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**DRAFT**

# Muleshoe Ecosystem Management Plan and Environmental Assessment





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# EXECUTIVE SUMMARY

## BACKGROUND

The Muleshoe Ecosystem is located in the Galiuro Mountains in southeastern Arizona within northern Cochise County and southern Graham County. The Ecosystem planning area encompasses the Muleshoe Cooperative Management Area (CMA) which is jointly managed by the Bureau of Land Management (BLM), Forest Service (FS), and The Nature Conservancy (TNC). The 57,500 acres comprise major portions of the Redfield, Hot Springs, and Cherry Springs watersheds. Included within the planning boundary are the Redfield Canyon Wilderness and Hot Springs Watershed Area of Critical Environmental Concern (ACEC), administered by the BLM, and a portion of the Galiuro Wilderness, administered by the FS.

The Bureau of Land Management (BLM) brought together an interdisciplinary team of resources specialists from the BLM, Arizona Game and Fish Department (AGFD), FS, TNC, Soza Mesa Ranch, Saguaro-Juniper Association, and Bayless and Berkalew Company to prepare a plan for the Muleshoe Ecosystem. The team members owned or managed land or resources within or adjacent to the Muleshoe Ecosystem and shared the common goal of restoring and enhancing the resources and ecological processes of the Muleshoe Ecosystem through cooperative effort.

Additional public participation came from an open house, scoping mailing, and several field trips.

The Muleshoe Ecosystem Management Plan (EMP) will become the primary guide for management of all BLM administered public lands (including wilderness) within the Muleshoe Ecosystem. This plan also provides management guidance for TNC private lands within the CMA. Although the USFS had already developed plans for the Galiuro Wilderness, their participation was important for achieving consistency in management of the two adjoining wilderness areas. The Muleshoe EMP includes interdisciplinary activity planning for the Redfield Canyon Wilderness, Hot Springs ACEC,

Soza Mesa and Muleshoe Allotments, wildlife habitat, recreation and cultural resources.

## ECOSYSTEM MANAGEMENT APPROACH

Ecosystem management can be defined simply as keeping natural environments healthy, diverse, and productive so people can benefit from them year after year. The ecosystem management approach means identifying limits to use and development of the land's resources and managing within those limits in order to ensure the long-term health, biodiversity, and productivity of the environment. For some areas, it also means trying to restore damaged land to a healthy condition. Ecosystem management recognizes that natural systems must be sustained in order to meet the social and economic needs of future generations.

The ecosystem management approach for the Muleshoe Plan had several major steps. Since ecosystems do not stop at traditional boundary lines, the first step was to look across boundaries and develop an active partnership between public and private interests to work on the plan. This was accomplished by bringing together the inter-agency and interdisciplinary team. The next step was to use inventory data and the best scientific information available to determine existing and potential resource conditions and current and future potential impacts on the resources of the ecosystem. The team then used this information in subsequent steps including development of a vision and goals, consolidation of planning issues, and development of resource objectives and management actions to respond to the issues. The team also developed monitoring and an evaluation schedule to track progress in achieving the objectives.

## PROPOSED PLAN

The proposed action provides for the protection and enhancement of ecosystem resources, processes and function including riparian and

upland vegetation, wildlife, wilderness, cultural and social environment values while allowing for compatible levels of use. Six resource objectives were developed by the planning team and management actions were prescribed to achieve them. A monitoring schedule was developed to track progress in achieving the objectives. Informal evaluations of the plan will be conducted annually and formal evaluations will be conducted at least every five years.

### 1. Riparian Objective

The objective for the riparian areas on the Muleshoe is to achieve or maintain proper functioning condition and high seral ecological states for the riparian vegetation. In this condition, the riparian areas will support a diversity of native riparian vegetation with all age classes of woody riparian vegetation well represented, will have dense vegetation with structural complexity, will support a diversity of aquatic habitats including pools, runs, and riffles, and will have natural processes working near optimum in this zone of the ecosystem. **The** objective recognizes **the** dynamic nature of riparian areas by specifying that the areas recover to desired conditions within 5 years of any major flood that decreases the tree density by at least 1/3 through scouring and removal.

Proposed actions to achieve the riparian objective include pursuing instream flow water rights, removing non-native vegetation, implementing closure of Hot Springs Canyon riparian area to vehicles, eliminating livestock grazing in riparian areas, designating Bass Canyon as a day use area, ensuring that recreation activities in riparian areas do not cause adverse impacts to stream bank stability, and prohibiting commercial collection of plant materials or wood-cutting in riparian areas. Casual uses and traditional use collecting by native Americans will be allowed. Prescribed fire units will include riparian areas, but special practices will be used to avoid burning them except for small experimental areas.

### 2. Upland Objective

For the Muleshoe portion of the planning area, the upland objective is to improve watershed

conditions and wildlife habitat by converting shrub-invaded grassland to more open, denser stands of grass with mid-tall statured perennial grasses replacing annual or short growth forms of perennial grasses. For the Soza Mesa portion of the planning area, the upland objective is to maintain current high and potential natural community (PNC) range conditions and to improve mid condition range to high or PNC.

Proposed actions to achieve the upland objective include implementation of a prescribed fire program and livestock grazing management. Livestock management actions include reducing the size of the Muleshoe Allotment to exclude riparian areas, placing the grazing on the remaining area of the allotment in Pride Basin in nonuse until desired upland vegetation conditions are achieved and then constructing necessary range improvements when grazing is resumed. In addition, active grazing will continue on Soza Mesa under a rotational grazing plan, and the necessary range improvements will be cooperatively developed.

### 3. Fish and Wildlife Objective

The fish and wildlife objective is to maintain and enhance the biological diversity of the Muleshoe Ecosystem by re-establishing extirpated native species to the Muleshoe and by supplementing or extending the ranges of existing native species on the Muleshoe.

Proposed actions to achieve the fish and wildlife objective include evaluating habitat potential for reintroduction, reestablishment, range extension or supplementation of fish and wildlife including several native fish species, bighorn sheep, and turkey. Where habitat potential is present, the appropriate action will be pursued using AZGFD established procedures. Other actions include inventory for exotic aquatic species and removal of any exotics which are threatening native aquatic species and inventory of natural and artificial water sources to assess the adequacy of permanent water for wildlife.

### 4. Cultural Resources Objective

The objective for cultural resources (prehistoric



and historic sites and artifacts as well as Native American traditional use plants) is to protect and preserve them on the planning area while making them available for scientific, public, and sociocultural uses.

Proposed actions to achieve the cultural objective include conducting a class III inventory of the planning area, completing an ethnoecology study of planning area, posting regulatory and interpretive signs about cultural resources, classifying traditional use plants and areas, reating a partnership education program with universities, fencing livestock out of significant cultural sites and pre-treating cultural sites that could be impacted by prescribed burns.

## **5. Wilderness Objective**

The wilderness objective is to maintain and improve wilderness values of naturalness and outstanding opportunities for solitude and primitive, non-motorized types of recreation in the Galiuro Wilderness and Redfield Canyon Wildernesses.

Proposed actions to achieve the wilderness objective include placing wilderness boundary signs, limiting group size to 15 persons, removing unnecessary range improvements, providing for wildlife operations in wilderness including annual surveys and maintenance and development of waters, attempting to acquire wilderness inholdings if they become available, and limiting prescribed burns in wilderness to those occurring by natural ignitions.

## **6. Social Environment Objective**

The social environment objective is to maintain or improve the current range of open-space recreation opportunity settings (rural, semi-primitive motorized, semi-primitive non-motorized and primitive) that provide existing recreational activities on the Muleshoe.

Proposed actions to achieve the social environment objective include developing pullouts along Jackson Cabin road, constructing visitor kiosk with sign in station at beginning of Jackson Cabin road, developing informational recreational brochures, maintaining and improving hunting opportunities, pursuing legal public access as identified in Safford RMP, implementing road closures in the Safford RMP, and maintaining Jackson Cabin and Soza Mesa roads to 4x4 standard.



# I. INTRODUCTION

The Muleshoe Ecosystem is located in the Galiuro Mountains in southeastern Arizona within northern Cochise County and southern Graham County. The **Muleshoe** Ecosystem planning area boundary (Figure 1) encompasses the Muleshoe Cooperative Management Area (CMA) boundary. The CMA is jointly managed by the Bureau of Land Management (BLM), Forest Service (FS), and The Nature Conservancy (TNC) through a Cooperative Management Agreement. Within the planning area boundary are private lands on Soza Mesa and private and state lands that are within the boundary of the Redfield Canyon wilderness.

The planning area includes approximately 26,500 acres of BLM public lands, 22,000 acres of FS lands, 6,000 acres of private lands and 3,000 acres of Arizona state lands. These lands comprise major portions of the Redfield, Hot Springs, and Cherry Springs watersheds. Included within the planning boundary are the Redfield Canyon Wilderness and Hot Springs Area of Critical Environmental Concern (ACEC), administered by the BLM, and a portion of the Galiuro Wilderness, administered by the FS.

