges are Tarrant soil which is clayey, calcareous, and very dark grayish-brown. The Brackett soil is light grayish-brown and calcareous. Tarrant soil makes up 65 percent of the association, and Brackett soil makes up 20 percent. Neither soil type is suited to crops, because stones and topography make the use of machinery difficult.

Crawford and Bexar Stony Soil

Crawford and Bexar Stony soil (Cb) occupies portions of both the inner and outer cantonments, for a total of 16.9 percent (676.7 acres) of CSSA. It occurs in broad, nearly level to gently undulating areas with slopes of 0 to 5 percent. The soil is stony, very dark gray to dark reddish brown, noncalcareous clay, about 8 inches thick. Bexar soil ranges from a cherty clay loam to gravely loam. The soil is nonarable and suited for native grasses, such as Texas winter grass, little bluestem, sideoats grama, and buffalo grass.

Trinity and Frio Soil

The Trinity and Frio soil (Tf) covers 8.8 percent (352.4 acres) of CSSA. The soil is frequently subjected to flooding, because it forms the main channel soil for Salado Creek and a large tributary that joins the creek in southwestern CSSA. Some areas are subject to thin sediment depositions, while other areas are scoured. Channels are poorly defined and are of small capacity. Trinity soil is 3 to 5 feet deep and composed of clayey to gravely loam. Frio soil is a dark grayish-brown clay loam, 3 to 4 feet deep. Vegetation may consist of elm, hackberry, oak, mesquite, and other thorny shrubs, Texas wintergrass, Johnson grass, buffalo grass, bermuda grass, and annual weeds.

Krum Complex

The Krum Complex soil (Kr) makes up the remaining soil covering the streambeds and floodplains, approximately 20.0 percent (800.8 acres) of CSSA. The soil is dark grayish-brown or very dark grayish-brown, calcareous, and approximately 30 inches thick. The soil developed from slope alluvium of the limestone prairies. It occurs on slopes of 2 to 5 percent and occupies "foot" slopes below Tarrant and Brackett soil. The Krum Complex soil receives sediments and runoff from higher elevation soil, and is highly prone to hydraulic erosion if unprotected.

Lewisville Silty Clay

A minor soil type found at CSSA is the Lewisville silty clay (LvB) found on slopes of 1 to 3 percent. This soil type covers only 1.0 percent (40.0 acres) of CSSA. It typically occupies long, narrow, sloping areas separating nearly level terraces from upland soil. It can be found in small areas south of Dietz Elkhorn Road and north of the inner cantonment boundary around Moyer Road. Surface soil is dark grayish-brown and about 20 inches thick. This is a highly productive soil, but is also susceptible to hydraulic erosion if unprotected.

2.6.4 Topography

CSSA is characterized by a rolling terrain of hills and valleys in which nearly flat-lying limestone formations have been eroded and dissected by streams draining to the east and

southeast. River and stream dissection of limestone is the major surface feature at CSSA. Most major rivers and streams originating in the Edwards Plateau to the northwest of CSSA tend to follow the northwest-southeast regional fracture patterns. Resistive limestone beds crop out as topographic highs, but none of these beds form buttes or mesas. Rather, the predominant physiography is hills and "saddles" which lead to stream valleys. Topographic relief across the area ranges from about 1,100 feet to 1,500 feet above sea level. Figure 2.6 is a shaded relief map of CSSA.

2.7 WATER RESOURCES

2.7.1 Surface Water and Drainage

Salado, Leon, and Cibolo Creeks drain surface water from CSSA (Figure 2.6). Approximately 75 percent of CSSA is in the Salado Creek watershed, 15 percent in the Cibolo Creek watershed, and 10 percent in the Leon Creek watershed. Most of the active-use areas of CSSA are in the Leon Creek watershed, including a wastewater treatment plant which drains into a tributary of Leon Creek at the southern boundary. These streams are intermittent at CSSA. Natural stream channels on CSSA generally have broad floodplains, and portions of CSSA are in the 100-year floodplain.

The Salado Creek watershed on CSSA extends in a broad swath from northwest to southeast with the Salado Creek headwaters located in adjacent Fair Oaks subdivision. Impervious cover in Fair Oaks is currently estimated at 5 to 10 percent. Drainage from Camp Bullis to the east also flows across CSSA to Salado Creek. Impervious cover for CSSA within the Salado Creek watershed is substantially less than 5 percent, with much of the area undeveloped except for dirt and gravel roads.

