4.8 BIOLOGICAL RESOURCES

This section assesses the impacts of the alternatives on biological resources, which include vegetation, Waters of the U.S., wildlife, and sensitive species. This assessment includes impacts of military training and testing activities, and nonmilitary activities conducted by the Army or other users of McGregor Range. For purposes of analysis in this LEIS, it is assumed that the broadest possible Army activities and natural resource management practices would be implemented.

The impacts of nonmilitary activities are considered separately from impacts of military activities. Military activities that would affect biological resources include off-road vehicle maneuvers, weapons use, training area maintenance including road construction and maintenance, construction activities, and aircraft overflights. The resulting types of impacts would include vegetation and wildlife habitat loss and disturbance from off-road vehicle maneuvers, the use of controlled access FTX sites, road construction and maintenance, construction, and from weapons impacts; fire from ordnance and vehicles; and noise from vehicles, ordnance, and aircraft. Nonmilitary activities that would affect biological resources include livestock grazing, wildfires, and recreation. However, since no increase in grazing is anticipated for Alternatives 1, 2, 3, 4, and 6, the impacts of grazing for these alternatives are addressed under *Cumulative Impacts* (Section 4.8.7).

4.8.1 Alternative 1

As described in Section 2.1.1, military activities could vary from the same as currently conducted, to an expanded range of capabilities and intensified use. Implementation of Alternative 1 would affect biological resources on McGregor Range within the currently defined boundaries. The impacts to biological resources are described relative to the activities that occur on withdrawn and Army fee-owned land to the degree possible under each withdrawal configuration alternative. Impacts from the McGregor Range boundary changes under each alternative are relative to the type of military or nonmilitary activity conducted on the land. As indicated above, military activities could result in impacts to biological resources from land disturbance, noise, and fire. Wildfires can start when hot missile parts and incoming rounds land on the ground and from ground vehicles used during training. Numerous fires from military and natural sources occur on McGregor Range each year but data on the number, location, date, cause, and number of acres burned are incomplete. Uncontrolled wildfires have the greatest potential to have negative impacts on biological resources. The degree of these impacts would depend on the level of use for current military training and any future proposal to use additional installation capabilities. As stated above, it is assumed that the broadest possible Army activities would take place.

The USAF proposes to expand the GAF operations to include a new air-to-ground target complex. Two of the three alternative sites that were considered for the tactical target complex are on McGregor Range. The construction and operation of a tactical target complex at the selected site on Otero Mesa on McGregor Range has the potential to impact biological resources. The impacts of the USAF tactical target complex have been evaluated in a separate EIS (USAF, 1998) and the effects of implementation on biological resources are presented in the ROD (Appendix A).

The impacts of military activities are analyzed in Section 4.8.1.1, and potential nonmilitary impacts are assessed in Section 4.8.1.2

4.8.1.1 Effects of Military Activities

Vegetation. Vegetation would be affected by military activities on McGregor Range; these activities would result in ground disturbance and/or fire.

Ground Disturbance. Road maintenance activities and users of the roads have the potential to affect vegetation along roads by (1) widening existing roads during maintenance or from repeated driving on the road edge; (2) creating new sections of road next to sections that are no longer passable; (3) improperly grading roads so they become deeper and are more susceptible to water erosion; and (4) creating gullies along roads. At present, there are an estimated 2,673 acres of land covered with roads on McGregor Range. The amount of vegetation affected along roads by these actions depends on the specific project undertaken.

Off-road vehicle maneuvers would continue to occur only on TA 8 in the southwest corner of McGregor Range (Figure 2.1-1). Potential for off-road vehicle use could range from the current low use to high use in TA 8 (Table 2.1-3), if the installation's heavy division training capability were utilized. These high use levels are expected to be similar to those experienced during 1990 when the 3rd ACR was stationed at Fort Bliss. Research in various vegetation types has shown that off-road vehicles can significantly alter the plant communities by reducing above and below ground plant biomass; altering soil infiltration rates, bulk density, and erosion rates; reducing soil fertility; and increasing root exposure (Barton et al., 1966; Marston, 1986; Wilshire, 1977). More specific research and monitoring in Chihuahuan Desert and mesquite coppice dune vegetation of McGregor Range is available to estimate impacts as described below.

TA 8 is about 32,400 acres and the mesquite coppice dunes plant community is the dominant type (83 percent of total). Disturbed ground covers the next largest area (13 percent), and the remaining land is covered with minor plant community types (Figure 3.8-1). Land Condition-trend Analysis (LCTA) for 1991 through 1993 showed that mesquite coppice dunes used for training had the lowest plant canopy coverage of all plant communities on McGregor Range. Mesquite dunes not used for training (West Buffer Zone) had plant canopy coverage similar to areas used for military training. Mesquite coppice dune plant communities used for off-road training had approximately 60 to 70 percent bare ground, compared to about 50 percent bare ground in mesquite coppice dunes not used for training (O'Regan et al., 1995). In a study of the impacts of tracked vehicles in the creosotebush plant community type in the Chihuahuan Desert on McGregor Range, percent cover of shrubs and perennial grasses was reduced while annual grasses and herbs increased in areas used for tracked vehicle maneuvers (U.S. Army, 1996q). Therefore, it appears that vehicle maneuvers can alter plant communities by changing plant composition from perennial to annual species and reducing litter, but may not necessarily change overall plant cover. Therefore, increased vehicle maneuvers over current conditions under Alternative 1 would likely result in additional loss of perennial vegetation, an increase in annual vegetation, and a loss of litter. This would result in significantly adverse impacts to vegetation in the creosote type and negligible impacts in the mesquite coppice dune type.

The use of eighteen 262-acre and six 20-acre controlled access FTX sites would continue (See Figure 2.1-4). Fifteen large sites (3,930 acres) occur on Otero Mesa; three large sites (786 acres) and six small sites (120 acres) occur in the Tularosa Basin for a total of 4,836 acres. The sites on Otero Mesa occur primarily in grassland plant communities while sites in the Tularosa Basin are primarily in the mesquite coppice dune and creosote bush plant communities. Land is not cleared when vehicles take up their positions at these sites. These 24 FTX sites are used only once a year during Roving Sands. Each site is not used every year and the land used within each site varies from year to year. These operating procedures give the vegetation a chance to recover.

Impacts to vegetation would occur on 13.5 square miles that would potentially be used to establish additional controlled access FTX sites. Some of these sites could be located in the grassland plant communities on Otero Mesa with the remainder immediately east of U.S. Highway 54 in the Chihuahuan Desert shrubland plant communities in the Tularosa Basin. These sites could be used more than once a

year and, therefore, have the potential for greater impacts to vegetation than under current conditions at the FTX sites.

Potential construction projects could include a helicopter training complex, development of a 32-building MOUT Complex, a rail spur from U. S. Highway 54 to McGregor Range Camp, an ASP Phase III, and a geothermal program. The number of acres required for these facilities is not available, and any future proposal to construct the project will be subject to NEPA evaluations. These potential construction projects would likely occur in the shrubland plant communities in the Tularosa Basin and have an adverse effect on vegetation.

An estimated 1,000 to 5,120 acres of vegetation would be disturbed during construction, operation, and maintenance of the proposed USAF tactical target complex on McGregor Range. Construction of this complex on Otero Mesa would disturb grassland plant communities (USAF, 1998).

Continued missile training and testing and use of weapons (e. g., missiles and inert bombs) would disturb vegetation in impact areas on McGregor Range. The impacts of falling missile debris and inert weapons strikes are negligible because much of the debris has little or no impact when it strikes the ground and the remaining debris and inert ordnance affect only small areas. Weapons impact areas are in the Chihuahuan Desert shrublands plant communities in the Tularosa Basin, in TA 32 (McGregor launch complex and Meyer small arms range); TAs 39, 30, and 31 (SHORAD, and Orogrande missile ranges); and TA 11 (20-acre Class C Bombing Range) (Figure 2.0-1). In addition, there could be weapons firing from a new helicopter training complex. There could also be an increased use of Otero Mesa (TAs 15 through 23) with much of this increase due to the use of the airspace over Otero Mesa as a weapons firing SDZ. This would indicate a potential for an increase in the number of fires on Otero Mesa.

Fire. Fire is a significant ecological element on southwestern rangelands, and is a natural component of the climax ecosystem. Studies in west Texas have shown the absence of fire in tobosa and juniper communities severely limits forage production. On McGregor Range wildfires have had the following effects: reduction in litter; improved vigor of grass species; increase in cattle utilization; reduction (to some extent) of shrubs such as cholla, soaptree yucca, creosotebrush and broom snakeweed; greater productivity on burned sites (at the time of the BLM 1979 survey); and less cover (more bare soil) on burned sites. Except for the effects of burning, and the very localized consequences of missile impacts, adverse impacts from military uses of the range are not apparent (BLM, 1980).

A total of 38 fires were recorded on Fort Bliss from 1982 to 1995. Thirty-one were from natural causes and eight were man-made fires. Wildfires as well as fires caused by military activities have the potential to have the greatest impacts on vegetation on McGregor Range. Fires resulting from off-road vehicle maneuvers and weapons strikes could occur in training areas where these activities are authorized. Hot missile parts are also a source of fire on McGregor Range. Fires have occurred principally in the Chihuahuan Desert shrublands and grasslands plant communities in the Tularosa Basin and grasslands on Otero Mesa on McGregor Range. Fires from hot missile parts have the potential to occur anywhere within the missile SDZs on McGregor Range (Figure 2.1-2). However, most fires have occurred in TAs 25 through 32, and 17, 21, and 23 (Figure 2.7-2).

Although the impacts of fires on the major plant community grouping (desert grassland, desert shrublands, and pinyon pine/juniper woods) on McGregor Range have not been studied in detail, there are published studies regarding the effects of fire on these plant community types and plant species that form these communities.

Fire is generally thought to have a major role in maintaining grasslands and reducing the spread of shrubs in the western U.S. (Valentine, 1971). Short-grass prairies dominated by blue grama are an example of

grasslands that are thought to have co-evolved with fire. However, fire may not play as large a maintenance role on desert grasslands. Each grassland type has a typical fire regime that characterizes the frequency, seasonality, intensity, severity, extent, and effects of fire on the community (Wright and Bailey, 1982). Altering the fire regime can change the species composition of a vegetation community. Short-term impacts of fire generally include reduced plant cover, removal of litter, and increased soil erosion. However, grasslands can recover within one to several years if other factors (e.g., sufficient rainfall, limited grazing, no repeated burning) are favorable (Wright and Bailey, 1982; Martin, 1983). If other factors are unfavorable, such as a burn occurring during a drought or burns occurring in consecutive years, then grass recovery may be delayed or the grass-dominated community may be replaced by more fire-resistant shrubs and herbaceous annual species.

The impacts of fire on grassland communities on McGregor Range may be positive or negative, depending on the specific conditions at the time of the burn. The grasslands on Otero Mesa are dominated by blue grama and black grama (U.S. Army, 1996e). Grass cover is substantially reduced during the first year after a fire but will recover from fires in 2 to 4 years (Finberg, 1994; Bock and Bock, 1992; Martin, 1983). Blue grama is fire tolerant but can be damaged by fire under certain conditions (e.g., drought, heavy grazing immediately after the burn). Some studies have shown that blue grama is slow to recover from fire (Ahlstrand, 1982; Dix, 1960; Finberg, 1994); however, small prescribed burns in Arizona did not appear to have a long-term affect on blue grama (Bock and Bock, 1992), and in New Mexico, blue grama recovered quickly from fire (Dwyer and Pieper, 1967). In general, blue grama recovers within 1 to 4 years after a burn. Black grama is less fire-tolerant than blue grama. Black grama can be slow to recover from fire, especially if the area is grazed (Martin, 1983; Reynolds and Bohning, 1956; Wright, 1974). Cable (1967, 1972) reported that black grama has a poorer response to fire than desert shrubs. Cornelius (1988) suggested that fire was not an important factor in the maintenance of black grama desert grasslands and could be a factor in reducing grass composition and increasing shrub composition in this vegetation type. Buffington and Herbel (1965) reported that fire frequency in southern New Mexico was historically very low, supporting the hypothesis that fire may not have been a major factor in maintaining desert grasslands in New Mexico. However, other studies in Texas, New Mexico, and Arizona suggest that black grama can recover within 2 to 3 years after a burn. Also, Martin (1983) found that grass production on desert grasslands would generally return to pre-burn levels in 2 to 3 years.

Yucca and cacti are another vegetation component important to the grasslands on McGregor Range that may be affected by fire. Banana and Torrey's yucca are common species in the grasslands plant communities and serve as nesting structure for some bird species. Five years after a fire on the Doña Ana Range–North Training Areas, Torrey's and banana yucca mortality were 61 percent and 30 percent respectively; although, some of these "dead" plants produced root sprouts (U.S. Army, 1994d). Cholla (*Opuntia imbricata)* is a common woody plant species in the Otero Mesa grasslands (U.S. Army, 1997l) and fire kills or injures most plants less then 1.5 feet tall; mortality of tall cholla was minimal (up to 27 percent) (Bunting et al., 1980; Dwyer and Pieper, 1967).

Based on past observations and research, if the grassland vegetation community has time to recover between burns and the burns do not occur during droughts and grazing is controlled, then the grassland vegetation should recover within several years. However, if areas are burned during drought; burned on consecutive years; or grazing is not controlled, then grasses may be reduced and shrubs and herbaceous plants may dominate the area. The size of the yuccas would likely be reduced after burns and this species is slow to recover regardless of the frequency of fires. The BLM and Army's ability to minimize the size and frequency of fires (as demonstrated by the limited number and size of fires on McGregor Range) would likely result in the grasslands being maintained on Otero Mesa.

Desert shrub communities on McGregor Range generally are dominated by creosote bush, tarbush, and mesquite with grasses interspersed. In addition, cacti are an important component of these vegetation communities. The effects of fire on vegetation in creosotebush, tarbush, and bush muhly plant communities in the Tularosa Basin on McGregor Range were studied immediately after and 1 year after a burn (U.S. Army, 1996f). It was found that shrub cover was reduced immediately from 23 to 13 percent and remained reduced 1 year after the burn. Grass cover was reduced from about 36 percent to 6 percent immediately after the burn, but increased to about 10 percent 1 year after the burn. Forb canopy coverage increased substantially from pre-burn conditions 1 year after the burn. After a fire in Arizona, 37 percent of the creosote bush sprouted and in California, only 3 percent sprouted (Brown and Minnich, 1986; McLaughlin and Bowers, 1982). Honey mesquite is a common shrub on McGregor Range and plants less than 1.5 years old were easily killed by fire; 2.5-year old plants were severely damaged; and plants over 3.5 years old are very fire tolerant (Wright et al., 1976). Various studies have shown that the closely related velvet mesquite (*Prosopis velutina)* is also very fire tolerant (Bock and Bock, 1978; Cable, 1967; Martin, 1983). Common sotol and lechugilla are common in the desert shrublands of the Hueco Mountains on McGregor Range. A fire in the foothills of the Organ Mountains resulted in 36 percent mortality for sotol (U.S. Army, 1994d), while a 75 percent reduction in cover from a fire was noted for this species elsewhere in New Mexico (Ahlstrand, 1982). This species sprouted from the terminal buds in lightly and moderately burned areas and regained most of its cover after 3 years (Ahlstrand, 1982). Lechugilla did not respond well to a fire that reduced its cover by 81 percent; there was little sign of recovery after 7 years (Ahlstrand, 1982). The effects of fire on prickly pear cactus varies with species; with Englemann prickly pear (*Opuntia engelmannii)* being fairly fire resistant (Bunting et al., 1980; Cable, 1967; Reynolds and Bohning, 1956) and brown-spined prickly pear (*O. phaeacantha)* suffering 70 percent mortality from fire (Bunting et al., 1980). Fire-related mortality to other species of cactus is generally high; barrel cactus (*Ferocactus wislzenii)* suffered 59 to 67 percent mortality (McLaughlin and Bowers, 1982; Reynolds and Bohning, 1956; U.S. Army, 1994d); pincushion cactus (*Mannillaria sp.*) mortality was 74 and 96 percent (Bunting et al., 1980; McLaughlin and Bowers, 1982); hedgehog cactus (*Echinocerceus sp*.) mortality was 88 to 94 percent (Bunting et al., 1980; McLaughlin and Bowers, 1982); and bee hive cactus (*Coryphantha vivipara*) mortality was 100 percent (Bunting et al., 1980).