In 1982, TNC purchased the Muleshoe Ranch and its grazing leases to protect and manage its riparian areas and associated aquatic, plant, and animal communities. A land exchange in 1986 allowed the BLM to acquire the state lands of the Muleshoe. The Muleshoe CMA was established through the signing of a Cooperative Management Agreement by the BLM, FS and TNC in 1988. The FS Galiuro Wilderness was originally designated by Congress in 1964 and was enlarged in 1984. The Redfield Canyon Wilderness was designated by Congress in November 1990. The Hot Springs Watershed ACEC was designated through the Safford Resource Management Plan in 1994 in order to provide special management for the significant riparian resources in the Hot Springs watershed.

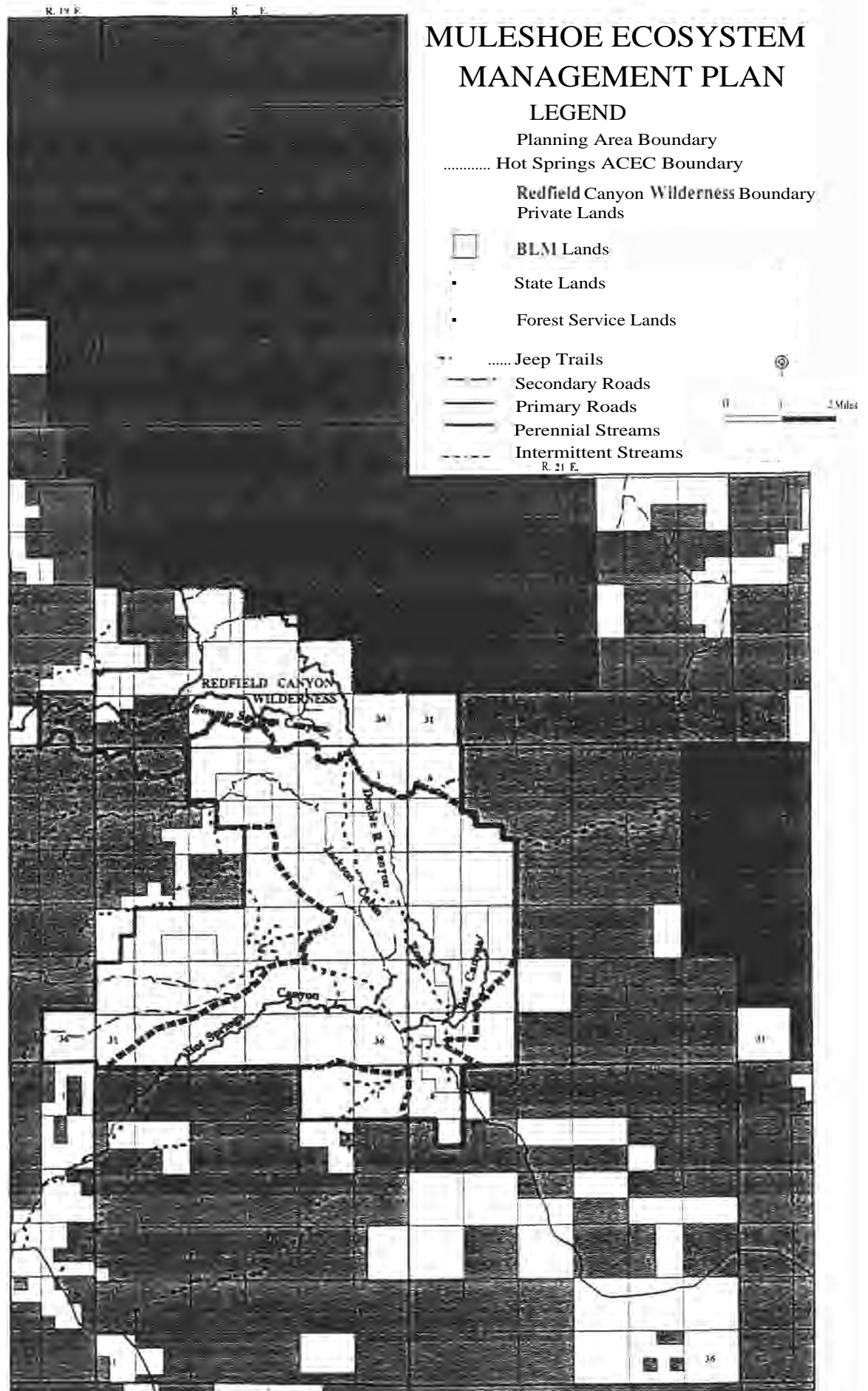
To eliminate duplicate planning efforts and increase efficiency, the Muleshoe Ecosystem Management Plan (EMP) includes interdisciplinary activity planning for all BLM lands within the planning area including the Redfield Canyon Wilderness, Hot Springs **ACEC**, and the Soza Mesa Allotment. The Muleshoe EMP functions as the BLM's Redfield Canyon Wilderness Plan, Hot Springs Watershed ACEC Plan, Muleshoe And Soza Mesa Allotment Management Plans, and as the Habitat Management Plan, Recreation Activity Plan and Cultural Resources Activity Plan for the Muleshoe. The Muleshoe EMP also prescribes management for TNC lands within the CMA.

When the ecosystem planning process began, the Forest Service's Safford Ranger District had in place plans which covered the Galiuro Wilderness including a Wilderness Implementation Schedule. Therefore, a primary purpose of the FS involvement was coordination to ensure as much consistency as possible in management of the adjoining BLM and FS wilderness areas. The Muleshoe EMP does not prescribe new management actions for FS lands.

The Arizona Game and Fish Commission has responsibility for the conservation and management of all wildlife species of the State of Arizona. The Arizona Game and Fish Department (AGFD) acts under authority of the Commission and represented wildlife resources on the planning team.

The plan was prepared by an interdisciplinary team of resources specialists from the BLM and representatives from AGFD, FS, TNC, Soza Mesa Ranch, Saguaro-Juniper Association, and Bayless and Berkalew Company (Appendix 1). The team developed a vision statement, reviewed and consolidated planning issues, and developed resource objectives and management actions to respond to the issues. The team also developed a monitoring program and evaluation schedules to track progress in achieving the objectives.

FIGURE 1

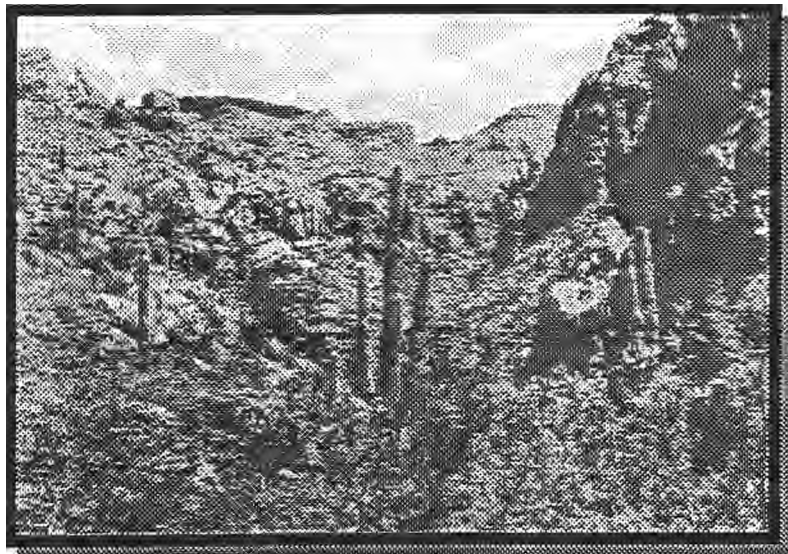


## II. ECOSYSTEM MANAGEMENT APPROACH

Ecosystem management can be defined simply as keeping natural environments healthy, diverse, and productive so people can benefit from them year after year. The ecosystem management approach means identifying limits to use and development of the land's resources and managing within those limits in order to ensure the long-term health, biodiversity, and productivity of the environment. For some areas, it also means trying to restore damaged land to a healthy condition. Ecosystem management recognizes that natural systems must be sustained in order to meet the social and economic needs of future generations.

The ecosystem management approach for the Muleshoe Plan had several major steps. Since ecosystems do not stop at traditional boundary lines, the first step was to look across boundaries and develop an active partnership between public and private interests to work on the plan. This was accomplished by bringing together the interagency and interdisciplinary team. The team was composed of public and private land owners and managers within and adjoining the planning area boundary. The planning boundary was based on several factors; watershed boundaries, scope of issues, willingness to participate, and feasibility.

The next step was to use inventory data and the best scientific information available to determine existing and potential resource conditions and current and future potential impacts on the resources of the ecosystem. The resource inventory data is summarized in more detail in the Muleshoe Ecosystem Analysis (BLM Files). This information was then used in several subsequent steps including developing a vision for the area, analyzing issues and developing measurable resource objectives. Next the team looked at what management actions were needed to achieve the resource objectives and resolve issues relating to riparian management, watershed condition, livestock grazing, recreation, access, wilderness, cultural resources, wildlife and mining. Part of this step was also determining the limits on uses which are imposed by the objectives relating to reaching and maintaining a healthy, functioning ecosystem over the longterm. Monitoring was then prescribed to track progress toward achieving the objectives. Finally, a plan evaluation schedule was specified. This step builds flexibility into the plan allowing it to be amended as we learn more about the natural functioning of ecosystems through studies and monitoring. Management can then change as we acquire new knowledge.