As shown in Figure 2.6, there are four ponds within the Salado Creek drainage area of CSSA, one pond in the Cibolo Creek drainage area, and one in the Leon Creek drainage area. In the developed areas of CSSA, rainfall runoff is conveyed to natural stream flow channels by ditches and sheet flow. CSSA has sufficient relief to allow the rapid conveyance of runoff from developed areas. In the undeveloped areas, runoff flows overland to natural channels. The 100-year flood plain has recently been modeled for CSSA and is shown in Figure 2.6.

2.7.2 Groundwater

The primary groundwater source at CSSA and surrounding areas is the Middle Trinity Aquifer, the most prolific producer with the best quality of water of the three Trinity Aquifers. The Middle Trinity Aquifer consists of the LGR Limestone, the Bexar Shale (as a facies of the Hensell Sand), and the CC Limestone. The average combined thickness of the aquifer members is approximately 460 feet.

In the vicinity of CSSA, the LGR portion of the Middle Trinity Aquifer derives its recharge from direct precipitation on the outcrop and stream flow infiltration. Likewise, over the same area, the Bexar Shale acts as a hydrologic barrier to vertical leakage except where faulted. Most recharge to the CC Limestone comes from overlying updip formations. Where structurally compromised, it is inferred that the CC Limestone can be in natural hydraulic communication with the LGR due to the extensive Balcones fault zone faulting. The bottom of the CC Limestone forms the base of the Middle Trinity Aquifer.

In the CSSA area, most water production wells are completed as open boreholes to maximize groundwater yield. These wells include varying lengths of surface casing to facilitate borehole stability or isolate less desirable groundwater strata. Observation wells at CSSA consist of cased and screened wells that discretely monitor 25-foot segments of the LGR, Bexar Shale, or CC Limestone. Often, these wells are arranged in clusters at a single location. By monitoring individual members of the aquifer, an assessment regarding the occurrence and distribution of contaminants within the Middle Trinity aquifer can be ascertained.

Information regarding the subsurface was compiled from borehole data, geophysics, and surface mapping to create a conceptual stratigraphic model. Data indicate that the LGR is typically an average thickness of 320 feet, and is overlain by a thin layer of the UGR which is normally 50 feet in thickness, but the thickness depends on the local topography. However, the UGR comprises nearly 90 percent of the surface outcrop, while exposures of the LGR only typically occur in the lowlands and creek beds. The underlying Bexar Shale is normally 60 feet in thickness, and the facies do not outcrop anywhere in the Texas Hill Country. The underlying CC Limestone unit is typically 75 feet in thickness, and is known only to outcrop along the Guadalupe River to the northeast. Drilling operations typically only penetrated the upper 15 feet of the Hammett Shale for logging purposes.

Based on measurements at observation wells, the regional groundwater flow is generally to the south-southeast. The LGR typically has a southward gradient that deviates around mounding which occurs near the central and northern portions of the facility (CS-MW4-LGR). The Bexar Shale exhibits the potential for either northward or southward flow, depending on the season. Likewise, the CC Limestone exhibits erratic flow paths, with seasonally radial flow from mounded areas, to a northeastward flow possibly related to on- and off-post pumping along Ralph Fair Road.

Long-term monitoring shows that groundwater response to precipitation events can be swift and dramatic. Depending on the severity of a precipitation event, the groundwater response will occur within several days, or even hours. Average precipitation events do not invoke much response from shallower wells within the LGR, yet main aquifer body wells will respond within a week. Such observations indicate that the preponderance of recharge observed occurs elsewhere on the outcrop, and not necessarily within CSSA.

2.8 BIOLOGICAL RESOURCES

2.8.1 Vegetation

CSSA is located within the Balcones Canyonlands subregion of the Edwards Plateau natural region. Evergreen woodlands and deciduous forests dominate this subregion of steep slopes and high-gradient streams. Grasslands are restricted primarily to drainage divides, usually in the context of open woodlands or savannas. Some of the woodlands and a majority of the native grasslands on the Edwards Plateau have been destroyed by historic human settlement of this region. Overall, vegetation at CSSA is similar to that of the region. Past land uses at CSSA resulted in a patchwork of open grassland/disturbed savanna delineated by stands of Ashe juniper-oak (*Juniperus ashei-Quercus* sp.) woodlands.