Based on past observations and research, fire on desert shrub communities would reduce shrub cover in the short-term, and would result in long-term reduction in plant cover in creosote bush and tarbush-dominated communities. In addition, cacti diversity likely would be reduced. Therefore, the potential effects of fire and the increased risk of fire would be adverse to desert shrub communities.

Pinyon pine/juniper woodlands occur on McGregor Range (U.S. Army, 1996e) primarily at the northern edge near the Sacramento Mountains. A fire burned through sections of this community type in the Organ Mountains in 1994. Two years after the fire, the average percent cover and total number of plant species was greater in the burned site (86 percent cover and 35 species) than the unburned site (49 percent cover and 29 species) (U.S. Army, 1997b). Data regarding tree mortality from this fire are not available. All juniper less than 4 feet tall were killed during a grass fire in New Mexico. Overall, 13.5 percent of the pinyon pines and 24 percent of the junipers were killed (Dwyer and Pieper, 1967). Elsewhere in New Mexico, redberry juniper (*Juniperus pinchotii)* coverage was less on burned sites than unburned and it was estimated that it would take damaged trees 25 to 50 years to attain preburn heights (Ahlstrand, 1982). Other woody species such as mountain mahogany and scrub oak (*Quercus sp.*) are fire resistant and reproduce through sprouts after a fire (Ahlstrand, 1982). As indicated above, fire often results in an increase in herbacious cover. Overall, fire in the pinyon pine-juniper plant community may result in a decrease in conifer cover, an increase in herbacious cover and the continued existence of other shrub species such as Mountain Mahogany. Therefore, fire would have a negligible impact on this plant community type and may have a positive effect on a more open pinyon pine-juniper woodlands.

Wetlands and Arroyo-riparian Drainages. Wetlands are protected on McGregor Range; however, off-road vehicle maneuvers (in TA 8 only), weapons training, and facility construction may affect arroyo-riparian drainages. There is a potential that fires could impact wetlands and arroyo-riparian drainages under this alternative; this potential would increase over current risk because of the possible increase in weapons training. If wetlands and arroyo-riparian drainages have the potential to be affected because of an increase in weapons training, the U.S. Army would initiate the 404 Permit process when appropriate.

Ground Disturbance. Vehicle maneuvers could impact wetlands and arroyo-riparian drainages in TA 8; this impact could be greater compared to current conditions because of the potential increase in off-road vehicle maneuvers if the installation's training capability were utilized at the 1990 levels. However, wetlands are not currently being disturbed in TA 8 and would not be disturbed if off-road vehicle maneuvers were to increase.

Impacts to wetlands and Waters of the U.S. may occur from the operation of the additional controlled access FTX sites. However, the siting of these facilities would be sufficiently flexible to avoid wetlands and arroyo-riparian drainages. If the controlled access sites FTX sites do affect Waters of the U.S., a 404 Permit may be required from the USACE. Therefore, depending on the sites selected within Alternative 1 boundaries, the potential effects on probable Waters of the U.S. are currently undetermined.

Weapons training and testing would result in widely scattered but locally concentrated ground disturbance having only negligible effects on probable Waters of the U.S. under current conditions. Expanded military operations such as a new helicopter gunnery range would increase the number of weapons strikes that impact Waters of the U.S. in the Chihuahuan Desert shrublands. However, as under current conditions, these impacts would be negligible because they would be widely scattered but locally concentrated. The importance of desert washes to the maintenance of biodiversity has been documented (Section 3.8) and every attempt would be made to eliminate or minimize construction activities in these washes.

Construction in the McGregor Range Camp and other built-up areas would not affect probable Waters of the U.S. However, construction activities on the training areas, such as an initiative to construct a rail spur from near U.S. Highway 54 to McGregor Range Camp and other possible construction projects as listed under vegetation, have the potential to affect probable Waters of the U.S. If Waters of the U.S. were impacted, a 404 Permit might be required.

Construction of the USAF tactical target complex on McGregor Range would not impact wetlands because no jurisdictional wetlands occur in the selected site. Up to 8.7 miles of probable Waters of the U.S. could be affected at the selected site on Otero Mesa. Proposed road and bombing array construction drawings are not yet available so the number of acres of Waters of the U.S. that may be impacted is not known.

Fire. Fires have historically burned through areas considered Waters of the U.S. (mostly arroyo-riparian drainages and swales) on McGregor Range, in the desert grassland and shrubland plant communities on Otero Mesa, and in the Tularosa Basin. As indicated in Appendix D, skeleton goldeneye and little and large leaf sumacs are common shrubs in the foothill drainages (Cockman, 1996). Skeleton goldeneye density was higher on burned than unburned sites and it reproduces through root and crown sprouts (Ahlstrand, 1982). The dominant shrub species in the submesa drainages are desert willow, little and big leaf sumac, honey mesquite, creosotebush, skeleton goldeneye, and tarbush (Cockman, 1996). Based on the information presented in the vegetation section, many of these species, except possibly, creosotebush, would be expected to recover from a fire but would take several years to attain prefire height and density. Yucca and cholla are common woody plants in the swales in the grassland plant communities on Otero

Mesa. A large percent of these plants have the potential to be damaged or killed by fire. Some may recover via root sprouts but would likely take many years to attain prefire height.

Fire may burn through wetlands such as those dominated by mesquite, little leaf sumac, and willow *(Salix sp.)* that grow around some of the stock tanks in the Tularosa Basin of McGregor Range. As indicated in the vegetation section, mature mesquite plants are fire tolerant, so many of these plants would recover after a fire. However, it would likely take a few years for these plants to attain their preburn height; velvet mesquite attained 48 percent of its prefire height 4 years after being burned in Arizona (Bock and Bock, 1992). Large leafed sumac (*Rhus trilobata)* sprouts vigorously after fires (Dwyer and Pieper, 1967) so it is assumed that little leafed sumac will also sprout after a fire. However, it will probably take many years for damaged sumac to attain their preburn height and density. It is expected that the grasses, sedges, and other herbaceous plants in these wetlands would recover relatively rapidly after a fire. For example, giant sacaton (*Sporobolus wrightii)*, which forms tall dense stands at stock tanks and in dry washes, attained preburn percent cover and 54 percent of preburn height 2 years after a burn (Bock and Bock, 1978).

Based on the above discussion, fires initiated from ordnance and missile debris would potentially result in short-term adverse effects on wetlands and arroyo-riparian drainages (probable Waters of the U.S.) In addition, if weapons-caused fires are substantially more frequent and wide-spread than have occurred in the past, then there is a potential for long-term adverse impacts on probable Waters of the U.S.

Fires from the tactical target complex would have the potential to spread to wetlands in the vicinity. The nearest wetland to either site is at Mack Tanks, (see Figure D.3-3 in Appendix D), which are about 2.5 miles from the lower site. A fire break could surround the tactical target complex and fire suppression measures would greatly minimize the potential for fires from a tactical target complex site reaching this or any other wetlands. It is therefore assumed that there will be no adverse impact on wetlands due to construction and operation of a tactical target complex.

Fires on and near the tactical target complex would impact desert washes that are not directly impacted by construction and operation. The USAF, in coordination with Fort Bliss, will complete consultations with the USACE to ensure that adverse impacts to Waters of the U.S. will be minimized.

Wildlife. Impacts to wildlife from military training and testing would be due to vehicle maneuvers, weapons training and testing, construction, and the resulting potential for noise and fire. Impacts to wildlife due to construction and demolition activities within the McGregor Range Camp and other built-up areas would be negligible, since wildlife resources are limited in these areas.

Ground Disturbance. Off-road vehicle maneuvers in TA 8 would continue to affect wildlife in the mesquite coppice dune plant communities by disturbance of habitat, and potentially crushing mammal burrows and disturbance of nesting birds (see Section 3.8.3 and Appendix D for a description of wildlife species found in the mesquite coppice dune plant communities). If in the future, a type of training similar to that in 1990 were added, there could be a potential for significant adverse impact on wildlife because of increased off-road maneuvers resulting in potential increased loss of habitat.

The use of the existing 24 controlled access FTX sites would result in the temporary disturbance of wildlife for a 2-week period each year during Roving Sands. Some wildlife use of the FTX sites would be precluded because of the presence of equipment and humans. Additionally, wildlife adjacent to the sites may be impacted by human activity. The impacts to wildlife would be negligible due to the small size of the area used and short duration of this activity. The establishment of additional controlled access FTX sites on 13.5 square miles of McGregor Range would result in additional localized impacts to wildlife. The impacts to wildlife at these sites could be more long-term because the new FTX sites could

be used more frequently during the year than the existing sites. However, it is expected that impacts to wildlife at the additional FTX sites also would be negligible.

Weapons use would result in increased habitat disturbance if military activities increase over current conditions. A potential helicopter training facility in the Tularosa Basin would be one of the principal areas where increased impacts could occur. This facility would cover an area approximately 13 by 14 miles in the mesquite coppice dune and creosotebush plant community types in southern McGregor Range. Wildlife species in these types is discussed in Section 3.8.3 and Appendix D.

Wildlife habitat disturbance could occur from construction of a helicopter training complex; development of a 32-building MOUT Training Complex; a rail spur from U.S. Highway 54 to the McGregor Range Camp; ASP Phase III; and a geothermal project could potentially occur. The number of acres of land that would be disturbed by these facilities is not known; all of these additional construction projects would affect wildlife in the Chihuahuan Desert shrublands plant communities in the Tularosa Basin. This would result in potential burial, stress, and displacement of reptiles, amphibians, birds, and mammals that occur in the desert shrubland habitat in the Tularosa Basin. See Section 3.8.3 and Appendix D for discussions of the species of wildlife known to occur in these plant community types on McGregor Range. This loss of habitat, direct mortality, stress, and displacement of animals from these construction sites would result in adverse impacts to wildlife.

The estimated loss of 1,000 to 5,120 acres of natural plant communities at the USAF target complex would have an impact on wildlife from clearing of land and human disturbance. Arroyo-riparian drainages (Waters of the U.S.) are within the proposed tactical target complex site and these areas have been shown to be particularly important to wildlife (Section 3.8) such as reptiles, nesting birds, and neotropical migrant birds.

Fire. Fires have the greatest potential to adversely affect wildlife on McGregor Range. The effects of fire on invertebrates and vertebrates have been studied on Fort Bliss and elsewhere. Arthropods were sampled after controlled burns in the Chihuahuan Desert shrublands and comparisons immediately after and 1 year after the burn showed that there was no difference in the average number of arthropods at burned and unburned sites (U.S. Army, 1996f). Samples in burned and unburned locations in the Jemez Mountains, New Mexico, shortly after a fire showed a 46 to 69 percent decrease in the number of genera and 26 to 29 percent decrease in individuals. Light traps in burned areas showed a 75 percent decrease in arthropods shortly after a fire; 1 year later, the volume of arthropods captured in light traps was similar in burned and unburned areas (Pippin and Nichols, 1996). Limited data indicated that the number of harvester ant mounds was greater in burned than unburned areas (Fair and Henke, 1997). These results indicate that fire may have a short-term adverse impact on arthropod species richness and abundance.

The effects of fire on reptiles and amphibians has received little study (Scott, 1996). The box turtle can suffer heavy losses from fire; 25 dead box turtles were found after an August burn in Oklahoma (Bigham et al., 1965). Limited direct mortality from fire to snakes and lizards has been documented in other studies (Erwin and Stasiak, 1979; Simons, 1989). On McGregor Range, reptiles were sampled shortly after a fire on burned and control plots in the Chihuahuan Desert shrublands and it was observed that the common trans-Pecos whiptail lizard was equally abundant on burned and unburned plots. A reduction in the common side-blotched and western marbled whiptail lizards by 54 and 26 percent respectively was noted shortly after the fire. The abundance of these species was similar on burned and unburned plots 2 to 3 months after the fire. Overall, the average lizard species richness was similar in the burned and control plots shortly after the fire (U.S. Army, 1996f). These results indicate that fires may have severe effects on some species such as the box turtle, but have only short-term impacts on species groups such as lizards.

Fires on McGregor Range would have the greatest effect on birds in the Chihuahuan Desert shrublands and grassland plant communities because fires are most frequent in these types. Direct mortality to birds from fires would generally be limited to the destruction of nests with eggs or young birds. In Nebraska, one meadowlark and 38 ground nests of the ring-necked pheasant (*Phasianus colchicus)* were destroyed by fire (Erwin and Stasiak, 1979). Fire alters habitats, which can result in changes to the bird community. Fires in ungrazed grasslands in Arizona attracted species such as the mourning dove, lark sparrow, horned lark, chipping sparrow, and Say's phoebe. Species that avoided recently burned grasslands were Cassin's, grasshopper, and Botteri's sparrows, eastern meadowlark and Montezuma quail (Aid, 1990; Bock and Bock, 1992; Bock and Bock, 1990). Species that did not respond to fire were scaled quail, ash-throated flycatcher, western kingbird, northern mockingbird, canyon towhee, rufous-crowned sparrow, and brown-headed cowbird (Aid, 1990). Some species of birds of prey are attracted to recently burned areas because prey species are exposed by fire or prey species are abundant in new growth after a fire (Beck and Vogl, 1972; Lehman and Allendorf, 1987). Fire could have a direct effect on birds of prey if an active nest site were burned. Preliminary results of a study of the effects of wildfire on breeding birds in various habitats in the Organ Mountains showed that the number of birds in burned and unburned areas was similar. However, the average number of species per census plot for all habitats combined showed that there were over twice as many species detected in the unburned plots. This difference was pronounced in the desert shrubland/grassland habitats where eight species were detected in the unburned plots and two species on the burned plots. The difference between species richness in burned and unburned plots was much less in the arroyo/riparian, mixed conifer, mesic shrublands, and montane shrubland habitat types (U.S. Army, 1994d). Therefore, fires have the potential to result in a reduction in species richness as well as changes in species composition in Chihuahuan Desert shrublands and grassland plant communities.

Mammals have been categorized as having fire-positive or fire-negative responses. Negative response mammals include those that forage for invertebrates in the litter layer, live in dense vegetation, or nest above ground. Mammals that occur at Fort Bliss in this group are the hispid cottonrat, pinyon mouse, pocket mouse, antelope ground squirrel, white-throated woodrat, and western harvest mouse. Fire-positive species include those that use microhabitats with a relatively open herbaceous layer and/or nest under ground. Included in this group are the deer mouse, white-footed mouse, cottontail rabbits, and hispid cotton mouse (Ford and McPherson, 1996). Studies of the effects of fire on mammals have been few. In California, 28 woodrats (*Neotoma fuscipes)* and 9 desert cottontails were found dead after a chaparral fire. It was believed that most of the woodrats and rabbits living in the burned area perished in the fire (Chew et al., 1959). Two burns in Arizona resulted in the almost complete elimination of the white-throated woodrat and least cotton rat (*Sigmodon minimus)* while deer, white-footed, and grasshopper mice were unaffected (Bock and Bock, 1978). In Nebraska, an inspection of harvest mice nests yielded eight with dead young; and 72 of 92 nests where the fire had burned into the inner chamber. Species such as the deer, white-footed, and plains pocket mice were apparently unaffected (Erwin and Stasiak, 1979). An overall short-term increase in the number of small mammals residing in an area 1 year after a fire has been documented (Bock and Bock 1983; Tester, 1965). In general, predators such as the badger, bobcat, red fox, and coyote, as well as most ungulates, show increases in the use areas after a burn (Ford and McPherson, 1966).

Military activity-induced fires would have an adverse impact on wildlife. The installation's capability to support increased training activities could potentially be used. If this occurs, the number of military-related fires could substantially increase over current conditions due to (1) increased off-road vehicle training in TA 8, (2) increased weapons strikes at the 23- by 24-mile helicopter training facility, and (3) increased missile firing resulting in more hot missile parts landing on the ground.