# III. PLAN PURPOSE

The purpose of the Muleshoe Ecosystem Management Plan is several fold: to provide management direction for the Muleshoe CMA; implement decisions made in the Safford District RMP; implement multiple use management in a manner that ensures ecosystem health and integrity with an emphasis on riparian and grassland biotic communities; to fulfill the intent of Congress to protect and preserve part of the area for the use and enjoyment of present and future generations as wilderness; and to maintain the character of streams found eligible for status as "wild and scenic" until Congress acts on designation.

## CONFORMANCE TO LAND USE PLANS

The proposed plan is consistent with the approved Safford District RMP and Final Environmental Impact Statement (EIS) (BLM 1994). The Safford RMP directs that a coordinated activity level plan (the Muleshoe EMP) be developed for the Muleshoe (CMA) including the Hot Springs ACEC. The EMP is to be prepared by an interdisciplinary team of BLM resource specialists, landowners, permittees, academia, and representatives of other state and federal agencies with management responsibilities in the planning area. The EMP will propose specific resource allocations and prescriptions for multiple uses to achieve identified resource objectives. Range suitability will be determined through a range evaluation process as part of the resource inventory for the EMP, but suitability will not be used to establish livestock carrying capacity.

The RMP leaves livestock use on the Hot Springs ACEC in suspension pending resource allocations made in the interdisciplinary activity plan. The RMP authorizes livestock use on the new Soza Mesa allotment at an initial stocking rate of 44 cattle yearlong. The RMP directs that watershed conditions in the upland areas of the Muleshoe CMA will be improved by vegetation manipulation and sound range management practices. Prescribed fire will be one of the tools used to achieve the resource objectives for the Muleshoe CMA.

## RELATIONSHIP TO STATUTES, REGULATIONS, OR OTHER PLANS

The proposed plan actions comply with mandates of the Federal Land Policy and Management Act (FLPMA) of 1976 which require the Bureau of Land Management to manage public lands for multiple use on a sustained yield basis.

The Muleshoe EMP includes interdisciplinary activity planning for the Muleshoe CMA including the Redfield Canyon Wilderness, Hot Springs ACEC, and the Soza Mesa Allotment. This approach eliminates the need to develop separate wilderness, ACEC, wildlife habitat, allotment, recreation or cultural activity plans. In the Muleshoe EMP, resource objectives are integrated and management prescriptions include actions to achieve resource objectives as well as constraints to achieve compatible and sustainable levels of public land uses.

Those actions pertaining to the Redfield Canyon Wilderness comply with the Wilderness Act of 1964, the Arizona Desert Wilderness Act of 1990, and are guided by wilderness management policy as outlined in BLM Manual 8560. Those actions relating to cultural resources are managed according to mandates set forth by the National Historic Preservation Act, the Archaeological Resources Protection Act, the Native American Graves and Repatriation Act, management policy specified in BLM Manual 8100, and the Programmatic Memorandum of Agreement between the BLM, Arizona State Historic Preservation Officer (SHPO) and the President's Advisory Council on Historic Preservation. Those actions pertaining to threatened and endangered species management conform to regulations of the Endangered Species Act of 1973 as amended, BLM manual 6840, and relevant Endangered Species Recovery Plans which include the following: The Desert Pupfish Recovery Plan (USFWS 1993), Sonoran Topminnow [Gila and Yaqui] Recovery Plan (USFWS 1984) (soon to be replaced with Gila topminnow revised recovery

plan now in final stages of draft), Spikedace Recovery Plan (USFWS 1991), Loach Minnow Recovery Plan (USFWS 1991), draft lesser long-nosed bat recovery plan, Mexican Gray Wolf Recovery Plan (USFWS 1982), and American Peregrine Falcon Recovery Plan (USFWS 1984). The Muleshoe EMP plan meets the Sikes Act (1974) requirements for a wildlife habitat management plan. The Muleshoe EMP replaces those portions of the Mescal-Dripping Springs Habitat Management Plan (HMP) which applied to lands on the Muleshoe CMA. The Mescal-Dripping Springs HMP directed the agencies to prepare a new, separate HMP for the Muleshoe. Those actions pertaining to range management are consistent with the Eastern Arizona Grazing EIS (1986), conform to provisions of the Taylor Grazing Act of 1934, and meet requirements of the Public Rangeland Improvement Act of 1978. All proposed grazing and rangeland improvement practices conform to the Best Management Practices developed by The Arizona Department of Environmental Quality for grazing activities.



## IV. ECOSYSTEM RESOURCES

The following summaries of resources and conditions relate primarily to BLM and TNC lands within the planning area.

### A. CLIMATE

Average annual precipitation ranges from 10-12 inches along the eastern margin of the lower San Pedro Valley to approximately 16-20 inches on the higher mountain elevations. The annual rainfall is typically distributed in a bimodal pattern with about half falling as intense thunderstorms between July and September, and the other half as frontal, less intense, but longer lasting winter storms between November and April.

Temperatures range from 20 to 110 degrees Fahrenheit. At lower elevations, frost-free days may exceed 300 annually. At higher elevations frost is common at night from December through April. Summers are warm to hot at lower elevations with temperatures above 110 degrees Fahrenheit common.

### B. GEOLOGY

#### Structure and Landscape

Southeastern Arizona was the site of major volcanic activity and tectonic extension (horizontal stretching of the Earth's crust) during mid-Tertiary time between about 17 and 30 million years ago. After the volcanic activity ceased about 17 million years ago, the modern landscape began to take shape. Renewed tectonic extension broke the Earth's crust along northwest-trending faults, forming the Basin and Range physiography of today.

In the Muleshoe Planning Area, one of these northwest-trending faults is the Muleshoe fault just west of the ranch headquarters. Movement on the Muleshoe fault over the last 17 million years has displaced the rocks beneath the Allen Flat basin, on the east side of the fault, downward more than 3200 feet relative to the rocks exposed in the southern Galiuro Mountains to the west. As the

Allen Flat basin subsided, it was filled with sediment eroded from the adjacent Galiuros and from the Winchester Mountains and other ranges to the east.

Tectonic extension has waned in southeastern Arizona over the past 1.5 million years, the basins are not subsiding as rapidly, and through-flowing drainages, such as Hot Springs Canyon, have developed. These streams have begun to cut into the basin-fill sediments and, in places, have eroded to depths of hundreds of feet.

#### Rock Types and Topography

Tertiary volcanics and conglomerates are the predominant rock types in the Muleshoe planning area. These include a wide variety of rock types, from light-colored rhyolites through gray andesites to black basalts. Major mountain ranges are oriented in a northwest-southeast direction and resulted from uplift along parallel fault systems. Valleys are filled with alluvial deposits eroded from the mountain ranges.

The Muleshoe Ecosystem lies within the Basin and Range physiographic province. The topography of much of the Muleshoe is characterized by steep, stony and rocky hills and escarpments as high as 10,000 feet rising from narrow deeply incised canyons. The escarpments diminish on the southern end of the planning area where the topography consists of subdued rolling hills cut by a few deep canyons.

Minimum elevation of the Muleshoe is about 3,250 feet above mean sea level (MSL) at the west end of Redfield Canyon. Steep, rocky mountains rise above the plateaus to an elevation of 7,650 feet above MSL at Bassett Peak.

#### Mineral Potential

The potential for undiscovered resources of gold, silver, and copper is low within the Muleshoe planning area (USGS 1995). Due to differences in geologic histories, the area north of Redfield

Canyon could host gold, silver, and copper vein and replacement deposits associated with the rocks that resulted from volcanic activity in mid-Tertiary time while the area to the south of Redfield Canyon could host porphyry copper and related deposits in older rocks beneath volcanic and sedimentary rocks of Tertiary and Quaternary ages. As yet, no evidence for deposits of this type has been found. It is unlikely that significant resources of gold, silver, or copper will be found in the rocks presently exposed.

### C. SOILS

An "Order 3" soil survey was published for the planning area in 1990 (Norgren, J.A. and Spears, C.F., Order 3 Soil Survey for Aravaipa-Muleshoe Area). The survey identified six soil types (in order of relative abundance): Greyeagle cobbly loam, Bonita-Bonita Variant complex, Arizo-Brazito-Riverwash complex, Caralampi gravelly loam, Arguistolls-Haplustolls complex, and Greyeagle-Eloma complex. The majority of the soils on the planning area are moderately erodible with highly erodible soils found primarily in riverwash bottoms and on remnant stream terraces.

### D. WATERSHEDS

#### Watershed Characteristics

The Muleshoe Ecosystem is drained by two major watersheds, and one minor watershed. All three are tributaries of the lower San Pedro River. Redfield Canyon drains the northern portion of the Muleshoe Ecosystem. The Redfield watershed covers 62.1 square miles with 45.3 square miles on the planning area. Swamp Springs, Bear, Sycamore, Jackson, Mitchell, and Negro canyons are major tributaries to Redfield Canyon. Hot Springs Canyon drains the southern portion of the Muleshoe Ecosystem. The Hot Springs watershed covers 109.4 square miles with 23.9 square miles on the planning area. Wildcat, Bass, N.O., Polecat, Rattlesnake, Redrock, and Davis canyons are major tributaries to Hot Springs Canyon. Double R, Hackberry, Redus, West Fork, East Fork, Rockhouse, and Pine canyons are tributaries to Bass Canyon. The Cherry Spring watershed covers 26.33 square miles with about 14 square

miles on the planning area. The watersheds are steep. The average gradient from the top of Basset Peak, to the lower boundary of the planning area in Redfield Canyon is about 489 feet per mile.