The vegetation communities at CSSA consist of grasslands, woodlands, and savannas (Figure 2.7). Each vegetation community can be further divided into community types. Eight vegetation community types were mapped as part of the black-capped vireo and golden-cheeked

warbler surveys conducted in 2005 (Figure 2.9) (Parsons 2005b). Table 2.1 lists each vegetation community type with calculated areas. Definitions of vegetation communities are based on classification schemes provided by the USFWS (Underwood 2005), which are derived from the NRCS and Diamond, *et al.* (1988). Vegetation community types at CSSA include:

- **Juniper-Live Oak Woodlands** Composed of woody species ranging between 3-10 meters tall, with a canopy closure of 71-100 percent. Ashe juniper dominates with a large Live oak component.
- **Juniper Woodlands** Composed of woody species ranging between 3-10 meters tall, with a canopy closure of 71-100 percent. Ashe juniper dominates, few other woody species are present.
- **Live Oak-Juniper Woodlands** Composed of woody species ranging between 3-10 meters tall, with a canopy closure of 71-100 percent. Live oaks (*Quercus fusiformis*) dominate with a large Ashe juniper component. Other oak species persist in lower abundance, such as Spanish oak (*Quercus buckleyi*) and shin oak (*Quercus sinuata*).
- **Juniper Dominant Shrublands** Ashe juniper dominates and is under 3 meters tall, few other woody species are present.
- **Live Oak Dominant Shrublands** Live oaks and shin oaks under 3 meters tall, with other shrubs and shorter statured tree species such as flame-leaf sumac (*Rhus lanceolata*), Texas persimmon (*Diospyros Texana*), and agarita (*Berberis trifoliolata*).
- **Herbaceous Bluestem and Short Grass Prairie** Woody species compose less than 25 percent of ground cover, dominated by herbaceous vegetation, including grasses of different heights.
- **Mixed Oak Savanna** Woody species composed primarily of live oak, shin oak, Texas persimmon, and Ashe juniper, form 25-50 percent cover.

2.8.2 Wetlands

Wetlands are areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (hydrophytes), including swamps, marshes, bogs, and similar areas (33 Code of Federal Regulations [CFR], Section 328.3(b); 40 CFR, Section 230.3(t)). Wetlands and waters of the U.S. delineation field surveys were conducted at CSSA in November/December 1995 and April 1996. In November 1996, a wetlands specialist from the U.S. Army Corps of Engineers visited the site to verify the findings of the delineation (SAIC 1997a). Based on the survey results, four jurisdictional wetlands totaling 1.1 acres and seven non-jurisdictional wetlands totaling 3.2 acres occur on CSSA. The non-jurisdictional wetlands are all man-made impoundments. However, two impoundments are classified as jurisdictional because they intercept flows from defined channels, springs, or seeps. The other jurisdictional wetlands appear to be associated with either springs or seeps. In addition, approximately 32,250 linear feet of ephemeral stream drainages on CSSA have defined channels and are potentially jurisdictional waters of the U.S. (SAIC 1997a). However, since these streams are ephemeral (run few days per year) and have no or indirect ties to permanently flowing surface waters, it is questionable whether they are jurisdictional waters.

2.8.3 Wildlife

Bird surveys conducted at CSSA between mid-March and early June 2005 documented 92 bird species at the installation (Attachment C of Appendix B). Although definitive surveys have not been conducted for other wildlife at CSSA, the installation is expected to support a variety of wildlife similar to the surrounding region. Several game species are known to occur at the installation, including: white-tailed deer (*Odocoileus virginianus*), axis deer (*Axis axis*), wild turkey (*Meleagris gallopavo*), dove (*Zenaida macroura*), ducks, quail, rabbits (*Lepus californicus* and *Sylvilagus floridanus*), squirrel (*Sciurus niger*), raccoon (*Procyon lotor*), and coyotes (*Canis latrans*). Other species likely to be found at CSSA include skunk (*Mephitis mephitis*), opossum (*Didelphis marsupialis*), ring-tailed cat (*Bassariscus astutus*), bobcat *(Lynx rufus*), and a variety of rodent species (SAIC 1997b).

2.8.4 Rare Species

The Endangered Species Act (ESA) of 1973 and AR 200-3 require the Army to protect animal and plant species that are federally listed as endangered or threatened. The ESA specifically requires agencies not to "jeopardize" the continued existence of any listed species, or to destroy or adversely modify habitat critical to any listed species. Incidental take of species is permisable only when permitted through an Incidental Take Statement. In addition, the Texas Parks and Wildlife Department (TPWD) maintains a list of state endangered and threatened species.