Noise. Over most of McGregor Range, noise sources such as military jet aircraft are widely dispersed and relatively infrequent. Noise levels are higher at localized areas such as the 20-acre Class C Bombing Range in the northern part of McGregor Range, rocket launch sites, and built-up areas. However, noise

levels could increase over current conditions due to increased military activity on McGregor Range. Specifically, noise levels would be elevated at the potential 13- by 14-mile helicopter gunnery range and at missile firing locations. Wildlife has been reported to exhibit a wide range of responses to noise as discussed below. Based on the evaluation of studies on wildlife response to noise, it is anticipated that adverse impacts to wildlife may occur, particularly in the Chihuahuan Desert shrublands at the helicopter gunnery range.

Wildlife may be startled by noise associated with short-term events such as missile firings/strikes, weapons training, and aircraft overflights. Studies and incidental observations have been made on the response of animals to noise such as aircraft overflights. Reported animal responses vary among species, and the ability of species to adapt to overflights also varies. As an example, the potential consequences from noise are thought to be greatest on breeding animals (DOI, 1995).

Both physiological and behavioral animal responses to noise have been reported (Knight and Gutzwiller, 1995). Physiological effects may include temporary or permanent hearing threshold shifts, masking of auditory signals, increased respiration and heart rate, and increased corticosteroid levels. Reported hearing threshold shifts were related to noise sources that were of much greater duration (minutes and hours) than an aircraft overflight or missile firing, or weapons training. Behavioral responses may include animals becoming alert and turning toward the sound source, running from the sound source, changes in activity patterns (e.g., interrupted feeding), nest abandonment, or change in habitat use. It has been speculated that if the changes are sufficiently severe, the health and survival of an individual animal may be reduced. If a large number of animals are affected, then population declines potentially could result.

In general, literature suggests that the impacts of noise to wildlife populations such as those found on Fort Bliss appear to be short-term and affects individuals, but does not translate to long-term or population-level impacts. However, no conclusive studies have been conducted on the potential long-term impacts from noise exposure. Because of the lack of conclusive studies and inconsistent responses by wildlife reported in studies, potential impacts can only be predicted as variable with a probably low likelihood of population level impacts.

Many studies and surveys have been conducted regarding the impact of noise on birds. The studies and surveys indicate that noise has the potential to result in short-term adverse impacts on individual or small groups of birds (Lamp, 1989). The effects of loud noise on raptors have been studied. The studies indicate that raptors appear to have the ability to adapt to noise and human activities (Anderson et al., 1990).

Few studies have been conducted on the effects of noise on bats. Howell (1992) found that noise from unmanned aerial vehicles overlapped with lesser long-nosed bat's hearing at only one frequency (30 kilohertz [kHz]), and flights at operational cruising altitude (3,000 feet AGL) were inaudible. In another study conducted on the lesser long-nosed bat (Dalton and Dalton, 1993), the authors found no apparent short-term effects of low-altitude jet aircraft on bat maternity roosts; however, the authors stated that the extrapolation of their results to other areas may not be appropriate (Dalton and Dalton, 1993). Griffin et al., (1963) found echolocating Townsend's big-eared bats were able to resist jamming from a constant noise field by orienting to second harmonics. Jamming resistance and an ability to navigate and locate targets despite acoustical clutter and interference has been demonstrated for numerous other bat species (Simmons et al., 1974; McCarthy and Jens, 1983; Troest and Mohl, 1986; Schmidt and Joermann, 1987).

Studies on the effects of noise on wild small mammals have shown response by individual animals but the few studies on populations' attributes did not show changes from noise exposure. **Chesser et al., (1975**) documented increased adrenal and body weights as well as temporary threshold shifts in hearing. Long-

term exposure to noise has been shown to cause increased adrenal weights in mice, which generally corresponds to higher levels of stress. However, no adverse impacts on longevity, reproductive success, or health were detected or noted (Chesser et al., 1975). A study testing the effects of off-road vehicle impacts reported that vehicle noise caused a temporary shift in hearing sensitivity in desert kangaroo rats, with recovery of hearing thresholds taking at least 3 weeks (Brattstrom and Bondello, 1983).

Studies of big game exposed to noise events generally suggest that responses to overflights are usually temporary, and temporary changes would not be detrimental to populations (Lamp, 1989). However, Weisenberger et al., (1996) suggested that the interaction of noise with other environmental factors should be evaluated using free-ranging animals. Historic presence of big game on military installations demonstrates that big game can exist in areas with vehicle maneuvers and low-level military aircraft flights; however, it is unknown whether population levels would be greater if noise events from military events occurred at lower levels. As examples, mule deer and bighorn sheep populations continue to exist under airspace where low-level aircraft sorties have been flown for years at such training areas as Nellis Range, Nevada, and Goldwater Range, Arizona. In a study of the effects of helicopter noise and approach distance on pronghorn antelope, it was determined that helicopters at an altitude of 400 feet and a distance of 3,000 feet had little effect on antelope. As the helicopter moved closer, strong reactions to its presence were observed at an altitude of 150 feet and a distance of 500 feet (Luz and Smith, 1976).

Construction of a tactical target complex would result in an increase in the number of low-level aircraft sorties over portions of McGregor Range near the target complex. Wildlife under and near the flight paths would have a greater potential to be startled. The increased exposure to noise may result in lower wildlife population levels in some areas or reduced use of some areas. As an example, fewer birds may continue to nest along the Otero Mesa escarpment and other portions of McGregor Range because of the increased frequency of aircraft overflights.

Sensitive Species. Sensitive species that occur or have the potential to occur on McGregor Range are discussed in Section 3.8.4 and Appendix D. As with wildlife in general, activities that have the potential to impact sensitive species on McGregor Range are ground disturbance, fire, and noise.

Ground Disturbance. Off-road vehicle maneuvers would occur on TA 8, but there are no known sensitive species in this area so off-road maneuvers would not affect sensitive species.

The continued use of the Roving Sands controlled access FTX sites on the Otero Mesa could impact potential aplomado falcon and mountain plover habitat. Assuming that 15 of the 262-acre sites occur on Otero Mesa (Figure 3.1-1) and that 25 percent of each site is occupied during Roving Sands, then an estimated 982 acres of grassland habitat would be disturbed at these sites. Disturbance at these sites consists of vehicles driving and personnel walking over vegetation. In addition, these sites are used during Roving Sands which occurs for about 2 weeks during the spring and/or summer each year. The impacts from the use of these sites may be slightly detrimental to the potential aplomado falcon habitat. The disturbance and elimination of some of the vegetation at these sites may be beneficial for potential mountain plover habitat because this species prefers open short-grass habitat. The use of these sites during the spring and summer may be detrimental to both species due to the presence of humans and associated noise and activity during the nesting season. However, vegetation degradation and human activity at these sites would have negligible impacts on these two species because: (1) these areas have been part of the landscape for a number of years; (2) use of the sites is infrequent; (3) sites are not used every year; (4) there is a large amount of potential habitat elsewhere on McGregor Range; and (5) there is no known nesting activity of either species on McGregor Range. Therefore, the use of the 24 existing FTX sites would be unlikely to have any impact on sensitive species.

The establishment of additional controlled access FTX sites on 13.5 square miles of land also has the potential to impact sensitive species. The locations of these sites are not currently known, although many sites would occur on Otero Mesa (Figure 2.1-4). These new FTX sites could be used more frequently than the existing FTX sites and, therefore, have the potential to have a greater impact on sensitive species. As with other activities that potentially use McGregor Range, NEPA documentation will be prepared once specific locations have been determined and this documentation will include an assessment of potential impacts to sensitive species.

The direct disturbance from weapons strikes are localized in nature and would result in a small disturbance, and would likely have negligible or no impact on sensitive species.

Wildlife habitat could be disturbed from potential construction of a helicopter training complex, development of a 32-building MOUT training complex, a rail spur from U.S. Highway 54 to the McGregor Range Camp, and the McGregor ASP Phase III expansion. The number of acres of land that would be disturbed by these facilities is not known; all of these additional construction projects would have the potential to impact federal species of concern and state sensitive species such as the night blooming cereus, Texas horned lizard, loggerhead shrike, and burrowing owl. Federal and state listed species would likely not be affected. However, there is some flexibility in the placement of these facilities that would reduce or eliminate impacts to sensitive species. The Army would complete project specific NEPA documentation and consultation with USFWS, if required, under the Endangered Species Act to ensure that impacts are minimized to federally listed species.

Sensitive plant and wildlife species such as the night blooming cereus, grama grass cactus, mountain plover, burrowing owl, and prairie dog were not observed during biological surveys of the site for the USAF tactical target complex (USAF, 1997g, i). The loggerhead shrike was observed at or near the site (USAF, 1997b, c) and the Texas horned lizard is likely at the site. Construction and operation of a tactical target complex would result in the reduction of habitat for these two species.

The Otero Mesa tactical target complex site is in good to excellent aplomado falcon potential habitat. If this falcon reinhabits the general area, then they may be startled or otherwise affected by aircraft operations. This could result in an adverse impact to this species. However, there are currently no resident aplomado falcons on McGregor Range.

Fire. As with other biological resources, fires have the greatest potential to have an impact on sensitive species on McGregor Range. Potential impacts of military and naturally caused wildfires on sensitive species are summarized in Table 4.8-1. Based on available information, fire has the potential to have a negative impact on plant species such as night blooming cereus (not known to occur on McGregor Range) and grama grass cactus, less potential to impact species such as Sneed pincushion cactus (not known to occur on McGregor Range), which grows in rocky terrain, and Alamo beard tongue (not known to occur on McGregor Range), which grows on cliffs (Table 4.8-1). The 1994 fire in the Organ Mountains did not have negative impact on sensitive plant species that were in the burned area (U.S. Army, 1994d). Fire has the potential to be a positive force for such species as the Texas horned lizard, ferruginous hawk, mountain plover, and burrowing owl. Other species such as the bald eagle, loggerhead shrike, and bats would likely not be affected by fire (Table 4.8-1). The impacts from fire could increase due to the potential for an increase in military activity over current levels. If there is a large increase in the number of fires on Otero Mesa, negative impacts to potential aplomado falcon habitat could occur if a substantial reduction in potential perch and nest sites (e.g., loss of yucca) or a reduction in the prey base were to occur (because of reduced grass cover for several years). For example, meadowlarks were the principal prey item for aplomado falcons on occupied territories in Mexico (**Montoya et al., 1997**) and as shown in the *Wildlife* section, meadowlarks tend to avoid burned areas.

Table 4.8-1. Potential Effects of Fire on Sensitive Species and Sensitive Species Habitat on McGregor Range

Species	*Potential Fire Effects*	*References*
Sneed pincushion cactus (*Coryphantha sneedii var. sneedii*)	Not known from McGregor Range but has the potential to occur. Effects of fire on this species are unknown. The Organ Mountain pincushion cactus *(Corypantha organensis)* grows in similar habitat and has a growth form like the Sneed pincushion cactus. The Organ Mountain pincushion cactus survived the 1994 fire in the Organ Mountains. The average number of stems, plant size, and reproductive stems were similar in burned and unburned plots. Sneed pincushion occurs in rocky terrain with low fuel loads, which may reduce its susceptibility to fire, such as was observed for the Organ Mountain pincushion cactus.	Bunting et al., 1980; U.S. Army, 1980b
Alamo beard tongue (*Penstemon alamosensis*)	This species grows in rocky canyon bottoms and on cliffs, which would likely limit its susceptibility to fire damage or mortality.	U.S. Army, 1991a
Grama grass cactus (*Toumeya papyracantha*)	This species is fairly common in the grassland plant communities on Otero Mesa. Given its small size and habit of growing within clumps of grass, it would be very susceptible to being killed by fire. Its ability to recover from fire is unknown.	Corral, 1997
Night blooming cereus (*Peniocereus greggii*)	Not known to occur on McGregor Range but has the potential to occur. Would be susceptible to fire damage and/or mortality in its desert shrub habitat. Ability to recover from fire unknown.	
Hueco Mountain rock daisy (*Perityle huecoensis*)	This species grows in mesic slopes and vertical cliffs well protected from fire. Its ability to recover from fire is not known.	U.S. Army, 1991a
Texas horned lizard (*Phrynosoma cornutum*)	This species was more common in burned than unburned grazed and ungrazed habitat so fire may have a positive impact by opening up the habitat. Fires may have a negative impact on populations that hibernate < 1 inch below ground but other populations that hibernate deeper may not be affected.	Fair and Henke, 1997
Bald eagle (*Haliaeetus leucocephalus*)	Fire in the pinyon pine/juniper habitat used by this species in the winter could eliminate perch sites. However, given the open nature of this habitat, all perch trees would likely not be eliminated so fire would have little impact on wintering bald eagles on McGregor Range.	
American Peregrine falcon (*Falco peregrinus*)	This species occurs only as a sporadic migrant on McGregor Range so fires would not affect it.	U.S. Army, 1980a
Aplomado falcon (*Falco fermoralis septentrionalis*)	This species was associated with grassland habitats in the southwestern U.S. where fire was a common occurrence before fire suppression measures were implemented. Therefore, fire in potential aplomado habitat on McGregor Range would not be expected to reduce its suitability for this species. However, if military activities are expanded and the number of fires increased, fires could have a negative impact on potential aplomado falcon habitat if a reduction in potential roost and nest sites took place or if the prey base were reduced.	
Willow flycatcher (*Empidonax traillii extimus*)	The willow flycatcher is an occasional migrant on McGregor Range and fires would not affect this species.	

Table 4.8-1. Potential Effects of Fire on Sensitive Species and Sensitive Species Habitat on McGregor Range (Continued)

Species	*Potential Fire Effects*	*References*
Piping plover (*Charadrius melodus*)	The piping plover is a very rare migrant on McGregor Range and fire would not affect this species.	
Mexican spotted owl (*Strix occidentalis lucida*)	Although this species does not nest on Fort Bliss, limited potential marginal wintering habitat occurs in the Sacramento Mountains foothills on McGregor Range. Given the marginal nature of the habitat and the apparent infrequent use of this area, fire on McGregor Range is not expected to affect the Mexican spotted owl.	U.S. Army 1996k; U.S. Army, 1991b
Mountain plover (*Charadrius montanus*)	Although the mountain plover has not been observed on Fort Bliss, fire in potential grassland habitat on Otero Mesa may improve the habitat since this species prefers open areas such as those created by prairie dogs or by over grazing.	Knopf and Miller, 1994; Miller and Knopf, 1993; Sager, 1996
Black tern (*Chlidonias niger*)	The black tern is an occasional migrant on McGregor Range and fires are not expected to affect this species.	
Ferruginous hawk (*Buteo regalis*)	Fire may benefit migratory and wintering ferruginous hawks on Fort Bliss by making prey more accessible or resulting in greater prey density in areas of new plant growth.	Lehman and Allendorf, 1987
Burrowing owl (*Athene cunicularial*)	Direct mortality by fire has not been documented, although young caught outside their burrow during a fire could suffer mortality. Fires may benefit burrowing owls by increasing prey availability and reducing litter in its grassland habitat. This species has been reported to use burns 5 days after a fire.	Ford and McPherson, 1996; Howard, 1996; Lehman and Allendorf, 1987
Loggerhead shrike (*Lanius ludovicianus*)	This species is common and widespread on Fort Bliss, so localized sporadic fires would probably not have a negative impact on this species. Fires may benefit this species by making prey more accessible.	
Baird' s sparrow (*Ammodramus bairdii*)	Fires could have a negative impact on the thick grass cover used by this species during migration and the winter on McGregor Range.	
Varied bunting (*Passerina versicolor*)	The varied bunting is an occasional migrant on McGregor Range and fires on the range would not be expected to affect this species.	
Bell' s vireo (*Vireo bellii*)	Bell' s vireo is an occasional migrant on McGregor Range and fires would not affect this species.	
Gray vireo (*Vireo vicinior*)	This species is not known to nest on McGregor Range although potential breeding habitat occurs in the pinyon pine/juniper habitat in the Sacramento Mountains foothills. If this species were to breed in this habitat, a major fire in these areas could adversely affect the habitat of this species.	
Bats	Areas such as cracks and crevices in the Otero Mesa escarpment used by bats would not be impacted by fire. Bats that roost in the various plant communities could be negatively affected by fire. The susceptibility of bats to fire is unknown because little data are available regarding the distribution of bats on McGregor Range.	
Gray-footed chipmunk (*Tamias canipes*)	A fire in the wooded habitat used by this species in the Sacramento Mountains foothills on McGregor Range could have a negative impact due to alteration of its habitat.	
Black-tailed prairie dog (*Cynomys ludovicianus*)	Fire would likely not affect prairie dog towns due to low fuel loads. Fires may benefit this species by creating new plant growth for them to feed on.	