#### Watershed Condition

The soils on the Muleshoe are generally very shallow soils with rock outcrops on ridges and sideslopes. Inventories in 1994 found that approximately 40% of the Muleshoe Allotment is composed of slopes greater than 50%, and that the ground cover averages almost three-fourths rock and gravel (Appendix 3, Table 3-1).

Although the watershed terrain is steep, the amount of bare soil subject to erosion is rather small. Approximately three-fourths of this ground cover has an overstory of protective grass, shrubs, and litter. On the average, only 3% bare soil is exposed to direct raindrop impact (Appendix 3, Table 3-2). While the soils are moderately permeable, they have a low water holding capability (Aravaipa - Muleshoe Soil Survey 1990). Therefore, these steep, rocky slopes will tend to shed water quickly, producing high volumes of runoff during storm events. These high peak flows tend to scour wash bottoms and creek channels rather than deposit sediments.

Watershed condition in the BLM managed portions of the Redfield Canyon and Hot Springs watersheds has been classified as fair (BLM, Safford District RMP, Management Situation Analysis, 1989). Local residents have expressed concerns about flood peaks damaging riparian terraces in lower Hot Springs and lower Redfield Canyon at the confluences with the San Pedro River. Increasing the vegetative cover of perennial grasses in the upland areas could help slow the runoff, which should also help attenuate peak flows in the lower reaches of the streams. The Hot Springs Canyon watershed contributes a significant portion of base flow to the lower San Pedro River (Arizona Department of Water Resources 1991; Braun and Maddock 1992). Good watershed management on the CMA helps to ensure delivery of high quality water into the San Pedro River.

## Stream Flows

There are seven perennial streams on the Muleshoe Ecosystem with over 23 miles of perennial water (Table 1). There are 10.1 miles of perennial stream on the Redfield watershed, 12.5 miles on the Hot Springs watershed, and 0.7 miles on the Cherry Springs watershed.

Stream flow sampling is conducted to support water rights applications for instream flow and to provide resource information. Stream flows are taken monthly at Upper and Lower Hot Springs, Bass, and Wildcat canyons. Flows have been taken irregularly on Swamp Springs and Redfield canyons. Stream flow data collected thus far indicate flows are highly variable with season and seem to exhibit a flashy response to moderate and significant precipitation events. Base flow may become interrupted in dry summer months.

## Water Quality

Water quality monitoring is conducted to evaluate progress in reducing soil erosion and non-point source pollution, in maintaining and enhancing water quality at or above established standards for designated use and to assess improvement in watershed conditions from management such as prescribed fire. Water quality samples for laboratory analysis were collected annually beginning in the late 1980s at single sites in Redfield, Bass, and Hot Springs canyons and have since been discontinued. Hot Springs had one violation for fecal coliform and Redfield had three noted violations (chromium exceeded state standards twice and fecal coliform once) during this sampling period. All three streams have high water quality and appear to be good candidates for nomination as Unique Waters under the state-approved program.

**TABLE 1**  
Perennial Stream Lengths, Ownership, and Average Flows

Stream	Reach Length in Miles				Average Flow CFS
	BLM	STATE	PVT.	TOTAL	
Hot Springs	4.5	0.0	0.6	5.1	5.4
Bass	0.5	0.0	2.4	2.9	3.02
Double R	0.0	0.0	3.6	3.6	N/A
Wildcat	0.9	0.0	0.0	0.9	0.08
Redfield	0.6	3.0	3.9	7.5	3.9
Swamp Springs	2.2	0.4	0.0	2.6	N/A
Cherry Springs	0.0	0.0	0.7	0.7	N/A
<b>Total</b>	<b>8.7</b>	<b>3.4</b>	<b>11.2</b>	<b>23.3</b>	

## Water Rights

In 1988, the BLM Safford District filed applications for instream flow permits for Hot Springs and Swamp Springs canyons with the Arizona Department of Water Resources (ADWR). A permit was issued for Hot Springs Canyon in 1992. The BLM must continue to collect data on Hot Springs until 1996 in order to receive a

certificate of water right. Due to **the remoteness of** Swamp Springs, few flow measurements in support of the instream flow application have been **taken**.

Following congressional designation of the Redfield Canyon Wilderness, the **BLM** filed a Federal Reserve Water Right in 1990, and a Statement of Claimant for the Gila River Basin

Adjudication. The Federal Reserve Right claims a total of 1659.06 acre feet per year for springs, seeps, tanks, and streams. The Nature Conservancy filed an instream flow application for their reach of lower Hot Springs Canyon in December 1989 and received a certificate in May 1994 (Appendix 3, Table 3-3).

#### Water Sources and Developments

Permanent springs occur in Redfield, Swamp Springs, Hot Springs, Bass, Double R, Wildcat, and Cherry Springs canyons. There are also several perennial springs along the mid-lower slopes of the Galiuro escarpment. Many of the wells are non-operational. There are two bighorn sheep developments within the Redfield Canyon Wilderness. A complete water sources inventory is needed for the planning area. A complete list of the known natural and developed water sources can be found in the Muleshoe Ecosystem Analysis (BLM Files).

#### E. AIRSHED CLASSES AND CONDITIONS

Because of its remote location and relatively high elevation, the air quality of the Muleshoe Ecosystem is excellent. The Redfield Canyon Wilderness and other public lands are a Class II airshed. The Galiuro Wilderness is a Class I airshed. The nearest source of urban air pollution is Tucson which is 32 miles west. The copper smelter at San Manuel, a potential source of sulfur dioxide pollution, is about 20 miles northwest and agricultural fields around Willcox, potential sources of dust pollution, are 16 miles east. These may influence air quality depending on wind direction. Wind generally comes from the west or northwest in winter and west or southwest in summer. The FS maintained a photographic air quality monitoring station in the Galiuro Wilderness from April 1985 to November 1987 and from December 1988 to September 1992 to monitor impacts from the smelter at San Manuel. Data collected during these periods indicate high visibility ratings with only occasional haze.

#### F. VEGETATION

The Muleshoe Ecosystem is located primarily within the Southeastern Arizona Basin and Range

Major Land Resource Area (MLRA) in the 12 to 16-inch precipitation zone. The western end of Hot Springs Canyon is in a transitional zone where the Central Arizona Basin and Range MLRA extends upstream along the San Pedro River into the Southeastern Arizona Basin and Range MLRA, blending the Upper Sonoran Desert Scrub and Chihuahuan Semidesert Grassland biotic communities.

Anderson, Warren & Reichenbacher (1985) mapped five major vegetation communities from 14 vegetation associations on the Muleshoe Ecosystem: Sonoran desert scrub, desert grassland/semi-desert shrub land, broadleaf deciduous woodland (riparian), evergreen woodland/chaparral, montane forests and woodlands. The lower elevation mesa tops and hotter south- and west-facing slopes are dominated by Sonoran desert scrub with creosote bush, palo verde, diverse shrubs and saguaro. Mid-elevations have semi-desert grassland/scrub communities consisting of open stands of evergreen and deciduous trees such as mesquite and hackberry with an understory of native perennial grasses such as sideoat grama and curly mesquite and with varying levels of shrubs such as acacias, amole, snakeweed and burroweed. Riparian areas support large broad-leaved deciduous forests of sycamore, cottonwood, willow, walnut, ash, and white oak. Mesquite bosques line higher terraces above the floodplain. Steeper slopes at middle and upper elevations support evergreen woodlands of Mexican blue oak and juniper, and, on north slopes, a mixed chaparral with species typical of Sierra Madrean vegetation. The highest elevations of the planning area support montane forests and woodlands consisting of open stands of evergreen trees such as Arizona cypress, pinon pine, and ponderosa pine with dense understories of evergreen chaparral shrub species such as manzanita, buckbrush, and snowberry.

#### Ecological Sites

An ecological site (range site) is a unit of land in a specific environmental zone that is capable of supporting a native plant community typified by an association of plant species that differs from other ecological sites in the kind or proportion

of species. In terms of vegetation, it expresses the potential vegetation, or what could grow, not necessarily what grows there now. The potential vegetation may differ greatly from the existing plant community, or from the original or pristine vegetation, which may have changed due to long-term environmental variation or past management practices.

The criteria for delineating ecological sites are based on certain physical characteristics, not vegetation. The primary characteristics include topographic position and percent slope, soils and parent geologic material, precipitation, and elevation.

To evaluate an individual ecological site it is necessary to conduct a condition analysis. The ecological condition rating compares the similarity of the existing vegetation to the potential of which it is capable, or to the desired condition expressed in a management objective. Range condition is typically described by four condition classes of excellent, good, fair, or poor as compared with the potential vegetation community for the site. In this analysis ecological condition is also described by four classes: Low, Mid, High, and Potential Natural Community (PNC). The rating is based on the comparison of the existing vegetation community to the PNC. The higher the correlation to PNC, the higher the ecological rating.