Limited surveys have been conducted at CSSA for endangered and threatened species. A general habitat evaluation was conducted in December 1992 and detailed bird surveys were conducted in the spring of 1993 (Stewardship Services 1993). More recently, presence-absence surveys for black-capped vireos (BCVI) (*Vireo atricapillus*) and golden-cheeked warblers (GCWA) (*Dendroica chrysoparia*) were conducted between mid-March and early June 2005 (Figure 2.9). In addition, a Phase 1 karst hydrogeologic investigation was conducted at CSSA in 2002 (Veni 2002). Although the karst investigation was never finalized, it did not include specific endangered species surveys. However, it provided a general evaluation of potential habitat for subterranean species. Table 2.2 provides a summary of federal and state listed species with potential to occur in Bexar County, Texas, based on information obtained from the USFWS (2004) and TPWD (2005). An analysis of the known distributions, habitat requirements, and habitat present at CSSA suggests that a majority of the state-listed species are not expected to occur at CSSA.

Of the species listed in Table 2.2, the BCVI and GCWA have been documented at CSSA. The following subsections provide additional information for each species and discuss their potential to occur at CSSA.

2.8.4.1 Amphibians

The black-spotted newt is typically found along the Gulf Coastal Plain south of the San Antonio River, and is not expected to occur at CSSA. However, the potential exists for troglobitic salamanders to occur at the installation. During a downhole video camera survey of wells at CSSA, an unidentified salamander was observed in well CS-2 (Parsons 1996). This unidentified salamander could have been a Comal blind salamander (*Eurycea tridentifera*) or

another rare troglobitic salamander. The Comal blind salamander occurs in two caves on Camp Bullis and one cave on private property just north of CSSA's northern boundary (Veni 2002).

Table 2.2 Federal and State Listed Species with Potentially Occurring in Bexar County

Common Name	Scientific Name	Federal Status	State Status	Presence/Absence
AMPHIBIANS				
Black-spotted Newt	*Notophthalmus meridionalis*	NL	T	Not Likely
Comal Blind Salamander	*Eurycea tridentifera*	NL	T	Not Likely
ARACHNIDS				
Braken Bat Cave Meshweaver	*Cicurina venii*	E	NL	Not Likely
Cokendolpher Cave Harvestman	*Texella cokendolpheri*	E	NL	Not Likely
Government Canyon Bat Cave Meshweaver	*Cicurina vespera*	E	NL	Not Likely
Government Canyon Bat Cave Spider	*Neoleptoneta microps*	E	NL	Not Likely
Madla Cave Meshweaver	*Cicurina madla*	E	NL	Not Likely
Robber Baron Cave Meshweaver	*Cicurina baronia*	E	NL	Not Likely
BIRDS				
American Peregrine Falcon	*Falco peregrinus anatum*	DL	E	Not Likely
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	T	Not Likely
Black-capped Vireo	*Vireo atricapillus*	E	E	Present
Golden-cheeked Warbler	*Dendroica chrysoparia*	E	E	Present
White-faced Ibis	*Plegadis chihi*	NL	T	Not Likely
Whooping Crane[(1)]	*Grus americana*	E	E	Not Likely
Wood Stork	*Mycteria americana*	NL	T	Not Likely
Zone-tailed Hawk	*Buteo albonotatus*	NL	T	Likely Present
FISH				
Toothless Blindcat	*Trogloglanis pattersoni*	NL	T	Not Present
Widemouth Blindcat	*Satan eurystomus*	NL	T	Not Present
INSECTS				
A Ground Beetle	*Rhadine exilis*	E	NL	Not Likely
A Ground Beetle	*Rhadine infernalis*	E	NL	Not Likely
Helotes Mold Beetle	*Batrisodes venyivi*	E	NL	Not Likely
MAMMALS				
Black Bear	*Ursus americanus*	NL	T	Not Present
REPTILES				
Cagle's Map Turtle[(1)]	*Graptemys caglei*	C	T	Not Present
Indigo Snake	*Drymarchon corais*	NL	T	Not Present
Texas Horned Lizard	*Phrynosoma cornutum*	NL	T	Not Present
Texas Tortoise	*Gopherus berlandieri*	NL	T	Not Present

Sources: USFWS 2004 and TPWD 2005
Key: E = endangered, T = threatened, NL = not listed, DL = delisted, C = candidate.
(1) Species are not included on current USFWS (2004) list for Bexar County.

2.8.4.2 Arachnids and Insects

The nine invertebrates (arachnids and insects) listed in Table 2.2 are obligate (capable of surviving in only one environment) karst or cave-dwelling species (troglobites) of local distribution in karst terrain in Bexar County. Habitat required by these invertebrates consists of underground, honeycomb limestone that maintains high humidity and stable temperatures. As of early 2003, 74 caves in Bexar County were known to contain one or more of the listed invertebrates (USFWS 2004). None of these known caves are located on CSSA. Critical habitat has been designated under the ESA for seven of the nine listed invertebrates. Lands designated as critical habitat include 22 separate units, with a total area of 1,063 acres (USFWS 2003). Critical habitat for these species has not been designated on the installation. Two caves and 94 potential karst features were found during the Phase 1 karst hydrogeologic investigation conducted at CSSA in 2002. However, the draft report indicates that none of the caves or karst features are likely to contain endangered karst invertebrates due to CSSA's probable location outside of the zones where they occur (Veni 2002). This finding is also supported by previous work conducted by Veni (1994) and Veni and Reddell (1999).