Noise. Noise levels would increase from increased weapons firings and the establishment of a helicopter gunnery range in the southern part of McGregor Range. These noise sources would occur principally in the Chihuahuan Desert shrublands in the Tularosa Basin. The Texas horned lizard, burrowing owl, and loggerhead shrike likely occur in this area. Noise levels that would occur at the gunnery range are not known but they do have the potential to affect the Texas horned lizard. A-weighted noise levels of 95 to 114 dB can result in short-term (1 day) and long-term (greater than 7 days) effects on reptile hearing (DuFour, 1980). The burrowing owl is well known to reside in noisy areas near airports, and currently resides at the radar tracking sites at the McGregor Range (U.S. Army, 1997c) where noise from rocket launching and helicopter flights are common. If burrowing owls reside in the area that would be used for the gunnery range, they may be able to adapt to the noise levels. Noise levels at the gunnery range could preclude the use of part of the gunnery range by the loggerhead shrike. Therefore, the potential increase in noise levels at a helicopter gunnery range could have an adverse impact on the Texas horned lizard and loggerhead shrike, and negligible impact on the burrowing owl.

As indicated in Section 3.8.4, the Mexican spotted owl is a rare winter visitor in the Sacramento Mountains foothills. This species does not nest in this area and there is no potential nesting habitat. Therefore, the occasional low-level helicopter flights in the Sacramento Mountains foothills would not or would only have a negligible affect on the Mexican spotted owl on the rare occasions this species is in the area.

4.8.1.2 Effects of Nonmilitary Activities

Nonmilitary activities that have the potential to impact biological resources include hunting, other recreation activities, wildfires, and grazing. Hunting and other recreational activities such as hiking have the potential to disturb a limited amount of vegetation and startle wildlife. Overall, these impacts would be negligible. Mineral extraction could result in the destruction of vegetation and wildlife habitat, including sensitive species habitat. It could also result in the disturbance of wildlife adjacent to the land being disturbed. The magnitude of these impacts can not be determined until specific mineral extraction proposals are available. The BLM and the USFS would be responsible for ensuring that all environmental compliance actions are taken. Wildfires and grazing have the greatest potential to have negative impacts on biological resources. The potential impacts of fire on wildlife resources are discussed above. Livestock grazing on McGregor Range is administered by the BLM, while the USFS administers grazing on the Lincoln National Forest. The potential impacts of grazing on biological resources are described under cumulative impacts.

4.8.2 Alternative 2

Under this alternative, a 40,000-acre tract of the Sacramento Mountains foothills portion of McGregor Range, including most of the Culp Canyon WSA, would return to the public domain (Figure 2.2-1).

4.8.2.1 Effects of Military Activities

In general, most military missions and reasonably foreseeable future missions would be supported under this alternative. Constraints to the military activities would occur in the Sacramento Mountains foothills (see Section 2.2.1). TAs 13, 14, 16, 33, and Culp Canyon WSA make up this tract of land and military activities in these training areas are very low to low (Table 2.1-3). These activities would have no or negligible impacts on biological resources and include using the area as part of the missile firing SDZ, on-road military vehicle movements, and infrequent ground troop movements. The cessation of these activities on the 40,000-acres would have negligible or no impacts on biological resources. Therefore, the impacts to vegetation, Waters of the U.S., wildlife, and sensitive species as a result of military activities under this alternative would be the same as described for Alternative 1.

4.8.2.2 Effects of Nonmilitary Activities

This tract is within grazing units 4 and 5 and parts of units 3 and 5 (Figure 3.1-2). It is assumed that grazing would continue on land returned to the public domain and Army fee-owned land in the area and that grazing intensity would be similar to current levels. In addition, there could be an increase of other nonmilitary activities on this tract such as increased public use including hunting, hiking, and firewood cutting. The increase in these activities, if it occurs, would likely have negligible effect on vegetation and wildlife.

4.8.3 Alternative 3

Under this alternative, 180,000 acres of land within grazing units 4, 5, 7 through 15, and about half of unit 3 would be returned to the public domain. This area includes the Sacramento Mountains foothills and Otero Mesa (Figure 2.3-1).

4.8.3.1 Effects of Military Activities

Under this alternative, some of the Army's military missions could not be conducted and other activities would be reduced in scope because of the loss of Otero Mesa (Section 2.3.1). Under this alternative, off-road vehicle maneuvers would continue on TA 8. Weapons training and testing would be conducted in the Tularosa Basin portion of McGregor Range. In addition, a proposed helicopter gunnery range could be constructed and operated. Types of impacts from military training and testing activities would be similar to those discussed under Alternative 1 (Section 4.8.1); however, the area affected would be smaller. The types of impacts would include physical disturbance of vegetation and habitat, potential for wildfires, and noise.

Vegetation.

Ground Disturbance. Under this alternative, off-road vehicle maneuvers would continue on TA 8 and weapons testing would continue in the Tularosa Basin. Therefore, impacts to vegetation from off-road vehicle maneuvers and weapons impacts would be similar to those described for Alternative 1.

Under this alternative, the controlled access FTX sites would be used in the Chihuahuan Desert shrubland and grassland plant communities in the Tularosa Basin but not on Otero Mesa, as in Alternative 1. Therefore, the 4,830 acres that may be disturbed for these sites would be entirely within the Tularosa Basin area of McGregor Range.

Fire. There would be much less risk of fire from military activities to pinyon-juniper vegetation or to grasslands and other vegetation on Otero Mesa, since these areas would not be withdrawn and thus would not be part of the missile and ordnance safety fans. Impacts of fire on desert grasslands described under Alternative 1 would occur in the grasslands in the Tularosa Basin. Fire impacts to desert shrub vegetation would also be the same as discussed under Alternative 1. Therefore, there would be fewer fires from military activities on Otero Mesa, with no changes in the Tularosa Basin portion of McGregor Range.

Wetlands and Arroyo-riparian Drainages.

Ground Disturbance. Under this alternative, off-road vehicle maneuvers would continue on TA 8 and weapons training and testing would continue in the Tularosa Basin portion of McGregor Range. Therefore, impacts from off-road vehicle maneuvers and weapons impacts to probable Waters of the U.S. would be the same as described for Alternative 1.

Impacts to wetlands and arroyo-riparian drainages would be limited to the Tularosa Basin. There would be no ground disturbance impacts to probable Waters of the U.S. on Otero Mesa or the Sacramento Mountain foothills area. Probable Waters of the U.S. in the Tularosa Basin may be impacted from construction as described under *Waters of the U.S.* in Section 4.8.1.2.

Fire. Impacts of fire to wetlands and arroyo-riparian drainages in the Tularosa Basin would be adverse as described for Alternative 1. Waters of the U.S. on Otero Mesa or the Sacramento Mountains foothills would not be affected by military-related fires, since these areas would not be withdrawn and not be part of the missile and ordnance SDZs.

Wildlife. The potential types of impacts to wildlife from ground disturbance and fires would be similar to those described under *Wildlife* in Section 4.8.1.1. The one difference is that land disturbance and fire from military sources would not affect wildlife or wildlife habitat in the grasslands of Otero Mesa or in most of the Sacramento Mountains foothills. Based on the potential for land disturbance and fire to affect wildlife in the Tularosa Basin, it is assumed that the potential impacts to wildlife due to these factors for this alternative would be the same as described under *Wildlife* in Section 4.8.1.1.

Sensitive Species.

Ground Disturbance. The potential impacts of ground disturbance to sensitive species under this alternative would be negligible, as determined for Alternative 1 (see *Sensitive Species* in Section 4.8.1.1).

Fire. The reduction of military-related fires on Otero Mesa would have a positive impact on those species that are negatively impacted by fire and may be detrimental to those species that react positively to fire (see *Sensitive Species* in Section 4.8.1.1). Military-related fires would continue to occur in the Tularosa Basin and could have an effect on sensitive species that have the potential to occur in these areas. The impacts of fire on sensitive species or their habitat that have the potential to occur in the Tularosa Basin are based on the distribution of sensitive species or their habitats on the range and species specific reactions to fire (Table 4.8-1). Based on this assessment, fire has the potential to have the following impacts on sensitive species under this alternative. This assessment does not include sensitive species that are occasional migrants on McGregor Range (see Table D.4-1 in Appendix D).

- Species, habitat or potential habitat negatively impacted by fire: Sneed pincushion cactus, Hueco Mountain rock daisy, and alamo beard tongue, which may have a low probability of being impacted by fire as indicated on Table 4.8-1; night blooming cereus, which could be destroyed by fire but grows in mesquite coppice dune habitat with low fuel loads; and potential aplomado falcon habitat that could be negatively impacted if increased military activities resulted in more fires with a resultant decrease in the suitability of potential aplomado falcon habitat.

- Species or habitat positively impacted by fire: Texas horned lizard, burrowing owl, and loggerhead shrike.

- Species or habitat where reaction to fire is not known: Bats.

4.8.3.2 Effects of Nonmilitary Activities

For the purpose of this assessment, it is assumed that grazing on these returned lands would continue at current levels and is, therefore, considered a cumulative impact and is addressed in Section 4.8.7. If the level of grazing does increase through an increase in the number of livestock or increased duration of use, the severity of impacts to biological resources would likely increase from those described in Section 4.8.7.

Impacts from recreational activities would include human presence, removal of downed wood, and noise. These activities may increase since public access would likely increase. Impacts to vegetation would likely be negligible. There would be a minor adverse effect to wildlife from these activities, as animals may alter their use of habitat to avoid humans.

The return of 180,000 acres of land to the public domain could result in the exploration and development of mineral resources for oil and gas, and geothermal resources. As indicated in Section 4.5, *Earth Resources*, the potential for geothermal development has been investigated in southern McGregor Range. Oil and gas exploration wells have been developed on McGregor Range. These wells indicate that oil and gas resources may be limited. Therefore, the likelihood of mineral development on the portion of McGregor Range returned to the public domain under this alternative would likely be limited. Direct vegetation loss, temporary displacement of animals, and limited habitat fragmentation on Otero Mesa and in the Sacramento Mountains foothills would likely occur with oil and gas development.

4.8.4 Alternative 4

4.8.4.1 Effects of Military Activities

Under this alternative, 244,000 acres of land (64,000 more acres than under Alternative 3) within all the current grazing units would be returned to the public domain (Figure 2.4-1). As with Alternative 3, McGregor Range would not be able to support some of its military operations and others would be reduced in scope (Section 2.4.1). Under this alternative, the military's ability to conduct live-fire missile testing would be more restricted than under Alternative 3 because there would be no safety fan north of New Mexico Highway 506 (Figure 2.4-2). In addition to the reduced military operations described for Alternative 3, the Class C Bombing Range north of New Mexico Highway 506 would be returned to the public domain.

Given that most of the ground disturbing military activities that would take place under Alternative 3 would take place under this alternative, the impacts to biological resources would be similar to those described for Alternative 3 (Section 4.8.3). However, 64,000 additional acres would not be used for military activities compared to Alternative 3. Therefore, impacts from military operations would occur on less area. There would likely be less noise because of the closure of the Class C Bombing Range, but the impacts of noise on wildlife was considered negligible for Alternatives 1, 2, and 3, as well as for this alternative.

4.8.4.2 Effects of Nonmilitary Activities

It is assumed that grazing would continue at its current levels on lands returned to the public domain and the military would continue to supply water for the stock tanks and troughs maintained by BLM. Therefore, grazing is considered a cumulative impact and is assessed in Section 4.8.7. Compared to Alternative 3, an additional 64,000 acres of land would be available for other nonmilitary activities such as hunting, other recreational activities, firewood cutting, and oil, gas and mineral exploration and extraction. The potential impacts of these activities would be similar to those described for Alternatives 1, 2, and 3.

4.8.5 Alternative 5 - No Action

Under this alternative, the withdrawal of McGregor Range would not be renewed and all land other than TAs 8 and 32 would return to the public domain. It is assumed that all this land, except for hazardous areas, would be open for public access, grazing, and mineral exploration. It is anticipated that public access for purposes such as hunting and hiking would not have an impact on the biological resources due

to the widely dispersed and relatively infrequent nature of these uses. Oil, gas, and mineral extraction and development could result in the direct and indirect disturbance of biological resources but the degree of such impacts can not be determined at this time.

Land within the Tularosa Basin that has been closed to grazing for many years would be open for grazing under the No Action Alternative. Based on the assessment of the impacts of grazing in Section 4.8.7, it is assumed that the resumption of grazing on previously ungrazed areas of McGregor Range would have impacts on biological resources as described below.

Vegetation. Under the No Action Alternative, the impacts of grazing would continue on Otero Mesa and other currently grazed areas. In addition, grazing would potentially begin on currently ungrazed portion of the Tularosa Basin in New Mexico. This includes TAs 8, 9, and 24 through 32 (see Figure 2.5-1). It is assumed that grazing practices would be similar to that on Otero Mesa. If grazing were instituted, the impacts would occur on all 337,400 additional acres that were returned to the public domain. Therefore, impacts from grazing on vegetation would be similar to those discussed under cumulative impacts.

Five general plant community types would be subject to grazing in the Tularosa Basin under the No Action Alternative (Table 4.8-2). The creosotebush type covers the largest area (132,700 acres) followed by the mesquite coppice dunes type (88,700 acres). The creosotebush and mesquite coppice dunes plant communities are the dominant types in the Tularosa Basin (Figure 3.8-1).

Table 4.8-2. Number of Additional Acres of Plant Communities That Would Be Grazed in the Tularosa Basin Under the No Action Alternative

Plant Community Types					
Disturbed ground	*Creosotebush*	*Mesquite dunes*	*Basin grasslands*	*Foothill desert shrublands*	*Mesa grasslands*
25,800	132,700	88,700	84,300	51,600	26,300

Source: **U.S. Army, 1996e.**

Approximately 111,000 acres of grassland plant communities that have not been grazed for many years would be subject to grazing under this alternative. As presented under *Vegetation* in Section 4.8.1.1, heavy grazing in grassland plant communities can result in an increase in bare ground, decrease in vegetation cover, decrease in black grama grass, reduced species richness, and an increase in undesirable species such as Russian thistle and snakeweed. However, in moderately grazed big sagebrush (*Artemisia tridentata)* range, percent grass cover was statistically significantly higher outside livestock enclosures than within (Holechek and Stephenson, 1983). In heavily grazed areas, shrubs such as creosotebush and mesquite would likely invade these grasslands and may, over time, replace the grasslands. Studies in New Mexico have shown that in over-grazed grasslands, creosotebush advanced into grasslands. Pioneer creosotebush plants formed a nucleus around which colonies developed and the grass eventually disappeared. In lighter grazed areas, creosotebush occurred as isolated individuals but did not appear to develop colonies (Gardner, 1951). Grazing could also promote the replacement of grasslands with mesquite shrublands. As noted under *Vegetation* in Section 4.8.7, a combination of over grazing, drought, and dispersal of seeds by livestock appear to be major factors in the spread of mesquite in the Chihuahuan Desert (Buffington and Herbal, 1965; Gardner, 1951; Hennessy et al., 1983). With the potential of grazing in currently ungrazed areas, the dispersal of mesquite seeds over fairly large areas by livestock, and the eventual drought, implementation of the No Action Alternative would potentially result in the expansion of the mesquite plant community into grasslands. With the advancement of shrublands into grasslands, the alteration and reduction of the grassland plant communities would result in a

reduction in plant community diversity. In addition, a reduction in plant species diversity would also be likely. Studies on the Jornada Experimental Range in the Chihuahuan Desert showed that grasslands have 2.5 times more plant species than mesquite shrublands and 1.7 times more plant species than creosotebush shrublands (Huenneke, 1995) where a grazed pasture adjoins one of the black grama grass study areas of New Mexico State University.