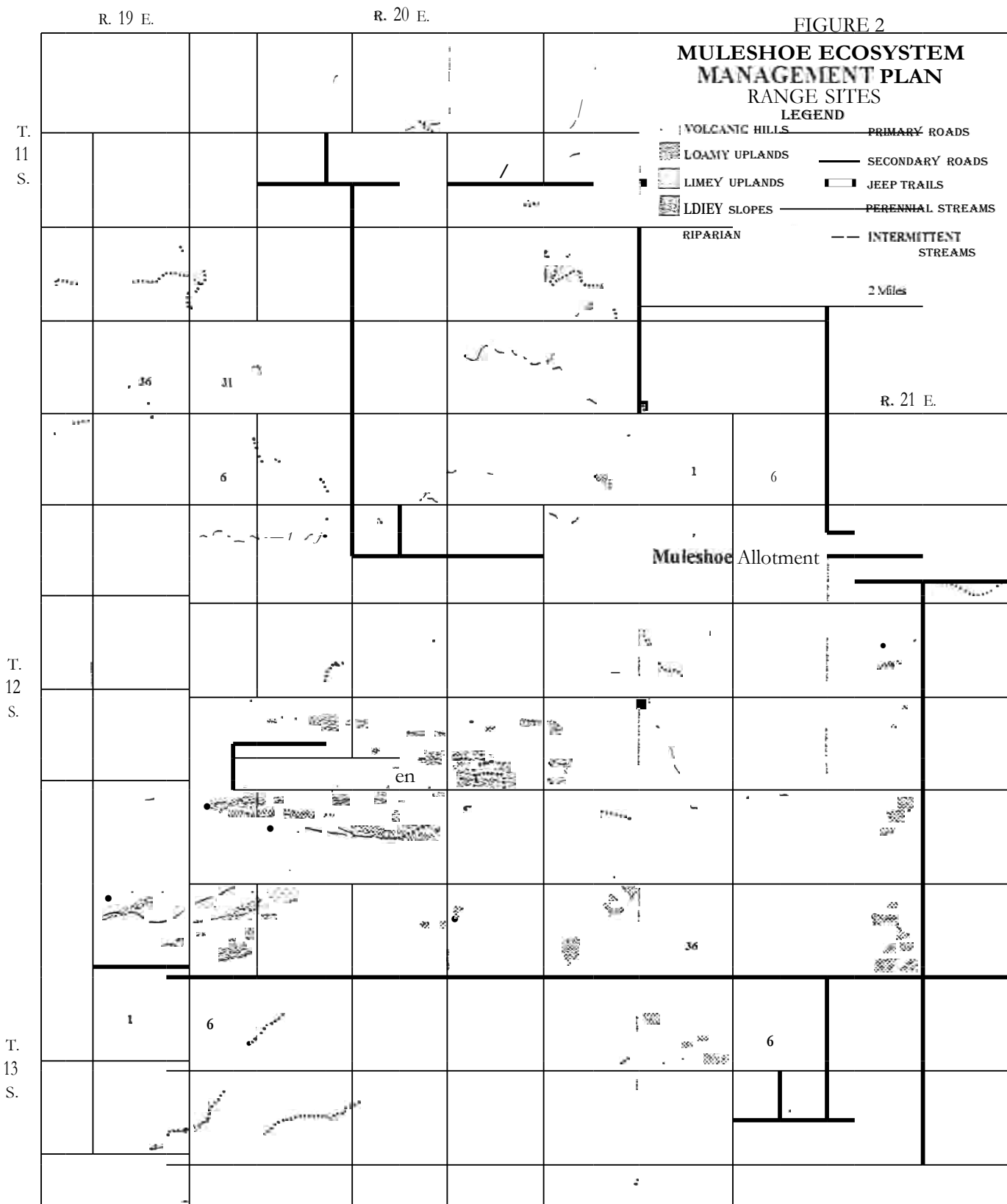
The ecological sites on the Muleshoe CMA east of Soza Mesa are predominately volcanic and granitic hills range sites (92%) (Figure 2). These sites occur on hill slopes and ridge tops with slopes ranging from 15-70%. The soils are shallow and formed primarily on basic igneous rocks and related conglomerates. They are non-calcareous, clay loam to clay textured, with well developed covers of cobbles, gravels, and stones. Numerous areas of rock outcrop occur intermingled with soil areas. Plant-soil moisture relationships are good.

The potential plant community on these ecological sites is dominated by warm season perennial grasses such as sideoat grama, curly mesquite, black grama, bush muhly, and various threeawns. All of the major grass species are well dispersed throughout the plant community. Many species of shrubs are well represented with larger

concentrations occurring at the edges of rock outcrops and in the canyon bottoms. The dominant shrubs include whitethorn, ratany, false mesquite, creosote bush, mimosa, paloverde, burroweed, and snakeweed. Various leaf succulents and cacti may also be present, including yucca, amole, agave, cholla, saguaro and barrel cactus. The aspect is open grassland. Well developed stone and cobble covers protect the soil from erosion and tend to protect forage species from heavy utilization. Natural fire was a factor in the development and maintenance of the open grassland aspect on these sites.

The ecological sites on the Soza Mesa portion of the Muleshoe CMA are influenced by the calcareous nature of the geology. Most of the soils have developed on calcareous mixed gravelly or loamy alluvium and conglomerate. Limy slopes (44%) and limy upland (30%) range sites dominate (Figure 2). These sites occur on pediments, fan terraces, and hill slopes. Slopes range from 1% to 40%. The soils are limy throughout and may be underlain by lime pans or calcic horizons at shallow depths. Volcanic and granitic hills sites (20%), and loamy upland sites (6%) also occur in lesser amounts on the Soza Mesa portion of the CMA.

The potential plant community on the Limy Slopes ecological sites is dominated by warm-season perennial grasses. Perennial forbs are well represented as well as a few species of low shrubs. The major perennial grasses are well dispersed throughout the plant community. In high condition, the grass component may account for 60 to 80% of total plant composition in the community. The aspect is open grassland. With continuous heavy grazing the more desirable grasses (sideoat and black grama, and bush muhly) are replaced by increases in species like threeawns and fluffgrass. Low shrubs which can increase include snakeweed and desert zinnia. Large shrubs such as creosote and whitethorn acacia can invade this site from adjacent areas. Natural fire may have been an important factor in development and maintenance of the grass dominance of the plant community. Gravel cover of the soil surface may not be adequate in preventing water erosion when herbaceous cover is reduced on the steeper slopes on these sites.



The potential plant community on the Limy Upland ecological sites is a diverse mixture of desert shrubs and perennial grasses and forbs. In high condition the grass component in the community will only account for 25 to 40% of the total plant composition by dry weight. The aspect is shrub land. The large woody perennials such as creosote and whitethorn acacia can increase to the exclusion of herbaceous species. Natural fire may have been important in maintaining a balance between herbaceous and woody species, but fire free intervals were probably higher than on other more productive sites, due to the time needed for fine fuels to accumulate.

### Grasslands

#### Semi-Desert Grasslands

Historically, the ecological sites on the Muleshoe were producing near their natural potential. The

aspect of the rangeland was an open grassland dominated by perennial grasses such as plains lovegrass, cane beardgrass, black grama, slender grama, sprucetop grama, bush muhly, curly mesquite, vine mesquite and several threeawn species intermixed with leaf succulents including beargrass and amole. However, partial or extensive invasion of mesquite, juniper, whitethorn, mormon tea, mimosa, snakeweed, and burroweed has occurred over much of the area. Intense grazing pressure and wildfire suppression over the past century have resulted in the transition of much of the area from grassland to a desert shrub vegetative state. Continuous yearlong livestock grazing prior to The Nature Conservancy's acquisition of the ranch resulted in a reduction of some of the desirable perennial grasses (such as plains lovegrass and cane beardgrass) and an increase of invasive shrubs (such as mesquite and whitethorn) and succulents such as amole.

**TABLE 2**  
Muleshoe Grassland State-Transition Model Data  
1994 Transect Data

State		Shrub Canopy & Grass Composition (by weight)		Acres	Percent
	Perennial Grassland Mid Grass Dominant	Shrub Canopy	<20%	400	2
		Perennial Grass	>70%		
		Mid Grass	>50%		
		Annuals	<30%		
II	Shrubby Grassland Mid Grass Dominant	Shrub Canopy	>20%	5,900	22
		Perennial Grass	>70%		
		Mid Grass	>50%		
		Annuals	<30%		
III	Shrubby Grassland Short Grass Dominant	Shrub Canopy	>20%	10,236	39
		Perennial Grass	>70%		
		Mid Grass	<50%		
		Annuals	<30%		
IV	Shrubs and Annuals Annual Grasses Dominant	Shrub Canopy	>20%	7,000	27
		Perennial Grass	<70%		
		Annuals	>30%		
V	Perennial Grassland Short Grass Dominant	Shrub Canopy	<20%	2,200	8
		Perennial Grass	>70%		
		Mid Grass	<50%		
		Annuals	>30%		
Riparian		N/A		624	2
Total				26,360	100

## Grassland Process

Upland vegetation communities change over time due to environmental influences. The vegetation communities continuously transition among a series of ecological states from disturbance factors such as climate, grazing, fire, or disease. The present vegetation communities on the Muleshoe are an expression of the past disturbance regimes and land use practices.