2.8.4.3 Birds

American and Arctic peregrine falcons potentially migrate through Bexar County. Other than transient individuals, these species are not expected to occur at the installation. The white-faced ibis and wood stork require extensive wetland habitats, which are not present on CSSA. Potentially suitable habitat for the zone-tailed hawk could occur at CSSA. The zone-tailed hawk was not observed during bird surveys conducted in 1993 or 2005.

Black-capped Vireo

BCVIs nest in Texas from April through July, and winter along the western coast of Mexico. In general, nesting habitat for this species includes a patchy arrangement of well-developed shrubs and mid-successional overstory irregularly interspersed with bare or grassy openings. The brush component should be complete to the ground to provide suitable nest sites. The species composition of the vegetation tends to be less important than its structure, but broad-leaved species are more favorable than others, and juniper may be underrepresented in occupied habitat. Suitable habitat development for this species is strongly associated with the rocky soil of the Lower Cretaceous limestones of the Fredericksburg Group.

BCVIs are known to nest in Bexar County, including at Camp Bullis, which is located east of and adjacent to CSSA. One pair of BCVI was documented in the northeastern portion of CSSA in the spring of 1993. A single detection of BCVI was recorded during the 2005 surveys in the East Pasture.

Golden-cheeked Warbler

GCWAs nest only in central Texas mixed Ashe-juniper and oak woodlands, typically in ravines and canyons. During breeding, this species inhabits dense forests and woodlands containing Ashe juniper and a variety of deciduous species, including various oaks. Although the species composition of woody vegetation varies greatly within suitable breeding habitat, Ashe juniper is typically the dominant species and occurs at all sites inhabited by nesting golden-cheeked warblers. This species constructs nests from strips of bark found on relatively mature Ashe junipers. They come to Texas in March to nest and raise their young, and leave in July to spend the winter in Mexico and Central America (USFWS 1992).

During the 2005 surveys, 19 GCWAs were detected in habitat areas typical of the species. Of these, 18 GCWAs were detected through both visual sightings and audible calls, while one GCWA detection was through only counter singing. Some detections were mated pairs, formulating an estimated total of 16 GCWA territories. Four fledglings were observed, but are not included in the total count.

Whooping Crane

The only remaining natural breeding population of whooping cranes winters along the Texas Gulf Coast in and around Aransas National Wildlife Refuge, approximately 200 miles southeast of CSSA. The TPWD's rare species list for Bexar County (TPWD 2004) indicates that whooping cranes are potential migrants in Bexar County. During migration they often pause overnight to use wetlands for roosting and agricultural fields for feeding, but seldom remain more than one night (TPWD 1996). The potential for migrating whooping cranes to use CSSA is low based on the lack of suitable foraging and roosting habitat.

2.8.4.4 Fish

The toothless blindcat and widemouth blindcat are endemic to the San Antonio Pool of the Edwards Aquifer, located in the southwestern part of San Antonio. Therefore, these troglobitic catfish would not be expected to occur at CSSA.

2.8.4.5 Mammals

In Texas, the black bear inhabits desert lowlands and high elevation forests and woodlands. This large mammal has not been observed at CSSA and is not expected to be present.

2.8.4.6 Reptiles

Cagle's map turtle is endemic to the Guadalupe River system and requires riverine habitat with permanently flowing water. CSSA is located in the upper San Antonio watershed and outside of the known range for this species. In addition, all the streams at CSSA are intermittent.

The indigo snake occurs in thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors. It is not likely that the distribution of this species reaches the Balcones Canyonlands in northern Bexar County, where CSSA is located. Therefore, this species is not expected to occur on the installation. Texas horned lizard habitat consists of open, arid, and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush, or scrubby trees. Once common throughout most of the state, this species has disappeared from many parts of its former range over the past 30 years. The habitat assessment conducted at CSSA in 1992 indicated that potentially suitable Texas horned lizard habitat exists at the installation. However, habitat for this species is very limited at the installation based on the mowing regime. The Texas tortoise is generally found south of a line connecting Del Rio, San Antonio, and Rockport. Therefore, it is not likely that the distribution of this species reaches the Balcones Canyonlands in northern Bexar County.