A total of 273,000 acres of currently ungrazed withdrawn and Army fee-owned land on McGregor Range is covered with shrub-dominated plant communities (Table 4.8-2). Many of these shrub-dominated plant communities have a fairly dense ground cover component and grazing has the potential to adversely affect the grasses and herbs that make up this layer. A comparison of grazed and ungrazed grasslands on Otero Mesa on McGregor Range where grazed pasture adjoins one of the black grama grass study areas of New Mexico State University (Table 4.8-3) showed that more plant biomass occurred in ungrazed areas including much greater biomass of black grama in ungrazed land (BLM, 1980). The *McGregor Grazing Management EIS* states that basal cover was greater on moderately grazed grassland pastures than on pastures that experience less utilization. The greater basal cover occurred because the grasses tended toward sod formation; in lightly used areas the grasses occurred in distinct upright clumps (BLM, 1980).

In a study in semiarid shrub-grassland in south-central Utah, perennial grass percent cover was 2.5 to 6.4 times higher in areas that had been ungrazed for 30 years than grazed areas. The percent shrub cover and density were similar in both treatments (Rosenstock, 1996). In moderately grazed sagebrush range, grass cover was higher outside livestock enclosures while shrub cover was higher inside the enclosures in the upland sites and higher outside the enclosures in lowland sites (Holechek and Stephenson, 1983). This indicates that grazing in the previously ungrazed shrubland plant communities may result in a reduction in percent ground cover under heavy grazing but increase under moderate grazing. In addition, shrub cover may remain fairly stable. Heavy grazing has the potential to adversely affect vegetation that has been previously grazed, as well as in currently ungrazed areas in the Tularosa Basin. Under moderate to light grazing, impacts to vegetation may be negligible.

Wetlands and Arroyo-riparian Drainages. The impacts of livestock on vegetation in currently grazed probable Waters of the U.S. on McGregor Range are described under *Wetlands and Arroyo-riparian Drainages* in Section 4.8.7. Under the No Action Alternative, grazing has the potential to impact Waters of the U.S. in previously ungrazed areas in the Tularosa Basin. Livestock grazing has a negative effect on unprotected wetlands: It can result in the reduction in wetlands herbacious species such as grasses and sedges (*Carex sp.*); and rushes (*Juncus sp.*); an increase in the amount of bare ground; the eventual reduction and damage to wetland shrubs such as willow (*Salix sp.*); the trampling of banks around the wetlands; and possibly, the reduction of surface water. BLM management, as described in the RMPA (BLM, 1990a), is intended to ensure that grazing and other activities have a minimum negative impact on wetlands. Stock tanks provide artificial wetland resources. These are, by their intended purpose, heavily used by livestock. The surrounding vegetation in currently grazed portions of McGregor Range are heavily grazed by livestock (BLM, 1980). These artificial wetlands also provide habitat for vegetation and biological species that otherwise would not be present. This effect can be enhanced by using fencing to exclude cattle from portions of the stock tank impoundments

There are an estimated 2,475 miles of probable Waters of the U.S. that are ephemeral washes on McGregor Range and many of these waters occur in the currently ungrazed areas in the Tularosa Basin (Figure 3.7-1). Livestock grazing could have negative impacts on vegetation in these dry washes by reducing grass cover, increasing the amount of bare ground, reducing shrub cover, and promoting an increase in surface runoff and erosion. Observations in New Mexico showed that there was only a trace of grass in many washes that were overgrazed, and that washes that had been protected from grazing for

Table 4.8-3. Comparisons Between Grazed and Nongrazed Areas

A. Grazed plot (slight utilization) in Pasture 7; adjacent nongrazed plot in black grama exclusion, north of New Mexico Highway 506. Values represent herbage production in grams, from a 4.8 square foot quadrant. Litter cover was 35.8 percent in the nongrazed area, 6.3 percent in the grazed area.		
Plant Species	*Nongrazed Area*	*Grazed Area*
Forbs	16.9	4.9
Black grama	16.9	8.0
Blue grama	8.2	9.1
Ring muhly	–	.8
Sideoats grama	–	Tr
Vine mesquite	–	Tr
Tobosa grass	–	2.6
Sand dropseed	.4	–
Threeawn	.4	–
Burrograss	.4	–
Hall' s panicum	–	Tr
Curlyleaf muhly	3.5	–
Broom snakeweed	4.6	1.2
Winterfact	7.2	–
Creosotebush	1.2	–
Total (excluding creosote)	*58.5 (1,168 pounds/acre)*	*24.6 492 pounds/acre)*
B. Grazed plot in Pasture 9 (light utilization); nongrazed area in black grama exclusion to west. Litter cover was 9.8 percent in nongrazed plot; 11.1 percent in grazed plot.		
Species	*Nongrazed*	*Grazed*
New Mexico feathergrass	3.3	14.1
Black grama	22.9	.4
Blue grama	4.3	1.0
Sideoats grama	5.4	.4
Hairy grama	3.4	3.5
Threeawn	1.4	–
Forbs	2.3	6.1
Broom snakeweed	6.5	2.3
Total (excluding snakeweed)	*43.0 (860 pounds/acre)*	*22.5 (510 pounds/acre)*

Source: BLM, 1980: 1979 field studies.

many years were recovering as indicated by the return of giant sacaton and side-oats grama (Gardner, 1951). Sacaton forms dense stands around some stock tanks and along some washes in the currently ungrazed portions of the Tularosa Basin on McGregor Range. These sacaton grasslands are disappearing from the southwest and overgrazing may be the reason (Bock and Bock, 1978). However, sacaton has been observed growing next to many cattle troughs on Otero Mesa and may be tolerant to grazing in this area (BLM, 1998).

Grazing could have an impact on woody species that occur in the washes. As discussed in Appendix D, little leaf sumac, Apache plume, desert willow, and cutleaf bricklebush are common shrubs in the washes in the Tularosa Basin. These species were also common in the washes of the Hueco Mountains (U.S. Army, 1997h). In New Mexico, percent shrub cover was similar in grazed and ungrazed washes. However, the species composition was markedly different; creosotebush comprised 57 percent of the shrub cover in grazed washes and 16 percent in ungrazed washes. Desert willow, Apache plume, little

leaf sumac, and bricklebush comprised over 50 percent of the cover in ungrazed washes. The first three species were absent from the grazed washes and bricklebush was equally abundant in grazed and ungrazed washes. Desert willow, Apache plume, and little leaf sumac had reinvaded washes that were protected from grazing (Gardner, 1951).

The removal of vegetation by heavy grazing in washes and surrounding uplands would likely result in erosion and surface runoff. Species such as desert willow and Apache plume form islands in the channels of washes as well as growing along the banks. These islands and shrubs along the banks break up and slow down the flow of water in the washes. The removal of these plants by heavy grazing could result in increases in surface water runoff along unobstructed channels (Gardner, 1951). However, light to moderate grazing would be expected to result in less damage to vegetation in washes.

Grazing in the currently ungrazed washes in the Tularosa Basin may result in a reduction in vegetative cover and plant species diversity. However, BLM grazing management practices would reduce this risk to a negligible level. In addition, it is BLM's policy to "minimize disturbance to arroyo-riparian habitats for endangered species and nongame birds" (BLM, 1990a).

Wildlife. Based on the analysis under *Wildlife* in Section 4.8.7, the implementation of grazing on currently ungrazed lands in the Tularosa Basin could result in a reduction in reptile and small mammal abundance and species richness. The impacts of grazing in upland habitats on birds would be mixed, in that it would favor some species and have a negative effect on others. In addition, there could be general reduction in grassland bird species diversity and density if the grasslands are replaced by shrublands. Species such as horned larks, meadowlarks, lark sparrows, and Cassin's sparrows would decrease in abundance, while the black-throated sparrow, western kingbird, and pyrrhuloxia would likely increase. The impacts of grazing in wetlands on birds would likely be negative. Wetlands such as Mack Tanks, (see Figure D.3-3 in Appendix D) with its permanent water supply and vegetative cover, are used extensively by birds year round. Impacts from cattle use can be managed to ensure that negative impacts are minimized.

As discussed in Section 3.8.3.2 and Appendix D, washes on McGregor Range are an important habitat for nesting and neotropical migrant birds traveling through the Chihuahuan Desert. The degradation of these washes from livestock grazing would reduce the cover and, potentially, the food supply of birds using these areas for nesting and migration corridors. In addition, shrubs such as little leaf sumac, desert willow, and Apache plume that are important for nesting could be replaced by creosotebush, which is rarely used by birds for nesting (Kozma and Mathews, 1997).

Therefore, heavy grazing would likely have impacts on reptiles and small mammals, negligible to adverse impacts on birds in upland habitats, and significantly adverse impacts to birds at wetlands and arroyo-riparian drainages. Under BLM's light to moderate grazing management practices, impacts to reptiles would be negligible and impacts to birds and mammals, mixed.

Sensitive Species. As indicated under *Sensitive Species* in Section 4.8.7, grazing would likely result in negative, positive, or no impacts, depending on the sensitive species (Table 4.8-4). Based on information regarding the distribution of sensitive species, or sensitive species habitat, and species-specific reactions to grazing, 12 species of plants and animals, bats, and potential habitat for two additional species have the potential to occur in the area to be opened for grazing under the No Action Alternative (Table 4.8-4). Grazing would have neutral or unknown impacts on 5 species of plants, positive impacts on 6 species of wildlife or potential habitat, a negative impact on 3 species of wildlife or potential habitat, and positive and unknown impacts to bats.

Table 4.8-4. Effects of Grazing on Sensitive Species or Sensitive Species Habitat That Have the Potential to Occur on Lands Opened to Grazing Under the No Action Alternative

Species	*Effects of Grazing*			
	Positive	*Negative*	*Neutral*	*Unknown*
Sneed pincushion cactus (P)[a]			●	
Night blooming cereus (P)				●
Grama grass cactus (P)				●
Hueco Mountain rock daisy (P)				●
Alamo beard tongue (P)			●	
Texas horned lizard (K)	●			
Ferruginous hawk (K)	●			
Aplomado falcon potential habitat (K)		●		
Mountain plover potential habitat (K)	●			
Burrowing owl (K)	●			
Loggerhead shrike (K)	●			
Bairds' s sparrow (K)		●		
Black-tailed prairie dog (K)	●			
Bats (K	● (more water)			●

[a] P = potentially occurring in area.
K = known to occur in area.

4.8.6 Alternative 6

Under Alternative 6, the elimination of military activities in an NCA would reduce the potential for wildfire and disturbance from training and test activities such as missile debris impacts. In addition, no additional military training and construction activities would occur on Otero Mesa. There would continue to be grazing impacts, as described in Section 4.8.7, if grazing is part of the NCA management plan. It is assumed that land management would remain similar to that currently occurring under the RMPA. Because the precise nature and extent of the congressional action cannot be determined at this time, detailed biological resource analysis of this alternative is deferred until the proposal is specified for this type of nonmilitary withdrawal by the DOI.

4.8.7 Cumulative Impacts

Activities in the ROI on and around McGregor Range that could contribute to cumulative impacts to biological resources include (1) Army-related training and testing elsewhere on Fort Bliss; (2) current grazing on and in the area of McGregor Range; (3) recreational activities such as hunting and hiking on and near McGregor Range; (4) development of natural resources such as oil and gas and mineral deposits on and near McGregor Range; and (5) BLM habitat management activities such as prescribed burns in various habitats and tree thinning in the pinyon pine-juniper woodlands on McGregor Range. (See Section 4.0 and Appendix G for general information regarding cumulative impacts analysis.) For a cumulative impact to occur, a specific biological resource must be subject to direct impacts from the LEIS alternatives, and also be subject to an impact from one of the sources listed above. For example, cumulative impacts to grasslands and associated wildlife would occur because the LEIS alternatives

would result in the direct impacts to these resources and impacts to these resources would also occur from military activities elsewhere on Fort Bliss, and grazing on and in the area of McGregor Range. Alternately, pinyon-juniper woodlands on McGregor Range are being impacted by grazing, and in the past have been impacted by fire on the Doña Ana Range–North Training Areas. However, no cumulative impact would occur because there would be little if any direct impact to this plant community type on McGregor Range from the LEIS alternatives.

Based on the impacts analysis in Sections 4.8.1 through 4.8.6, military activities on McGregor Range could have direct impacts on vegetation and wildlife habitat in the mesquite-sand sage coppice dunes shrublands, creosotebush-tarbush shrublands, grasslands, and arroyo-riparian drainages as well as on sensitive species. Therefore, the focus of this cumulative impacts analysis is on these biological resources. This cumulative impacts analysis also includes a summary of the Fort Bliss NASA LANDSAT Thematic Imagery monitoring, which a new program being implemented to assess cumulative impacts of military and nonmilitary activities on Fort Bliss. This program is described in greater detail in Appendix G. This section presents a summary of the NASA LANDSAT Thematic Imagery study, a summary of potential impacts of nonmilitary activities such as grazing on biological resources, and ends with an assessment of the cumulative impacts to biological resources listed above.

4.8.7.1 Effects of Military Activities

Cumulative impacts of military and nonmilitary activities on vegetation on Fort Bliss over a 10-year period is being monitored by Fort Bliss through NASA LANDSAT Thematic Imagery. This system will be used to monitor the entire landscape of Fort Bliss at high spatial resolution to capture variability in land cover on training areas. Validation will occur through the use of LCTA. This capability will allow positioning of monitoring plots to provide an accurate sample of impacts on the training landscape. Additional post sampling analysis using plot data, monitoring data, and GIS themes will allow analysts to map the extent and impact of training activities on a landscape scale.

This analysis reflects the process being implemented at Fort Bliss to evaluate cumulative impacts of military training, grazing, and natural events on training lands. To this end, Fort Bliss has acquired satellite imagery from 1972 to 1997. These images will be used to establish long-term trends in landscape change on Fort Bliss. For this PEIS, the data from 1986 and 1996 were used to illustrate the developing process for evaluating change in natural and man-induced change (Figure 4.8-1). Change occurred from drought (1994 and 1995 were particularly dry years) and fire (more frequent or larger fires occurred during1989 and 1994) as well as from training activity that occurred during the 10 years. The results from this analysis must be interpreted with some qualifications. The model was generated from plot data in grassland and desert shrub communities where vegetation cover ranged from 15 percent to 53 percent of the total covered area. Extrapolation of the model to other vegetation types or to vegetation cover outside of the range of the model cannot be evaluated for accuracy. Therefore, comparisons made in other vegetation types or outside of the model' s range should be viewed as preliminary comparisons. The images used in the analysis represent a snapshot view of conditions for 2 days 10 years apart, and do not represent trends in vegetation cover. The number of observations over time correlates to the reliability of the trend analysis.