In the semidesert grasslands on the Muleshoe, fire was probably the single most common disturbance controlling the transition from grassland to shrub land in the volcanic hills, granitic hills and loamy upland ecological sites prior to European settlement. Periodic wildfires reduced shrub cover and allowed grasses to remain dominant.

Livestock grazing practices played a major role in defining the present ecological state of the grasslands on the Muleshoe. Yearlong grazing management allowed maximum opportunity for cattle to selectively graze preferred plants resulting in undue intensity and frequency of defoliation of these species putting them at a disadvantage in plant competition. The frequency of fire in these grasslands was subsequently reduced by removal of these perennial grasses as fuels, and by man's fire suppression efforts. Under heavy grazing use and with low fire occurrence, the shrubs will generally remain until removed by fire or some other type of disturbance. Mesquite, catclaw, whitethorn, juniper, snakeweed, and other shrubs have increased and now dominate the perennial grasses in some areas.

In order to more easily understand the transitional changes that occur to vegetation on ecological sites within the semi-desert grassland communities, a modification of a Grassland State-Transition Model (Appendix 4) was used to describe the ecological states and processes occurring within the semi-desert grasslands on the Muleshoe (Volcanic Hills, Granitic Hills and Loamy Upland Ecological Sites).

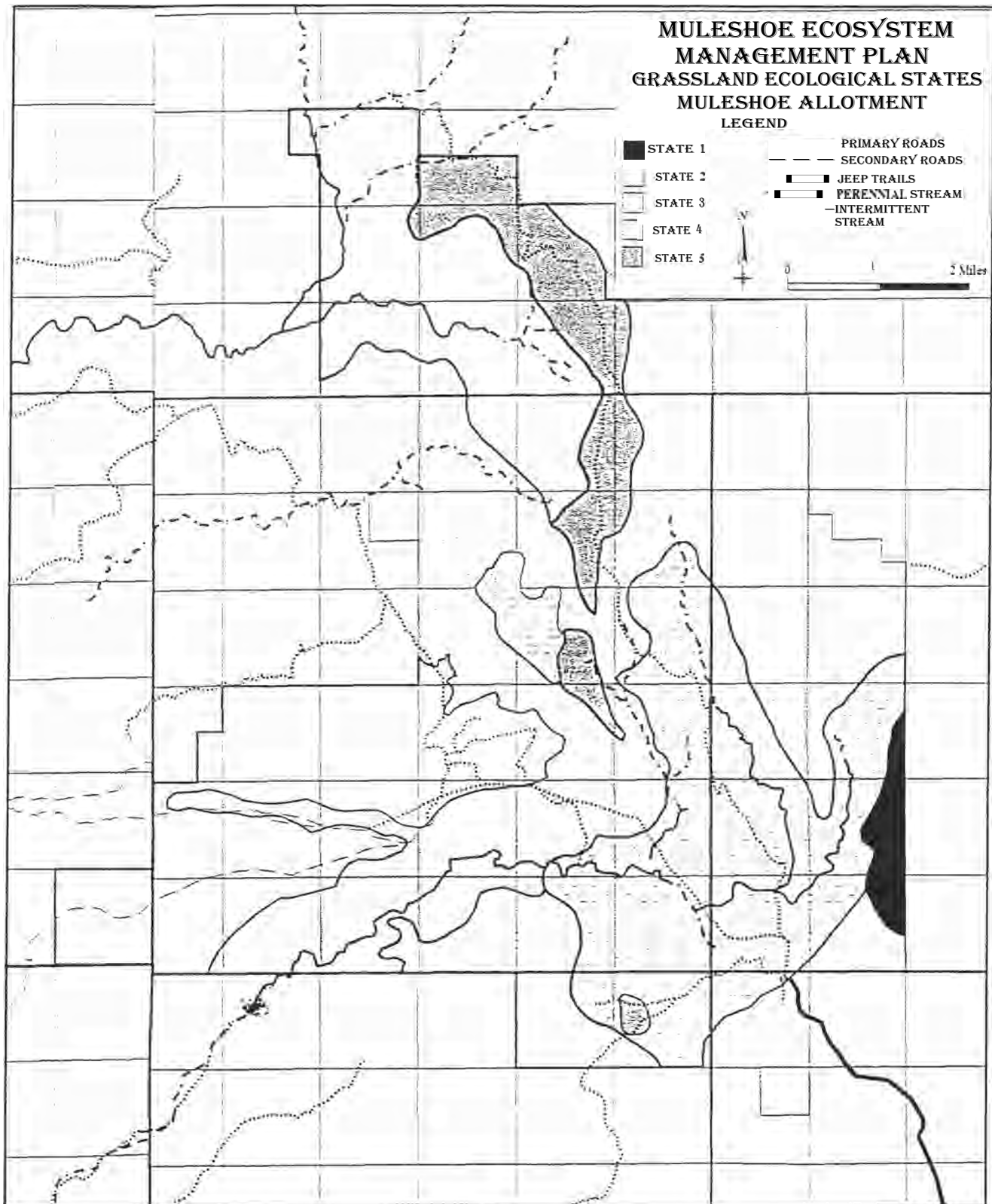
In the semi-desert grassland model, grasslands are viewed as a system cycled by climate, fire, and grazing, which contributes runoff and sediment to watershed, riparian, and aquatic systems. Fire and grazing management actions are considered the manageable forces driving the model. Although climatic cycles interact with fire and grazing regimes to affect the grass/shrub ratio, climate is not a manageable variable and is not used in the model. In the model, fire suppression and increased grazing drive the system to grassland states III and IV, the situation now at Muleshoe, where shrubs, annual grasses, and lower-statured, lower-producing perennial grasses occur. Restoration of high fire frequency (-every 3-10 years) combined with low grazing intensity drives the system back to states I and II, where mid-tall statured perennial grasses dominate and shrubs are much less prevalent.

Using this model, the semidesert grasslands within the Muleshoe Ecosystem have been classified into five ecological states based on the composition of the vegetation (amount of shrub invasion, amount of perennial versus annual grass and amount of mid-tall statured perennial grasses): State 1 - perennial grassland - dominated by mid stature grasses, State 2 - shrubby grassland - dominated by mid stature grasses, State 3 - shrubby grassland - dominated by short stature grasses, State 4 - shrub land - dominated by annual grasses and forbs, and State 5 - perennial grassland - dominated by short stature grasses (Table 2, Figure 3).

Management of this upland vegetation community will affect watershed function which affects the function of other plant communities and habitats. Watersheds consist of interdependent aquatic, riparian, and upland components. Watershed



FIGURE 3



condition is largely determined by upland vegetation and soil type. When properly functioning, watersheds capture, store, and release moisture efficiently, providing high infiltration of precipitation into the soil, low movement of soil off-site, reduced flood peaks, high quality water, and reduced evaporation of water from the soil profile. Attaining proper function and desired plant communities in the uplands contributes the physical and biological stability necessary to restore and maintain the aquatic and riparian ecosystems.

### Riparian Areas

#### Riparian Habitats

The stream channels in the riparian areas of the Muleshoe Ecosystem are characterized by narrow aquatic zones bordered by wide zones of riverwash rock and sand bottom sites (Appendix 3, Table 3-4). Narrow bands of woodland sites are restricted to the sandy or loamy terraces back away from the velocity of the main flows below the steep hills. During periods of low flow events, these bottom sites will aggrade with sediments covering the riverwash rock thus narrowing the active channel and allowing the development of stream banks capable of supporting perennial vegetation.

The riparian vegetation along Redfield and Hot Springs canyons and their tributaries is within the Mixed Broadleaf series of the Southwestern Riparian Deciduous Woodland biotic community. The dominant species include Velvet Ash, Sycamore, Arizona walnut, and willows. In the wider canyon bottoms Fremont cottonwood and Goodding willow may dominate locally as the tree component. Major understory species include wild rye, deer grass, seepwillow, sedges, and rushes. Mesquite bosques occur on the few loamy bottom sites found along stream terraces, and at major drainage ways. Past heavy livestock use along these canyons had resulted in heavy utilization of woody riparian tree seedlings and a subsequent lack of regeneration. A preliminary inventory of the riparian areas in Redfield, Hot Springs and Bass canyons in the summer of 1986 found all three to be in less than satisfactory condition. Channel banks and terraces lacked proper vegetative

armoring and barren gravel bars and cobble fields were present.

Active livestock grazing has been suspended on the Muleshoe since the property was acquired by the Nature Conservancy in 1982. This rest from livestock use over the past decade has allowed natural processes to resume and has helped restore proper functioning condition to the riparian systems on the Muleshoe. This has resulted in improved riparian function, greater diversity in the age structure of the woody riparian species, and increased streambank stability (Appendix 3, Tables 3-5 through 3-7).

#### Riparian Processes

Riparian areas and the associated stream channel are not static features of the landscape as they are constantly undergoing change. The riparian area and associated aquatic habitat are exposed to natural external factors primarily stream flow and sediment transport.