2.9 CULTURAL RESOURCES

2.9.1 Cultural Resources Management

The Environmental Program Manager (EPM) has the primary responsibility for managing cultural resources at CSSA on a day-to-day basis. Consultation with SHPO is initiated by the EPM. Administration of cultural resource management activities are described in the Integrated Cultural Resources Management Plan (Parsons draft) and therefore only the following short summary is provided.

2.9.2 Native American Consultation

Three federally recognized Native American tribes used the CSSA area in historic times, including the Comanche, the Mescalero Apache, and the Tonkawa, although the Comanche and Mescalero Apache may not have had permanent settlements in the area. Two additional tribes claim descent from Native Americans that once lived in the CSSA area, the Lipan Apache Band of Texas and the Tap Pilam Coahuiltecans. Both of these groups claim descent from missionized Native Americans who converted to Catholicism, and both have petitioned for federal recognition (Parsons 2005a).

Concerns specific to Native Americans usually revolve around the identification and preservation of Traditional Cultural Properties (TCP), access to sacred and ceremonial sites, and preservation of cemeteries or burial grounds. CSSA has not been surveyed for TCPs, and there has been no effort to consult with Native American groups to identify their presence. No Native American burial sites have been located during previous archeological surveys at CSSA, and there is low potential for their presence (Parsons draft).

2.9.3 Historic Architectural Resources

CSSA contains a total of 194 buildings and structures, along with infrastructure that includes roads, railroad sidings, and landscape elements. The buildings are concentrated in a rural setting within the inner cantonment which consists of a variety of building types primarily associated with munitions storage and support buildings that include administration, residences, operations, warehouses, vehicle storage, and utility related structures.

Overall, CSSA retains marginal integrity of architectural resources. While most of CSSA buildings dating to the 1930's and 1940's remain intact, many have been modified. Only a handful of structures possess the classic historic features of the San Antonio area such as limestone facades and tile roofs (like Fort Sam Houston or Randolph AFB possesses in much greater quantities). The facility has undergone limited new construction since the end of World War II. Although many of the historic buildings have undergone alterations that include window replacement and additions, none of the changes have significantly diminished the ability of the majority of the facility's buildings to convey their World War II-era significance.

2.9.4 Historic and Prehistoric Archeological Resources

There are 40 known archeological sites at CSSA, seven of which are eligible for listing in the National Register of Historic Places (NRHP) (Kibler, *et al.* 1998; Scott, *et al.* 1998; Parsons draft). Of these sites, 19 are considered historic sites and 21 are considered prehistoric sites. The prehistoric sites were interpreted as open campsites or lithic scatters. Historic sites

were either classified as pre-military (before 1906) or military (1906-1945). Military components represented World War I training trenches, utilities, and infrastructure, facility plans, housing properties, service/support properties, and unidentified property types. The pre-military sites included a 19th Century homestead, 20th century ranches, and a possible 20th-century saloon (Parsons draft).

Three sites were recommended by archeologists as eligible for the NRHP. Four sites were recommended by archeologists as potentially eligible for the NRGP, pending further archival investigations to assess their significance, but have not had formal determinations of eligibility made by a federal agency. The Texas Historical Commission (THC), hereafter the State Historic Preservation Office (SHPO) concurred with these findings.

2.10 INSTALLATION RESTORATION PROGRAM

Solvent contamination (tetrachloroethene, trichloroethene, and *cis*-1,2-dichloroethene) was first detected in a water supply well at CSSA during routine monitoring by the Texas Department of Health in 1991. Between 1992 and 1999, CSSA undertook a series of investigations to identify potential source areas for the groundwater contamination, which identified Solid Waste Management Units (SWMU) B-3 and O-1 and Area of Concern (AOC)-65 as likely candidates. SWMUs O-1 and B-3 are centrally located within CSSA. SWMU O-1 was a lined oxidation pond and nearby B-3 was a landfill where spent solvents were utilized as an accelerant for burning refuse. AOC-65 is located near the post southwestern boundary in an area where ordnance maintenance and testing operations were historically conducted. Starting in 1996, the first of 45 monitoring wells were installed, and well installation continues today.

CSSA has a total of 84 Installation Restoration Program sites, including 41 SWMUs, 38 AOCs, and five Range Management Units (RMU) (Figure 2.10). To date, the Texas Commission on Environmental Quality (TCEQ) has approved closure of 42 sites, and closure or delisting has been requested for five additional sites. Of the remaining 37 sites, investigation and/or remediation is in progress at 22 sites.