Precipitation and fires are important factors affecting vegetation cover. These factors can produce change in short and long time-frames depending on their duration and intensity. Data from precipitation monitoring indicates that during the 30 months preceding the 1986 image there was a total 33.15 inches of precipitation on WSMR, approximately 37.60 at Oro Grande, and 29.00 at EPIA. There were 16.69 inches of precipitation on WSMR, 27.55 inches at Oro Grande, and 16.69 inches at EPIA in the 30 months preceding the 1996 image. The average of these stations for the 30 months prior to July 1996 was

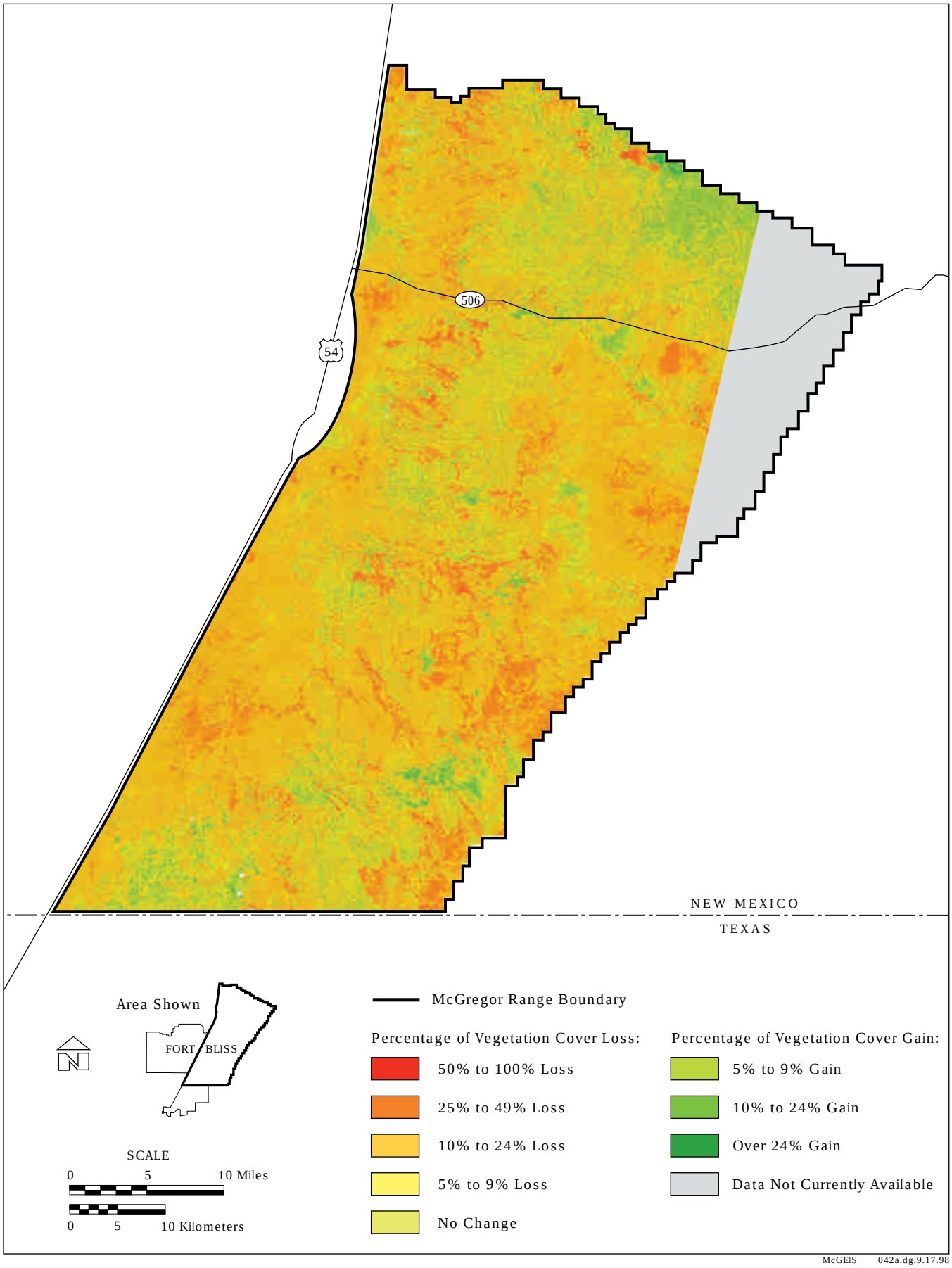

Figure 4.8-1. LANDSAT Derived Vegetation Change on McGregor Range, 1986 to 1996.

20.31 inches. Fire data indicate low fire frequency prior to the 1986 image and relatively high fire frequency prior to the 1996 image. There were significant fires on Otero Mesa in 1993 and 1994. Natural causes were responsible for 31 fires and 7 fires were attributed to man-made causes. These data suggest that vegetation cover would generally decline from 1994 to 1996 as a result of below normal precipitation and that cover would be drastically reduced in areas that were affected by fires. Results from change analysis of cover maps suggest that there is generally less vegetative cover in 1996 in all cover types than there was 1986 (Figure 4.8-2, Table 4.8-5, Figure 4.8-3). Areas impacted by fire suffered greater losses in cover (e.g. conifer forests in the Organ Mountains) than relatively undisturbed areas.

These results indicate that woody vegetation at high elevations was not affected as severely by drought, most cover loss was associated with fires in these vegetation types. The most severe drought effects were at lower elevations in mesquite coppice dune and sandscrub vegetation. Vegetation cover in grazed grasslands (Table 4.8-6) is lower than in ungrazed grasslands (Table 4.8-7) for both dates. Vegetation cover in Roving Sands controlled access FTX sites is similar to vegetation cover in grazed areas. More data are needed to assess plant cover response to drought years and moist years in desert environments, which would require analysis of long-term data sets that represent a series of wet and dry years.

An example of cumulative vegetation cover change in areas specifically used for a military activity may be estimated from the controlled access FTX sites. The dynamics of vegetation cover change in the Roving Sands controlled access FTX sites are shown in Table 4.8-8. The vegetation cover change resulting from Roving Sands is temporary. These sites are scattered across the grazed area on Otero Mesa and in the Tularosa Basin. Cumulative effects indicated are similar to the estimates for other areas on McGregor Range

4.8.7.2 Effects of Nonmilitary Activities

The principal nonmilitary activity on and in the area of McGregor Range that could contribute to cumulative impacts is grazing. The impacts of grazing on biological resources appear below. It is assumed that these impacts apply to all LEIS alternatives. In addition, grazing would result in direct impacts to biological resources on McGregor Range for LEIS Alternative 5 because lands that have not been grazed for many years would potentially be available for grazing if this alternative were implemented. These direct impacts of Alternative 5 appeared previously in Section 4.8.5.

Vegetation**.** As indicated in Section 3.8.1, historic records show that much of the approximately 350,000 acres of shrublands on McGregor Range may have been grasslands, before climatic changes and the advent of livestock grazing in the 1800s. Most of these shrublands are dominated by creosotebush (157,500 acres) and mesquite coppice dunes (136,700 acres) and are in the Tularosa Basin of McGregor Range (Figure 3.8-1). Once established, mesquite coppice dunes persist and the return to grasslands, even where livestock have been excluded, is highly unlikely (**Gardner, 1951; Buffington and Herbel, 1965; Hennessy et al., 1983**). This is borne out on McGregor Range where the mesquite coppice dune plant community has not been grazed for many years on much of the range and there has been no apparent shift in plant species composition from mesquite to a grassland plant community. To the contrary, studies have shown that mesquite will continue to expand into and replace grassland plant communities even in areas that are not grazed (**Hennessy et al., 1983; Glendening, 1952**).

Grazing currently occurs on approximately 271,000 acres of McGregor Range, Otero Mesa, the Chihuahuan Desert shrublands, mostly north of New Mexico Highway 506, and in the montane shrubland and pinyon pine/juniper of the Sacramento Mountains foothills (Figure 3.1-2). The portion of Otero Mesa that is grazed covers about 161,400 acres or about 23 percent of McGregor Range. The predominate

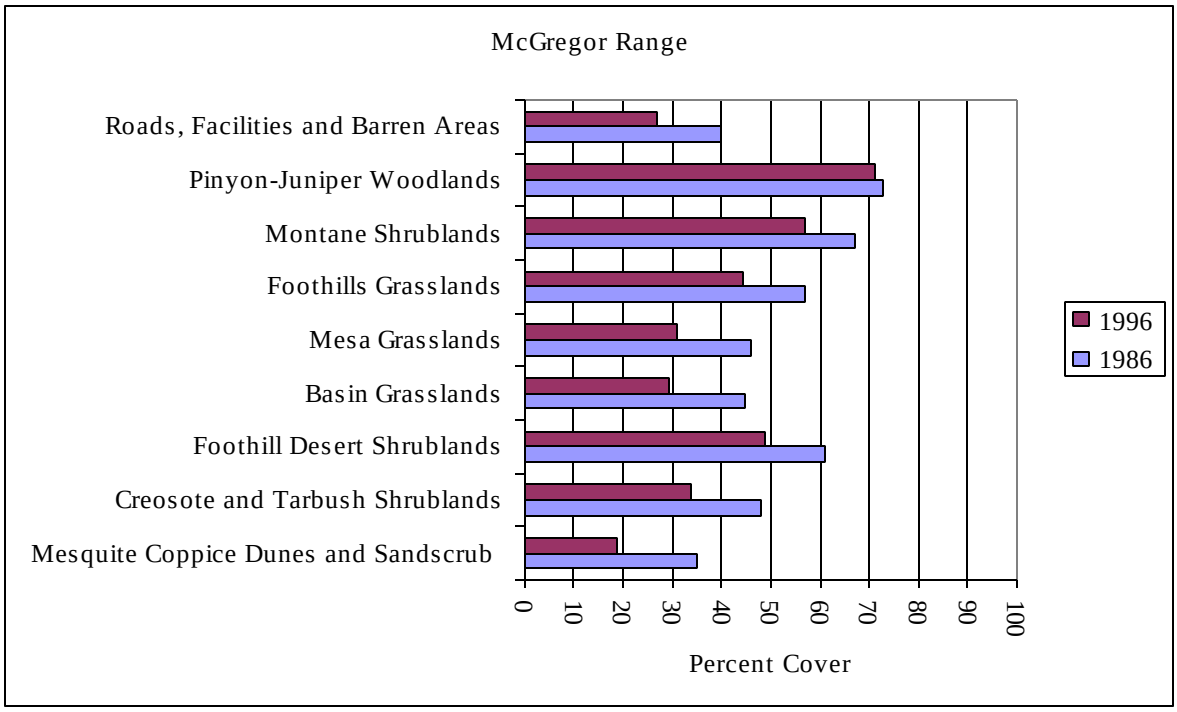

Figure 4.8-2. Percent Vegetation Cover on McGregor Range, 1986 and 1996.

Table 4.8-5. Vegetation Cover and Dynamics on McGregor Range, 1986 and 1996

Mapping Unit	*% Total Vegetation Cover*[1]		*Average Change*	*Mapping Unit*	*Mapping Unit Area Change*[3]		
	1986	*1996*			*% Area with Loss*	*No Change*	*% Area with Gain*
Mesquite Coppice Dunes and Sand Scrub	35	19	-16.14%	Mesquite Coppice Dunes and Sand Scrub	94	6	0
Creosote and Tarbush Shrublands	48	34	-14.00%	Creosote and Tarbush Shrublands	91	8	1
Foothill Desert Shrublands	61	49	-12.00%	Foothill Desert Shrublands	90	10	0
Basin Grasslands	45	29	-15.82%	Basin Grasslands	94	6	0
Mesa Grasslands	46	31	-15.00%	Mesa Grasslands	94	6	0
Foothills Grasslands	57	44	-12.57%	Foothills Grasslands	84	14	2
Montane Shrublands	67	57	-10.20%	Montane Shrublands	55	37	8
Pinyon-Juniper Woodlands	73	71	-2.00%	Pinyon-Juniper Woodlands	38	41	17
Roads, Facilities and Barren Areas[2]	40	27	-13.00%	Roads, Facilities and Barren Areas	85	13	2

(1) Total vegetation cover is the indicator of ecological conditions used in the modeling.
(2) Mapping unit includes vegetated areas such as disturbed natural vegetation, vegetation surrounding facilities such as the El Paso Water Treatment Lagoons and McGregor Range Camp.
(3) The ranges indicated are 5-100 percent–Loss, ±5 percent–No Change, and 5- over 24 percent–Gain as shown by Figure 4.8-1.

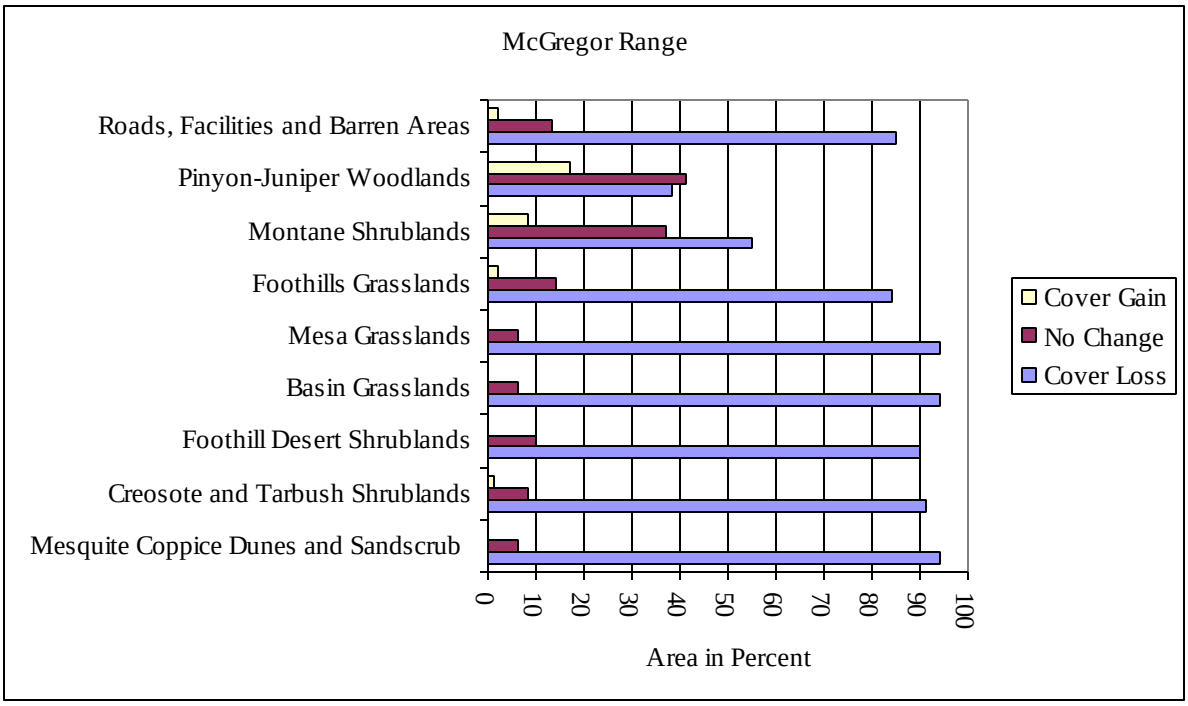

Figure 4.8-3. Percent Change in Vegetation Cover on McGregor Range, 1986 through 1996.

Table 4.8-6. Vegetation Cover and Dynamics of Grazed Areas on McGregor Range, 1986 and 1996

Mapping Unit	*% Total Vegetation Cover*[1]		*Average Change*	*Mapping Unit*	*Mapping Unit Area Change*[3]		
	1986	*1996*			*% Area with Loss*	*No Change*	*% Area with Gain*
Mesquite Coppice Dunes and Sand Scrub	33	18	-15.00%	Mesquite Coppice Dunes and Sand Scrub	94	6	0
Creosote and Tarbush Shrublands	42	27	-15.00%	Creosote and Tarbush Shrublands	93	7	0
Foothill Desert Shrublands	51	41	-10.00%	Foothill Desert Shrublands	81	17	2
Basin Grasslands	41	24	-17.00%	Basin Grasslands	96	4	0
Mesa Grasslands	44	29	-15.00%	Mesa Grasslands	95	5	0
Foothills Grasslands	55	45	-10.00%	Foothills Grasslands	77	20	3
Montane Shrublands	65	60	-5.00%	Montane Shrublands	50	42	8
Pinyon-Juniper Woodlands	70	66	-4.00%	Pinyon-Juniper Woodlands	42	48	10
Roads, Facilities and Barren Areas[2]	41	28	-13.00%	Roads, Facilities and Barren Areas	86	12	2

[1] Total vegetation cover is the indicator of ecological conditions used in the modeling.
[2] Mapping unit includes vegetated areas such as disturbed natural vegetation, vegetation surrounding facilities such as the El Paso Water Treatment Lagoons and McGregor Range Camp.
[3] The ranges indicated are 5-100 percent–Loss, ±5 percent–No Change, and 5- over 24 percent–Gain as shown by Figure 4.8-1.

Table 4.8-7. Vegetation Cover and Dynamics of Ungrazed Areas on McGregor Range, 1986 and 1996

Mapping Unit	*% Total Vegetation Cover*[1]		*Average Change*	*Mapping Unit*	*Mapping Unit Area Change*[3]		
	1986	*1996*			*% Area with Loss*	*No Change*	*% Area with Gain*
Mesquite Coppice Dunes and Sand Scrub	36	20	-16.00%	Mesquite Coppice Dunes and Sand Scrub	98	2	0
Creosote and Tarbush Shrublands	50	36	-14.00%	Creosote and Tarbush Shrublands	90	9	1
Foothill Desert Shrublands	61	49	-12.00%	Foothill Desert Shrublands	90	9	1
Basin Grasslands	51	35	-16.00%	Basin Grasslands	92	7	1
Mesa Grasslands	52	36	-16.00%	Mesa Grasslands	91	7	2
Foothills Grasslands	58	44	-14.00%	Foothills Grasslands	88	10	2
Montane Shrublands	74	64	-10.00%	Montane Shrublands	67	25	8
Pinyon-Juniper Woodlands	75	76	1.00%	Pinyon-Juniper Woodlands	33	34	32
Roads, Facilities and Barren Areas[2]	43	29	-14.00%	Roads, Facilities and Barren Areas	89	9	2

[1] Total vegetation cover is the indicator of ecological conditions used in the modeling.
[2] Mapping unit includes vegetated areas such as disturbed natural vegetation, vegetation surrounding facilities such as the El Paso Water Treatment Lagoons and McGregor Range Camp.
[3] The ranges indicated are 5-100 percent–Loss, ±5 percent–No Change, and 5- over 24 percent–Gain as shown by Figure 4.8-1.