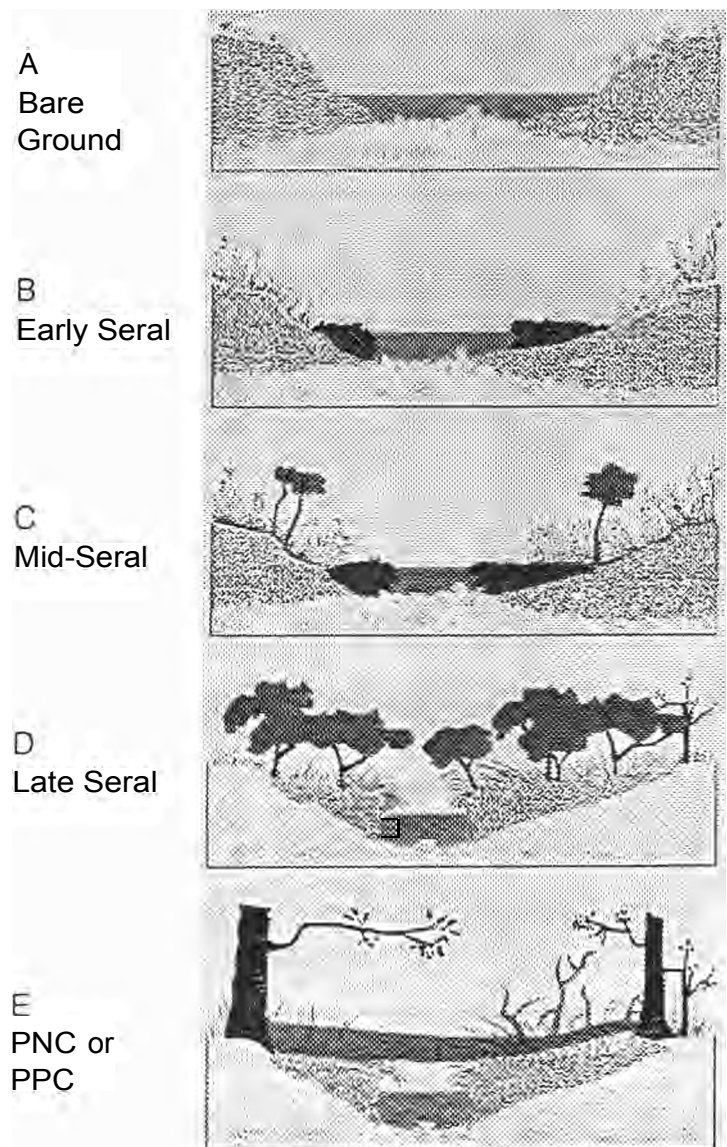
Riparian areas that are functioning properly change gradually and have adequate vegetation, flood plain development or woody debris to dissipate flood energies. Water from floods is slowed and spread out on floodplains where it can seep into the soil and drop sediment which builds banks. Riparian vegetation holds soil against erosion. This improves fish habitat by holding banks which allows for a diversity of fish habitat types to form through sediment scour and deposition. In this way riparian plants influence the formation of pools, cover, riffles, runs, bars, braids and clean spawning habitat. However, excessive flooding may scour away riparian vegetation and stream banks, especially where floods are concentrated in canyons. Flooding is influenced by rainfall and watershed health.

Watersheds dominated by bare ground or that have been impacted in such a way that ground cover is reduced foster flash flooding which can destabilize riparian areas in associated drainages. Excess sediment from these unstable watersheds can fill in important fish habitat features such as pools and riffles with fine sediment.

Through scour and sediment deposition, the topography of the floodplain continually changes, which influences riparian composition. The composition and structure of the riparian community can likewise influence sediment deposition, creating a dynamic feedback response between the plant community and physical processes. As an example, dense stands of young cottonwoods and willows are effective in trapping sediment during floods. As a terrace begins to form in the vicinity of young trees, the site is elevated above the flood scouring zone, enabling young trees to mature into forest stands. Continued sediment deposition and terrace building may lead to formation of a mesquite bosque, as the depth to water table increases to where young cottonwoods and willows can no longer become established. In overall floodplain dynamics, the same floods which build terraces in one location may erode sediments from another site, creating new opportunities for cottonwood and willow recruitment. This dynamic balance maintains the essential structural diversity of the community.

The riparian vegetation goes through stages of development as young trees grow older, and sediment deposition builds banks and terraces that alter soil/water relationships which influences plant species composition, density and abundance. Early seral stages are characterized by fewer species and younger age classes of trees while later seral stages have more species and a higher ratio of older trees. Finally if the riparian area is allowed to function unimpaired by disruptive land practices it may attain its potential (Figure 4) (BLM Tech. ref. 1737-9). Flooding serves to disturb the riparian community which provides opportunity for new seed beds to develop for tree seedlings and openings for herbaceous plants resulting in a mosaic of plant species, age classes, and microclimates that support a diversity of conditions and animals.

Impairment of vegetative development that causes reduction in vegetative density, plant vigor or production directly alters the integrity of floodplains and stream banks. This leaves the degraded riparian area vulnerable to further damage by flooding as the riparian community has lost its ability to dissipate flood energy and resist erosion (Figure 5) (BLM Tech. ref. 1737-9).

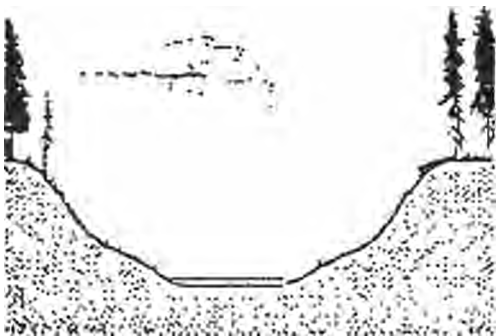
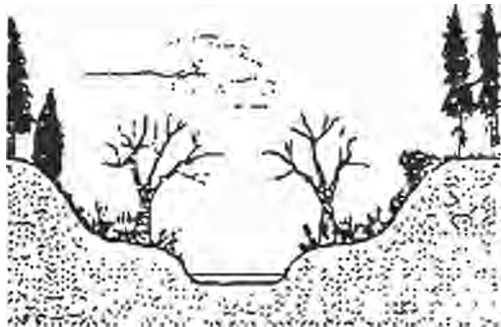


*Figure 4 - Riparian Area Development Process*

#### Aquatic Habitats

Habitat diversity in the form of the variety of pools, riffles, and runs available to fish will influence which species of fish can exist in a stream. For example, both Gila chub and Sonora sucker require pool habitat. Cover such as undercut bank and woody debris provide additional habitat features that enhance habitat quality for these fish.

In order to determine the quality of existing fish habitat on the Muleshoe, an intensive basin stream (fish habitat) survey was conducted in



First, good to excellent condition channel,

then, channel beginning to become wider and shallower,

finally, channel very wide and shallow

Redfield, Bass, and Hot Springs canyons in the spring of 1994 (Appendix 3, Table 3-9). Fish habitat characteristics were cataloged in conjunction with key areas used for riparian inventories. Pools were counted over long reaches of stream to better quantify their abundance. Fish habitat was most diverse in Redfield Canyon. This canyon had the most pools per mile, pools > 2 ft. deep, most woody cover and undercut bank. All three canyons had good to excellent bank stability. Both Hot Springs and Bass Canyons have fewer pools and much less undercut bank than Redfield Canyon. Bass Canyon had more woody cover but appeared to be impacted by the large flood of 1993 which scoured out the channel leaving few deep pools. Fish habitat in Hot Springs Canyon

appears to be well below its potential. The number of large pools in Bass Canyon are expected to increase as it recovers from the 1993 flood. However, fish habitat in Bass Canyon still appears to be below potential.

### Aquatic Habitat Processes

Fish habitats are controlled primarily by sediment input and transport, which are functions of the volume and pattern of precipitation and runoff. As discussed in the previous section (Riparian Processes), watershed and riparian health influence sediment transport and runoff characteristics that affect flood magnitude. Along the stream channel, high gradient, narrow channels receive coarser substrate, while finer sediments are deposited in areas where floodplains are wider and gradients lower. Pools tend to be permanent only where there are large obstructions like boulders and trees. When sediment input is excessive, pools may become rare due to sediment filling (Swantson 1991).

Flooding is not only an important process that influences channel geometry and plant community, it also influences fish community structure as well. In constrained canyon bound reaches of streams and rivers, non-native fish species are unable to resist flooding. Unlike native fishes that have adapted to flooding in canyon reaches, these exotic fishes tend to be eliminated or severely reduced in number by flood events (Minckley and Meffe 1987). Non-native fishes, once established, constitute a biotic habitat element that is incompatible with and can eliminate native fishes (Deacon and Minckley 1992). Therefore, maintaining a natural flooding regime is a key element in maintaining the native fish community.