2.11 MILITARY MISSION IMPACTS TO THE LOCAL ENVIRONMENT

The purpose of this subsection is to estimate future impacts to the local environment based on past activities and planned actions. Activities at CSSA may affect GCWA and BCVI habitat and individuals. Based on current distribution data of other federally listed species and current land use practices at CSSA, only GCWA and BCVI are considered in this analysis. Effects to these two species may range from beneficial effects to adverse effects (as defined by ESA). No activity at CSSA is expected to jeopardize the continued existence of GCWA or BCVI, and no critical habitat occurs on CSSA. CSSA natural resource planners; however, anticipate potential incidental take of GCWA and BCVI as a result of future actions and day-to-day operations at the facility.

Section 9 of ESA and federal regulations pursuant to Section 4(d) of ESA prohibit the take of threatened and endangered species without special exemption. Under the terms of Section 7(b)(4) and Section 7(o)(2), "taking" of species that is incidental to and not intended to be part of activities at CSSA are not prohibited by ESA, as long as such taking is in compliance with an Incidental Take Statement (ITS). CSSA is currently in consultation with USFWS to assess impacts of the day-to-day activities associated with the military mission and ecological

management activities. Consultation with USFWS is expected to yield a programmatic biological opinion (PBO), which will include an ITS.

2.11.1 CSSA Activities

Activities at CSSA can be grouped into three broad categories. These categories include (1) Operations and Maintenance, (2) Range Management, and (3) Natural Resource Management. The categories, and how the activities may affect GCWA and BCVI are described below:

- ***Operations and Maintenance –***
  These activities include maintenance and construction of new and existing infrastructure at CSSA and grounds maintenance, as well as security patrols and other activities that support the military mission. Maintenance of facilities and roads may require the removal of selected vegetation and could adversely affect listed species, in particular GCWA.

  CSSA anticipates road paving activities to occur on paved road segments once over the next ten years. Most of these road segments are within the inner cantonment and will not subject GCWA or BCVI to adverse effects; however, CSSA does anticipate the construction of a paved road for security purposes around the outer cantonment sometime in the next ten years (not currently programmed). Most of the road construction will occur in previously cleared areas and cleared areas adjacent to habitat. Timing of construction activities can be planned around nesting season periods for GCWA, and indirect effects from increased traffic along the road is expected to be minimal. If roadwork is conducted during breeding season a minimum 300-ft. buffer will be set-up around any occupied habitat. The road will be primarily utilized for vehicle security patrols. Beneficial effects from the road may include the creation of an impervious surface which would function as a permanent fuel break for GCWA habitat protection.

  Over the next ten years, CSSA, as a munitions storage and testing facility, will engage in active fuels reduction and fire containment activities with the dual intention of reducing fire risk and providing ecological benefit. Figure 4.1 shows burn units and associated fuel breaks. Maintenance activities will be required to keep fuel breaks clear of fine fuel loading and to remove "ladder fuels." In habitat areas, CSSA will utilize shaded fuel breaks (SFB) to discourage herbaceous vegetation in the understory, as well as removing shrubby vegetation and low hanging limbs along the woodland edges. This method is in use on the Balcones Canyon Lands National Wildlife Reserve in GCWA habitat areas, and is generally viewed as compatible with GCWA occupancy; however, some adverse effects may arise from construction of SFBs. These adverse effects include altering microclimate conditions (decrease in relative humidity, increase in temperature, decrease of foraging base) and facilitating predator encroachment into habitat areas (Sexton 2006, personal communication). CSSA will use the most current USFWS design criteria for SFB construction. Beneficial effects of SFB and prescribed burn operations include the protection of GCWA habitat from canopy fires. Based on the burn units shown on Figure 4.1, SFB construction in habitat areas would correspond to approximately 10,000 linear feet of fuelbreak, which would amount to approximately 7 acres of habitat impact (assuming an average width of the SFB of 30 feet). Construction of the SFB and other

fuelbreaks are anticipated to span a three year period.

Facility construction at CSSA is primarily limited to the inner cantonment; however, CSSA is planning the construction of a warehouse facility in the North Pasture adjacent to a single GCWA territory. Adverse effects are not anticipated from construction activities, as CSSA is scheduling construction outside of the nesting season and the project is located outside designated habitat area. CSSA anticipates completion of the project before the GCWA nesting season, however, since project planning is ongoing as of the date of this text, the potential take of this territory is considered in the estimation of potential temporary adverse effects (see below). Facility construction is not anticipated to occur in BCVI habitat areas; therefore, this activity type is expected to not affect BCVI at CSSA.