Table 4.8-8. Vegetation Cover Dynamics of Roving Sands Controlled Access FTX Sites on McGregor Range,1986 through 1996

Mapping Unit	*% Total Vegetation Cover*[1]		*Average Change*	*Mapping Unit*	*Mapping Unit Area Change*[3]		
	1986	*1996*			*% Area with Loss*	*No Change*	*% Area with Gain*
Mesquite Coppice Dunes and Sand Scrub	35	19	-16.00%	Mesquite Coppice Dunes and Sand Scrub	82	14	2
Creosote and Tarbush Shrublands	46	29	-17.00%	Creosote and Tarbush Shrublands	78	21	1
Basin Grasslands	44	28	-16.00%	Basin Grasslands	98	2	0
Mesa Grasslands	42	27	-15.00%	Mesa Grasslands	92	8	0
Foothills Grasslands	49	27	-22.00%	Foothills Grasslands	98	2	0
Roads, Facilities and Barren Areas[2]	39	23	-16.00%	Roads, Facilities and Barren Areas	90	8	2

[1] Total vegetation cover is the indicator of ecological conditions used in the modeling.
[2] Mapping unit includes vegetated areas such as disturbed natural vegetation, vegetation surrounding facilities such as the El Paso Water Treatment Lagoons and McGregor Range Camp.
[3] The ranges indicated are 5-100–percent Loss, ±5 percent–No Change, and 5- over 24–percent Gain as shown by Figure 4.8-1.

plant community types that are grazed are mesa grasslands (86,000 acres) and a mixture of basin, lowland, and foothill grasslands (82,000 acres) most of which are on Otero Mesa (Table 4.8-9). The total

Table 4.8-9. Number of Acres of Plant Community Types in Grazed Land on McGregor Range

Disturbed land	*Basin grassland*	*Mesa grassland*	*Mesquite dunes*	*Creosote bush*	*Foothill desert shrubland*	*Montane shrubland*	*Pinyon/ juniper*	*Total*
10,000	82,000	86,000	48,000	24,000	4,000	14,000	3,000	271,000

Source: **U.S. Army, 1996e.**

number of acres of grasslands grazed on McGregor Range is about 168,600 acres or 60 percent of the grasslands on McGregor Range. Approximately 76 percent of the mesa grasslands on McGregor Range are grazed.

LCTA data were collected in 1991 through 1993 for the Otero Mesa (grazed by livestock) and the East Buffer Zone (ungrazed, grass dominated areas at and below the Otero Mesa escarpment). Comparison of the two areas showed that Otero Mesa had higher percent bare ground and the recovery of vegetation after the dry year of 1992 was slower. These differences were due in part to grazing (O' Regan et al., 1995).

In addition, Otero Mesa has the highest density of snakeweeds (*Gutierrezia sp.*) per plot in areas sampled on Fort Bliss. There were about 200 percent more snakeweed per plot on Otero Mesa than in the East Buffer Zone (O' Regan et el., 1995). This species may be indicative of heavy grazing but climatic and other factors may also cause an increase in snakeweed stand density (O' Regan et al., 1995). In addition, areas of heavy grazing were observed around stock tanks and troughs on Otero Mesa. These areas typically had much bare ground, short grass, and numerous cow droppings and trails (USAF, 1997h, i).

In general, the grass cover on Otero Mesa is likely less than it would be with reduced or no grazing (BLM, 1980). In addition, in grasslands where blue and black grama grass are dominant, the proportion of black grama decreases as the utilization increases. According to BLM data collected in 1979, approximately 240,400 acres or 89 percent of grazed lands on McGregor Range is lightly or slightly grazed while the remaining 30,600 acres are moderately to heavily grazed. Areas of heavy grazing occur primarily near watering facilities and along drainage in the hilly terrain in the foothill grasslands and mountain shrublands plant communities in the Sacramento Mountains foothills north of New Mexico Highway 506 (see Figure 3.8-1) (BLM, 1980). Transect data indicated that utilization is very heavy near water and decreases about 20 percent per mile away from the tanks; most cattle stayed within 1.5 to 2 miles of stock tanks while grazing (BLM, 1980).

The following discussions of the potential impacts of grazing on wetlands and arroyo-riparian drainages, wildlife, and sensitive species provides information on the effects of heavy grazing and light to moderate grazing where appropriate.

Wetlands and Arroyo-riparian Drainages. Livestock grazing occurs in wetlands and arroyo-riparian drainages (probable Waters of the U.S.) within the current grazing allotments (see Figure 3.1-2). Some nonjurisdictional wetlands may occur around stock tanks, but these have not been mapped and are likely limited in size. Cattle concentrate around stock tanks to obtain water, more succulent vegetation, and shade, if available. Observations indicate that the herbaceous vegetation around stock tanks is very heavily grazed and bare ground is in evidence in many areas. Shrubs growing around these areas are also heavily grazed and some stock tanks have scattered large cottonwood trees (USAF, 1997h, i). Impacts from grazing as it relates to distance from water is evaluated in the *McGregor Grazing EIS* (BLM, 1980). The amount of land affected by overgrazing around stock tanks is typically 25 to 50 acres and 100 to 200 acres are typically affected in the elongated valley bottoms in the Sacramento Mountains foothills. Based on data from 1979, approximately 4,500 acres of land at stock tanks and in valley bottoms are subject to

heavy livestock grazing (BLM, 1980). Therefore, grazing would likely have an adverse affect on wetlands on Otero Mesa. Given that the number of acres of wetlands on the grazed portion of McGregor Range is limited, the effects of grazing on wetlands is considered negligible. However, this assessment is preliminary because the number of acres of wetlands is not known and grazing affects on the wetlands, if any, has yet to be determined.

Many of the probable Waters of the U.S. in the grassland plant communities on Otero Mesa are swales that are grass dominated (U.S. Army, 1996d). The impacts on these swales would be similar to that described for grasslands, above under *Vegetation*. Evidence of heavy grazing in some shrub-dominated (mostly little sumac) drainages on Otero Mesa consisting of more than 50 percent of the annual vegetation growth removed and bare ground on banks due to livestock trampling was observed (USAF, 1997a, b). Therefore, grazing on historically used grazing allotments has the potential to have adverse effects on probable Waters of the U.S.

Wildlife**.** Studies have shown that grazing can affect wildlife species richness and abundance. Jones (1981) sampled lizards in seven lightly and seven heavily grazed desert habitats in Arizona. Except for the Sonoran Desert shrublands, all lightly grazed sites had greater lizard species richness and abundance than heavily grazed sites. Jones (1981) determined that heavy grazing resulted in vegetation structural changes that resulted in an overall reduction in lizard abundance except in the Sonoran Desert where grazing did not alter the shrub vegetation structure although it did reduce grass cover. Comparison of lizard species richness and abundance based on foraging guilds (Pianka, 1966) showed that widely foraging species (foraging guild 1) such as skinks and whiptails that sit and wait in open spaces for foragers (foraging guild 2) such as the horned and earless lizards, were more common in lightly grazed areas. Species that sit and wait on rocks and logs (foraging guild 3) such as the side-blotched, tree, spiny, and northern prairie lizards were more common in heavily grazed areas (Jones, 1981). The bunchgrass lizard (*Sceloporus sclaria)* was once thought to be restricted to higher altitudes in southeastern Arizona but it was found during surveys of ungrazed bunchgrass habitats at lower elevations, indicating that it avoids grazed areas where bunchgrass escape habitat is lacking (Bock et al., 1990). Overall, it appears that moderate to light grazing can result in higher abundance and species richness of foraging guilds 1 and 2, and reduced abundance of foraging guild 3 when compared to overgrazed sites.

Studies of breeding birds in southeastern Arizona have shown that the lark sparrow and horned lark are more common in grazed areas while the grasshopper and Cassin's sparrows are much more common in lightly grazed or ungrazed sites (Bock and Webb, 1984). Other species that respond positively to grazing are the common nighthawk, northern mockingbird, and black-throated sparrow. Other species that responded negatively to grazing were the savannah and Henslow's sparrows (Bock et al., 1993). Grazing can influence raptors by (1) reducing available substrate for nesting, (2) reduce prey diversity and some cases abundance, and (3) increase prey vulnerability to raptor predation by removing cover (Kochert, 1989). Raptors such as the prairie falcon, American kestrel, northern harrier, various species of *Buteos sp.*, and the great horned owl have been observed to forage more frequently in open areas during the summer. Studies of the red-tailed hawk and American kestrel showed that they tended to nest more frequently in grazed than ungrazed locations. During the winter, the northern harrier, rough-legged hawk, red-tailed hawk, and golden eagle were more apt to be observed foraging in ungrazed or lightly grazed habitat (Kochert, 1989). In a summary of the impacts of grazing on birds, Bock et al., (1993) determined that the raptors that probably respond positively to grazing include the golden eagle and burrowing owl while the northern harrier, Swainson's hawk, and short-eared owl may show a negative response to grazing.

Studies of small mammals in grazed and ungrazed grasslands in southeastern Arizona showed that rodents were significantly more abundant in ungrazed areas. The hispid pocket mouse, western harvest mouse, white-footed mouse, grasshopper mouse, and hispid cotton rat were trapped significantly more in

ungrazed than grazed habitats. Merriam's kangaroo rat was the only species recorded more from grazed habitats. The silky pocket mouse and deer mouse were equally abundant in grazed and ungrazed habitats (Bock et al., 1984). In a study of the effects of grazing on small mammals in semiarid shrub-grassland habitats in south-central Utah, ungrazed habitats had 50 percent greater species richness and 80 percent higher abundance than grazed sites (Rosenstock, 1996).

Therefore moderate to light grazing on McGregor Range would have negligible effects on reptiles. Continued grazing would have mixed effects on birds and mammals in that some species would benefit while populations of other species would be reduced as a result of grazing. Overall, continued grazing would have positive, negligible, or adverse impacts on wildlife depending on the species.

Sensitive Species. Grazing, as with fire, can have varying effects on sensitive species depending on the species. The potential impacts of grazing on sensitive species appears in Table 4.8-10.

4.8.7.3 Summary of Cumulative Effects

As indicated above, implementation of the LEIS alternatives could result in cumulative impacts to four habitat types and sensitive species. The following provides an assessment of cumulative impacts to these biological resources based on the direct impacts resulting from the implementation of the LEIS alternatives plus impacts from other activities including grazing (see Section 4.8.7.2) and military activities elsewhere on Fort Bliss.

Mesquite-sandsage Coppice Dune Shrublands. For all LEIS alternatives except Alternative 5, the direct effects of military activities have the potential to result in the disturbance of 27,244 acres of this shrubland type on McGregor Range. Under Alternative 5, the direct effects of grazing in previously ungrazed areas of McGregor Range could affect 88,700 acres of this type (Table 4.8-11). Military activities on Fort Bliss outside McGregor Range as well as grazing on current allotments on McGregor Range have the potential to affect 307,400 more acres of the mesquite-sandsage coppice dune type (Table 4.8-11). Military activities could result in wildfires which could affect additional acreage of this type. However, given the low fuel loads that generally occur in this type, it is assumed that fires would be confined to the areas currently being disturbed by military activities and would not affect additional land. Therefore, implementation of LEIS Alternatives 1, 2, 3, 4, and 6 have the potential to have cumulative effects on about 334,700 acres of this type while LEIS Alternative 5 could potentially affect 396,100 acres.

The cumulative impacts to the mesquite-sandsage coppice dune shrublands would be negligible because (1) off-road vehicle maneuvers generally occur in the interdunal areas which, as indicated in Section 4.8.1, have very sparse vegetative cover weather or not they are being use for maneuvers; (2) cattle grazing would be light in this type due to lack of forage; and (3) mesquite is a dominant plant in an estimated 93,000,000 acres of land in the southeast (Buffington and Herbel, 1965) and is currently expanding into grasslands (Hennessy et al., 1983).

Creosotebush-tarbush Shrublands. For all the LEIS alternatives except Alternative 5, the direct affects of military activities on the creosotebush-tarbush shrublands have the potential to disturb about 3,370 acres while Alternative 5 could disturb 132,700 acres of this type that have not been previously grazed on McGregor Range (Table 3.8-11). Military activities elsewhere on Fort Bliss have the potential to disturb 13,200 acres of this type in off-road vehicle maneuver areas and 7,000 acres could be affected by fire at the Doña Ana Range–North Training Areas firing range and impact areas. An additional 24,000 acres of this type is currently being affected by grazing on current allotments on McGregor Range. In addition, to

Table 4.8-10. Potential Cumulative Effects of Grazing on Sensitive Species on McGregor Range

Species	*Potential Grazing Effects*	*References*
Sneed pincushion cactus	Not known from McGregor Range but has the potential to occur. Effects of grazing on this species unknown. Sneed pincushion occurs in rocky terrain with sparse grass cover, which may make it less susceptible to impacts from grazing.	Bunting et al., 1980; U.S. Army, 1980b
Night blooming cereus	Not known to occur on McGregor Range but has the potential to occur. May not be susceptible to grazing impacts due to its habit of growing inside the canopy of larger shrubs.	
Grama grass cactus	Species is fairly common on grazed and ungrazed grasslands on Otero Mesa so grazing does not appear to have an impact on this species.	Corral, 1997
Hueco Mountain rock daisy	This species grows in mesic slopes protected from direct sunlight. Its habitat of growing on slopes may protect it from grazing. In addition, grazing does not occur at any known locations or potential habitat in the Hueco Mountains.	U.S. Army, 1991a
Alamo beard tongue	This species grows in rocky canyon bottoms and on cliffs, which would likely limit its susceptibility to grazing. In addition, grazing does not presently occur at any known locations or in potential habitat in the Hueco Mountains.	U.S. Army, 1991a
Texas horned lizard	This species was equally common in grazed and ungrazed habitat in Texas and tended to be more common in lightly grazed versus heavily grazed habitat in Arizona.	Fair and Henke, 1997; Jones, 1981
Black tern	The black tern is an occasional migrant on McGregor Range and grazing is not expected to affect this species.	
Bald eagle	Grazing occurs in the pinyon pine/juniper habitat but is not expected to affect bald eagle use of this habitat.	
Ferruginous hawk	Grazing may benefit migratory and wintering ferruginous hawks on McGregor Range by making prey more accessible. Studies in the Northern Great Plains have shown that this species responded positively to grazing. Other studies have shown that this species does not respond positively or negatively to grazing.	Lehman and Allendorf, 1987; Saab et al., 1995; Bock et al., 1993
Aplomado falcon	Studies comparing potential aplomado falcon habitat on Otero Mesa with occupied territories in the Chihuahuan Desert in Mexico show that the percent grass cover and prey species biomass are less on Otero Mesa. This reduced cover and prey base and, therefore, reduced capacity to support the aplomado falcon may be the result of heavier livestock grazing on Otero Mesa, but could be related to other factors such as different soils at the two sites or precipitation patterns.	U.S. Army, 1997k; Montoya et al., 1997
American Peregrine falcon	This species occurs only as a sporadic migrant on McGregor Range so grazing would not affect it.	U.S. Army, 1980a
Mountain plover	Although the mountain plover has not been observed on Fort Bliss, grazing in its potential grassland habitat on Otero Mesa may improve the habitat since this species prefers open areas such as created by fires, prairie dogs, or over grazing in sacrifice areas such as around stock tanks.	Knopf and Miller, 1994; Miller and Knopf, 1993; Sager, 1996
Mexican spotted owl	Given the marginal nature of Mexican spotted owl habitat on McGregor Range and the apparent infrequent use of this area, grazing is not expected to affect this species.	U.S. Army, 1996k; U.S. Army, 1991b
Loggerhead shrike	This species is common and widespread on McGregor Range including grazed areas. Other studies indicate that this species has a positive response or no response to grazing.	Saab et al., 1995