Other maintenance and operations activities anticipated over the next ten years include limited brush clearing, with a primary focus on Ashe juniper. The brush management activities at CSSA are conducted to reduce fuel loading in grassland areas, maintain existing fuel breaks, and maintain fencelines. Subsection 4.2.1 provides a detailed description of brush management activities at CSSA. Brush management at CSSA typically involves the removal of shrubby Ashe juniper that are not of intrinsic value to GCWA; therefore, this removal should not adversely affect GCWA. Periodic brush removal may affect BCVI areas by removing shrubby oaks, sumac, and other shrub species from fencelines and woodland edges, which may be utilized by BCVI.

- ***Range Management -***
  CSSA maintains an active live-fire range in its East Pasture. Primary range activity impacts are associated with fire and noise. In addition, there is a very slight possibility of a GCWA or BCVI to be struck by a live round. Most live fire activities are confined either to an indoor practice range or an outdoor range with a protective earthen berm. In the very unlikely event that a live round shoots over the berm and causes a fire, six GCWA territories and one BCVI territory fall within the trajectory safety cone. Should an event such as this occur, CSSA anticipates the loss of one GCWA territory over the next 10 years, with the increased potential of creating BCVI habitat. Fires from the range in CSSA's recent past apparently has created suitable BCVI habitat. The only detection during 2005 surveys of BCVI occurred in the East Pasture adjacent to the range area. Pulse noise events (associated with explosives and small arms fire) are not generally viewed as an adverse impact to BCVI or GCWA (Tazik et al. 1992).

- ***Natural Resource Management -***
  Activities associated with the natural resource program are described in detail in Sections 3 through 9 of this document, and are generally designed to benefit listed species. The prescribed burn program (Section 4.2.1.2 and Section 6.2.2) involves cool and warm season burns, which may harass GCWA and BCVI in adjacent habitat through smoke inundation, displacing predators into occupied habitat areas, and directly removing woody species important for species. Temporary adverse effects of prescribed burn operations are estimated by considering the timing of burn operations relative to habitat locations. CSSA estimates five summer burns to potentially adversely affect BCVI and

GCWA, primarily through smoke disturbance. The prescribed burn program will benefit BCVI by maintaining and creating shrubby dense vegetation on a multi-year rotational burn regime, as described in Section 6.2.2. Recreational activities (Section 7.2.3) will benefit GCWA by encouraging hardwood regeneration by managing deer populations.

2.11.2 Estimation of Potential Take

Based on the activities occurring at CSSA and anticipated to occur over the next ten years, CSSA anticipates the following amount of potential incidental take from operations and maintenance, range management, and natural resource management activities:

- Potential take of GCWA habitat is anticipated to occur over the next ten years in the amount of 8 acres subject to permanent removal, at an average rate of 0.8 acres per year. Temporary adverse effects to GCWA are anticipated to occur over the next ten years for 30 acres of habitat, at an average rate of 3 acres per year.
- Potential take of BCVI habitat is anticipated to occur over the next ten years in the amount of 4 acres subject to permanent removal, at an average rate of 0.4 acres per year. Temporary adverse effects to BCVI are anticipated to occur over the next ten years for 10 acres of habitat, at an average rate of 1 acre per year.
- Potential take of the number of GCWA that may be found within 3.8 acres of habitat per year in the form of harm, harassment, disturbance, or mortality as a result of CSSA activities.
- Potential take of the number of BCVI that may be found within 1.4 acres of habitat per year in the form of harm, harassment, disturbance, or mortality as a result of CSSA activities.

These estimates are based on similar estimates of incidental take on other DoD installations for similar activities, and CSSA understands that these values may be adjusted in the future if necessary.

2.11.3 CSSA Training Restrictions

As part of the INRMP implementation, CSSA will adhere to certain activity restrictions, outlined in Table 2.3, in order to minimize and avoid adverse effects to listed species. The INRMP projects, described in Sections 3 through 8, were designed to have the smallest footprint possible on the military mission at CSSA. Indeed, many projects in the INRMP serve the military mission goals and provide ancillary ecological, and in some cases, recreational benefits. Restrictions on activities at CSSA are associated with endangered species habitat. Activity restrictions are adapted from current natural resource planning policies at Camp Bullis (Camp Bullis ESMP 2005).

2005 surveys (INRMP Appendix B) mapped "core" and "non-core" habitat for the warbler and vireos. Core habitat is defined by a 200-meter buffer surrounding a detection of BCVI or GCWA. Core habitat designations are updated after avian surveys (occurring every two years), and are valid for three years. Non-core habitat is determined by the presence of primary habitat elements, which include vegetation species composition and structure within vegetation communities, as well as abiotic factors, such as slope and aspect of slope.