Table 4.8-10. Potential Effects of Grazing on Sensitive Species on McGregor Range (Continued)

Species	*Potential Grazing Effects*	*References*
Willow flycatcher	The willow flycatcher is an occasional migrant on McGregor Range and grazing would not affect this species.	
Bell's vireo	Bell's vireo is an occasional migrant on McGregor Range and grazing would not affect this species.	
Piping plover	The piping plover is a very rare migrant on McGregor Range and grazing would not affect this species.	
Burrowing owl	Grazing may benefit burrowing owls by increasing prey availability and reducing litter in its grassland habitat. Studies have shown that this species responds positively to grazing including heavy grazing.	Bock et al., 1993; Saab et al., 1995
Gray vireo	This species is not known to nest on McGregor Range although potential breeding habitat occurs in the pinyon pine/juniper habitat in the Sacramento Mountains foothills. If this species were to breed in this habitat, grazing is not expected to affect it.	
Baird's sparrow	This species occurs in dense tall grasslands swales on Otero Mesa dominated by tobosagrass and black and blue grama. It was not observed in grassland swales that had been heavily grazed so heavy grazing may have a negative impact on this species.	U.S. Army, 1997m
Varied bunting	The varied bunting is an occasional migrant on McGregor Range and grazing would not be expected to affect this species.	
Black-tailed prairie dog	Grazing may be a positive influence for the black-tailed prairie dog because it maintains the open habitat preferred by this species.	
Gray-footed chipmunk	Current levels of grazing in the wooded habitat used by this species in the Sacramento Mountains foothills is not expected to affect this species.	
Bats	Areas such as cracks and crevices in the Otero Mesa escarpment used by bats would not be accessible to livestock. The effects of grazing on areas used by bats is not clear. The development of stock tanks has likely benefited bats by increasing the quantity and distribution of water for bats in arid environments.	Chung-MacCoubrey, 1996

the 7,000 acres mentioned above, fire could affect additional creosotebush-tarbush shrublands. Based on this analysis, implementation of LEIS alternatives 1, 2, 3, 4, and 6 could have a cumulative effect on about 47,600 acres of this type while Alternative 5 could affect 176,900 acres.

Off-road vehicle maneuvers in creosotebush-tarbush shrublands may result in a reduction in percent ground cover and a change in ground cover species diversity as indicated in Section 4.8.1 and grazing may also result in a reduction in percent ground cover. However, the cumulative impacts of the LEIS alternatives to this type would be negligible because (1) this type would continue to exist in the impact areas although in a somewhat degraded form; (2) there are an estimated 58,750,000 acres of creosotebush and tarbush-dominated lands in the southwestern U.S. (Buffington and Herbel, 1965); and (3) this type has greatly expanded into grasslands during the last century (see Section 3.8.1).

Grasslands. For all the LEIS alternatives except Alternative 5, the direct affects of military activities have the potential to disturb about 7,600 acres of grasslands while Alternative 5 could potentially result in the disturbance of 110,600 acres of grasslands that are currently not grazed on McGregor Range (Table 4.8-11). Military activities elsewhere on Fort Bliss could affect 14,200 acres due to off-road vehicle maneuvers and fire while grazing on existing allotments on McGregor Range has affected approximately 168,000 acres of grasslands. In addition, current military activities on McGregor Range have resulted in

Table. 4.8-11. Cumulative Impacts to Habitat Types From Implementing the LEIS Alternatives

Impact	*Habitat type*		
	Mesquite shrublands (ac)	*Creosotebush shrublands (ac)*	*Grasslands (ac)*
Direct Impacts			
Off-road vehicle	26,800	0	0
FTX	544	1,672	4,192
GAF	0	1,700	3,400
Fire	UNA[a]	UNB[b]	UNC[c]
Grazing (Alternative 5 only)	88,700	132,700	110,600
Totals: *Alternatives 1, 2, 3, 4, 6* *Alternative 5*	 *27,344* *88,700*	 *3,372* *132,700*	 *7,592* *110,600*
Other Activities			
Off-road vehicle - South Training Areas	73,900	5,700	2,100
Off-road vehicle - Doña Ana Range–North Training Areas	185,500	7,500	6,100
Fire	UNA[a]	7,000 +[d]	6,000 +[d]
Grazing [e]	48,000	24,000	168,000
Total	*307,400*	*44,200*	*182,200*
Total Cumulative Impacts			
Alternatives 1, 2, 3, 4, 6	*334,744*	*47,572*	*189,792*
Alternatives 5	*396,100*	*176,900*	*292,800*

[a] UNA–Number of acres burned not known; fire not likely to disturb additional habitat because of low fuel loads.
[b] UNB–Number of acres burned not known; fires not likely to disturb additional habitat in areas of low fuel loads but could spread to new areas under high fuel loads.
[c] UNC–Number of acres burned not known; fires likely to spread to undisturbed areas due to high fuel loads.
[d] Represents number of acres of habitat in Doña Ana Range–North Training Areas firing range and impact areas. Fires elsewhere on Fort Bliss outside McGregor Range could result in more habitat burned.
[e] Represents habitats that are currently grazed in existing allotments on McGregor Range.

fires in grasslands although the number acres is not known. Fires from military activities elsewhere on Fort Bliss could also affect grasslands. It is assumed that the 6,000 acres of grasslands at the Doña Ana Range–North Training Areas firing range and impact areas is susceptible to fires. However, the number of acres susceptible to fire elsewhere on Fort Bliss can not be quantified. Based on this analysis, implementation of LEIS Alternatives 1, 2, 3, 4, and 6 could result in cumulative affects to 189,800 acres of grasslands while Alternative 5 could have cumulative affects on 292,800 acres of grasslands.

Implementation of LEIS Alternative 1, 2, 3, 4, and 6 would have a negligible cumulative impact of grasslands because (1) the impacts of the FTX sites on grasslands is minimal as indicated in Section 4.8-1; (2) approximately 10 to 20 percent of the 3,400 acres of grassland that would be used for the GAF tactical target complex would be disturbed and the remainder with continue as grasslands (USAF, 1998); (3) grazing on 168,000 acres on current allotments on McGregor Range would continue to be managed by the BLM which would ensure the continued existence of the grasslands; and (4) grasslands on Fort Bliss typically recover from military-related and natural fires within 1 to 3 years. Implementation of LEIS

Alternative 5 has the potential to result in adverse cumulative impacts to grasslands because approximately 110,600 acres of grasslands that have not been grazed for decades could be grazed under this alternative. This adverse cumulative impact would occur because (1) grazing could result in the conversion of grasslands to shrublands as indicated in Section 4.8.5; (2) grazing could result in an overall reduction in vegetative cover and a decrease in percent cover of black grama as indicated previously in Section 4.8.7.2; and (3) grazing could have a negative impact on a 123,500-acre tract of black grama/blue grama grassland on and below the Otero Mesa escarpment that has made a significant recovery from grazing (U.S. Army, 1997b); this tract is important because black grama grasslands have been much reduced since the 19th century (see Section 3.8.1).

Arroyo-riparian Drainages. For all LEIS alternatives except Alternative 5, 9.5 miles of arroyo-riparian drainages (Waters of the U.S.) would be potentially affected by military activities while under Alternative 5, hundreds of miles of arroyo riparian drainages in the previously ungrazed portion of McGregor Range could be affected by grazing. Military activities elsewhere on Fort Bliss could affect arroyo-riparian drainages in the off-road vehicle maneuver area on the South Training Areas and Doña Ana Range–North Training Areas as well as on the Doña Ana Range–North Training Areas firing ranges and impact areas. In addition, livestock grazing on the current allotments on McGregor Range has affected hundreds of miles of additional arroyo-riparian drainages and swales. Also, military activities on McGregor Range and elsewhere on Fort Bliss would result in fires that could affect additional arroyo-riparian drainages. This includes swales in the grasslands of Otero Mesa and arroyo-riparian drainages in the firing ranges and impact areas on Doña Ana Range–North Training Areas. Based on this analysis, the implementation of the LEIS alternatives would result in the cumulative affects to hundreds of miles of arroyo-riparian drainages.

Implementation of LEIS Alternatives 1, 2, 3, 4, and 6 would have adverse cumulative impacts on arroyo-riparian drainages because, as indicated in Section 3.8 and Appendix D, these drainages provide important wildlife habitat that is (1) used by neotropical migrants moving across the Chihuahuan Desert; (2) used to a greater degree by breeding birds than adjacent uplands; (3) harbors a greater abundance and diversity of rodents then the surrounding uplands; and (4) is important for some sensitive bird species that migrate through and winter on McGregor Range. Implementation of Alternative 5 would have significantly adverse impacts on arroyo-riparian drainages because many more miles of arroyo-riparian drainages would be impacted when compared to the other alternatives. In addition, these drainages have not been grazed for many years and provide excellent wildlife habitat.

Sensitive Species. The determination of species to include in the sensitive species cumulative impacts analysis followed the same criteria used for the vegetation/wildlife habitat cumulative impacts analysis. That is, if a sensitive species occurred or had the potential to occur in habitats that would be directly impacted by military activities on McGregor Range, and if other activities had the potential to impact these species, then it was assessed in this cumulative impacts analysis. For example, as indicated above, implementation of the LEIS alternatives have the potential to result in cumulative impacts to grasslands so sensitive species (e.g., Baird's sparrow and prairie dog) or potential sensitive species habitat (e.g., aplomado falcon and mountain plover) that occur in this habitat type on McGregor Range were included in the cumulative impacts analysis. Conversely, sensitive species that occur in habitats not impacted on McGregor Range (e.g., wintering bald eagles in the pinyon pine-juniper habitat in the Sacramento Mountains foothills) or species that occur elsewhere on Fort Bliss in habitats not affected on McGregor Range (e. g., potential peregrine falcon nesting habitat and Mexican spotted habitat in the conifer habitats in the Organ Mountains) are not considered in this impacts analysis. Other sensitive species that occur on Fort Bliss that are not considered were species endemic to the Organ Mountains on the Doña Ana Range–North Training Areas or species that occur very sporadically on McGregor Range during migration. Also, certain species that have the potential to occur but have not been recorded on McGregor Range are

not included in this analysis. Based on this, 11 sensitive species may be affected by cumulative impacts (Table 4.8-12).

Table 4.8-12. Sensitive Species Status Regarding Cumulative Impacts Analysis

Species	*Habitat*
Species Not Included in Cumulative Impacts Analysis	
Bald eagle Gray-footed chipmunk	Known to occur on McGregor Range but principal habitat not directly impacted.
Sneed pincushion cactus Alamo beard tongue Hueco Mountain rock daisy Los Olmos tiger beetle Mottled rock rattlesnake Mexican spotted owl	Species not known to occur on McGregor Range. Potential habitat occurs but unlikely to be directly impacted.
Mountain short-horned lizard Bats	Status and/or habitat unknown.
Interior least tern Peregrine falcon Willow flycatcher Piping plover Black tern White-faced ibis Northern goshawk Costa's hummingbird Varied bunting Bells' vireo Gray vireo	Known to occur on McGregor Range as rare to occasional migrants.
Species Included in the Cumulative Impacts Analysis	
Night blooming cereus Sand prickly pear Northern aplomado falcon Mountain plover	Not confirmed on McGregor Range but potential habitat occurs in direct impact areas.
Grama grass cactus Texas horned lizard Ferruginous hawk Western burrowing owl Loggerhead shrike Baird's sparrow Arizona black-tailed prairie dog	Known to occur on McGregor Range in direct impact areas.

Species Not Confirmed From McGregor Range. The night blooming cereus and sand prickly pear occur in the mesquite-sandsage coppice dune type on or near the Doña Ana Range–North Training Areas and have the potential to occur in this habitat type on McGregor Range (see Section 3.8.4). The potential for cumulative impacts to these species for all LEIS alternatives is negligible because (1) there is only one known population of the night blooming cereus on Fort Bliss and the sand prickly has not been observed on Fort Bliss, (2) these species are not known to occur in areas of military activities on McGregor Range, (3) these species were not been observed during recent sensitive species surveys on Fort Bliss (U. S. Army, 1998h), and (4) the night blooming cereus was not observed during surveys at the alternate tactical target complex in the Tularosa Basin (USAF, 1998).

There have been no confirmed observations of the northern aplomado falcon on Fort Bliss although excellent to good potential grassland habitat occurs on McGregor Range and good to marginal habitat occurs on Doña Ana Range–North Training Areas and McGregor Range (see Section 3.8.4) (U. S. Army, 1997j). Implementation of the LEIS alternative has the potential to result in adverse cumulative impacts to aplomado potential habitat on McGregor Range because (1) an increase in military activities in terms of weapons firing may result in an increase in fires in potential falcon habitat (see Section 4.8.1); (2) grazing in current allotments on McGregor Range may have reduced to capacity of the potential habitat to support aplomado falcons (see Section 3.8.4 and Section D.4 in Appendix D); and (3) under LEIS Alternative 5, approximately 110,600 acres of previously ungrazed grasslands may be grazed which could reduce its capacity to support aplomado falcons (see Section 3.8.4 and Section D.4 in Appendix D).

The mountain plover has not been observed on Fort Bliss in recent years although potential habitat occurs principally on Otero Mesa on McGregor Range (see Section 3.8.4). Implementation of the LEIS alternatives would not have a negative cumulative impact and may possibly have a positive cumulative impact on the mountain plover potential habitat on McGregor Range because (1) the potential for increased fire frequency from increased military activities may create more open and short-grass habitat preferred by this species (see Sections 3.8.4 and D.4 in Appendix D); (2) heavy grazing around stock tanks in currently grazed allotments has crested open ground preferred by the mountain plover; (3) grazing elsewhere in currently used allotments creates more open habitat preferred by this species; and (4) under LEIS Alternative 5, grazing in 110,600 acres of currently ungrazed grasslands on McGregor Range may improve this habitat for the mountain plover.

Species Recorded From McGregor Range. Seven sensitive species occur on McGregor Range in habitats potentially subject to cumulative impacts (Table 4.8-12). Of these species, the Texas horned lizard, ferruginous hawk, western burrowing owl, loggerhead shrike, and Arizona black-tailed prairie dog would be subject to negligible negative cumulative impacts or, possibly, positive cumulative impacts from implementation of the LEIS alternatives. This is so because (1) the potential for an increase in the frequency of fire due to an increase in military activities may open up the habitat or make prey species more accessible (see Table 4.8-1) and (2) these species respond positively or have no response to grazing (see Table 4.8-10).

The grama grass cactus occurs in the grasslands of Otero Mesa and as indicated in Section 3.8.4, recent studies have shown that it is much more common on Otero Mesa then once thought. Implementation of the LEIS alternatives would result in no cumulative impact to this species because (1) it is much more common then originally thought and (2) it appears to be compatible with grazing because it occurs in currently grazed lands on Otero Mesa. As indicated on Table 4.8-1, this species would be susceptible to mortality from fire and its ability to recover from fire is not known. However, since this species is common on Otero Mesa, the potential cumulative affects of fire would likely be negligible.

Baird's sparrow is associated with grassland swales on McGregor Range which it uses as winter and migration habitat (see Sections 3.8.4 and D.4 in Appendix D). Implementation of the LEIS alternatives would result in adverse cumulative impacts to the Baird's sparrow because (1) the potential increase in the frequency of fires due to increased military activities on McGregor Range may have a negative impact on the thick grassland habitat used by this species; (2) current grazing on Otero Mesa on McGregor Range has reduced the ability of some swales to support this species (see Table 4.8-4) (U. S. Army, 1997l); and (3) under LEIS Alternative 5, grazing may reduce to ability of swales in currently ungrazed portions of McGregor Range to support the Baird's sparrow.

4.8.8 Mitigation

No mitigation measures are required for the effects of the congressional decision regarding alternative configurations of this withdrawal action on biological resources.

4.8.9 Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of biological resources would occur.