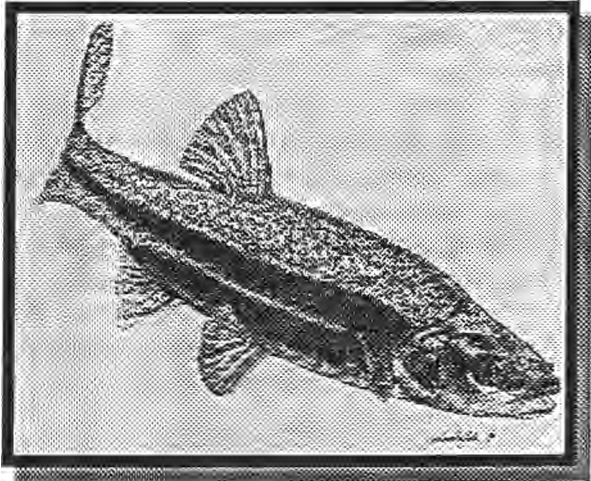
### Riparian/Aquatic Area Management

Management of riparian and aquatic habitats is largely passive due to the present resource conditions, low impact activities and low use levels currently occurring on the Muleshoe. The only intensive management occurs on private land at the Muleshoe Ranch Headquarters which is the major destination point in the area. Selected riparian areas have been monitored since 1984. Acquisition of detailed data on Redfield, Hot Springs, Sycamore, Swamp Spring, Bass and

Wildcat canyons has provided a basis for determining riparian condition and in some cases long-term data allows for determination of trend.

## G. FISH AND WILDLIFE

The variety of vegetation communities within the Muleshoe Ecosystem provide habitats which support a high diversity of animal species. Of particular management concern are the 29 special status fish and wildlife species (Table 3) which inhabit the Muleshoe Ecosystem. Special status species include five fishes, four reptiles, one amphibian, eight birds, 10 mammals and one plant. The majority of these species are aquatic or riparian dependent.



Fish surveys with habitat monitoring have been conducted by TNC in Redfield, Hot Springs, Bass and Double R canyons since 1991. The purpose of these surveys is to follow trends in the native fish community and to track exotic invaders such as the green sunfish found in Redfield Canyon.

Aquatic habitats in the 23 miles of streams on the Muleshoe Ecosystem support five native fish species: longfin dace, speckled dace, desert sucker, Sonoran sucker, and Gila chub. All five species are biologically imperiled and are candidates for federal listing. Lowland leopard frogs and Mexican garter snakes, both federal candidates, are also found in close association with these aquatic habitats. These streams are largely canyon-bound with narrow floodplains but have diverse habitat development. Aquatic habitat is characterized by pool, run and riffle

development. Undercut banks, woody debris and boulder ledges provide a diversity of micro habitats as does variation in shading by trees and brush along the banks.

The riparian areas support the highest diversity of wildlife on the Muleshoe Ecosystem. Many species, including Mexican garter snake, yellow warbler, summer tanager and red bat, are riparian obligates, spending most of their time in these areas. Others are attracted to riparian areas for breeding, foraging, or travelling. Substantial numbers of neotropical birds including summer tanagers, northern orioles, yellow-billed cuckoo, gray hawk, black hawk, and zone-tailed hawk nest in riparian habitats. A variety of insectivorous bats, including southwestern cave myotis and California leaf-nosed bat (both federal candidates), are attracted to the riparian areas to forage on the abundance of insects. The riparian corridors are important migration and movement corridors for wildlife such as black bear, coati, and neotropical bird species. Mexican spotted owl, a federally threatened species, has been observed in riparian areas within the Muleshoe and may use them for breeding, roosting, or travel corridors. The southwestern willow flycatcher, a federally endangered species, is a riparian obligate and possible visitor to the Muleshoe's riparian areas. However, recent surveys have found no individuals or breeding pairs present on the Muleshoe.

The desert grassland provides habitat for desert kingsnake, desert grassland whip-tail, southwestern earless lizard, desert box turtle, Gila monster, scaled quail, Gambel's quail, mourning dove, loggerhead shrike (federal candidate), Botteri's sparrow, Baird's sparrow, badger, javelina, white-tailed deer and mule deer community. The federally endangered lesser long-nosed bat and federal candidate Mexican long-tongued bat are summer and fall residents of the area feeding primarily on nectar of agave blossoms in the grassland areas. The rocky terrain provides many suitable caves or crevices for potential roost sites for these and other bat species. Several old buildings also provide roosting sites for various bat species. Bighorn sheep and the endangered peregrine falcon inhabit the rugged cliffs and remote canyons that border and cross through the desert grassland.

In the western portion of the Muleshoe Ecosystem, the desert grasslands typical of most of the Muleshoe transitions into a Sonoran desert scrub (mule deer, javelina, Gambel's quail, nectar-

feeding bats) occur in this transition, or ecotone, area. The area also supports a large population of Sonoran desert tortoise and has been designated as Category 2 Tortoise Habitat.

TABLE 3  
Special Status Wildlife and Plants of the Muleshoe Ecosystem

Common Name	Scientific Name	Federal Status <sup>1</sup>	State Status <sup>2</sup>
Gila Chub	<i>Gila intermedia</i>	C2	ST
Longfin dace	<i>Agosia chrysogaster</i>	C2	
Speckled dace	<i>Rhinichthys osculus</i>	C2	
Sonoran sucker	<i>Catostomus insignis</i>	C2	
Desert sucker	<i>Catostomus clarki</i>	C2	
Mexican garter snake	<i>Thamnophis eques</i>	C2	SC
Canyon spotted whiptail	<i>Cnemidophorus burti</i>	C2	
Desert tortoise	<i>Gopherus agassizii</i>	C2	SC
Texas homed lizard	<i>Phrynosoma comutum</i>	C2	
Lowland leopard frog	<i>Rana yavapaiensis</i>	C2	SC
Common black-hawk	<i>Butegallus anthracinus</i>		SC
Northern gray hawk	<i>Buteo nitidus maximus</i>	C2	ST
Peregrine falcon	<i>Falco peregrinus</i>	FE	SC
Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>		ST
Mexican spotted owl	<i>Strix occidentalis mexicanus</i>	FT	ST
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	FE	SE
Loggerhead shrike	<i>Lanius ludovicianus</i>	C2	
Baird's sparrow	<i>Ammodramus bairdii</i>	C2	ST
Western yellow bat	<i>Lasiurus ega</i>		SC
Red bat	<i>Lasiurus borealis</i>		SC
Spotted bat	<i>Euderma maculatum</i>	C2	SC
Southwest cave myotis	<i>Myotis velifer brevis</i>	C2	
Occult little brown bat	<i>Myotis lucifugus occultus</i>	C2	
California leaf-nosed bat	<i>Macrotus californicus</i>	C2	SC
Lesser long-nosed bat	<i>Leptonycteris curasoae yerbabuenae</i>	FE	SE
Mexican long-tongued bat	<i>Choeronycteris mexicana</i>	C2	ST
Greater western mastiff bat	<i>Eumops perotis californicus</i>	C2	
Yellow-nosed cotton rat	<i>Sigmodon ochrognathus</i>	C2	
Aravaipa sage	<i>Salvia amissa</i>	C2	

<sup>1</sup>Federal Status: FE=Federally endangered, FT=Federally threatened, C2=Category 2 Candidate, P=Proposed.

Note: The U.S. Fish and Wildlife Service no longer recognizes Category 2 Candidates. However, these species are being considered for inclusion on a BLM sensitive species list.

<sup>2</sup>State Status: SE=State endangered, ST=State threatened, SC=State candidate.

Note: The AZGFD is in the process of consolidating the above state categories of species into a single category of "species of special concern".

Montezuma quail and black bear are more commonly found in the oak woodlands and pine-oak woodlands of the higher elevations of the Muleshoe. An attempt was made in February 1994 to reintroduce Gould's turkeys to woodland habitat on FS lands in the Galiuros. The attempt was largely unsuccessful, and, as of June 1995, only one female turkey remains. More reintroductions are planned in 1996-7.

Large mammalian predators on the Muleshoe include mountain lion, bobcat, black bear, and coyote. Historically, Mexican wolves once roamed the Galiuro Mountains. The Galiuros were analyzed as a possible reintroduction site in the draft Mexican wolf recovery plan (USFWS 1982), but the site is not being pursued in the preferred alternative. The ranges of these species may cross into several vegetation communities. The Muleshoe Ecosystem boundary is not large enough to contain more than a few home ranges or portions of home ranges of these large predators.

#### Fish and Wildlife Management

Wildlife and its habitat are managed cooperatively under a Master Memorandum of Understanding (MOU) (1987) between BLM and the Arizona Game and Fish Commission. The MOU provides for coordination between the two agencies to accomplish wildlife habitat improvement projects and to develop Habitat Management Plans pursuant to the Sikes Act. This has allowed for improvements for wildlife such as the water developments for bighorn sheep. The BLM manages habitat for state-listed species in conformance with state objectives. Federally listed species and those proposed for listing are protected by the Endangered Species Act of 1973 as amended (ESA). The BLM is mandated to protect threatened and endangered species and the ecosystems (habitats) upon which they depend. Under the ESA, all actions authorized, funded or carried out by BLM must be in compliance with the Act. In addition, the BLM is directed to cooperate in planning and providing for the recovery of threatened and endangered species and to retain all habitat essential to the recovery or survival of any threatened or endangered species, including habitat historically used by these species. BLM also manages habitat for Federal candidate species to prevent their eventual listing.

## H. CULTURAL RESOURCES

### Archaeological Resources

Human occupation of what is now the Muleshoe Ecosystem may stretch back some 12,000 years. Five major periods of human occupation likely occurred on the Muleshoe including Paleo-Indian (10,000 B.C. to 5,500 B.C.), Archaic (ca. 5,500 B.C. to A.D. 100), Hohokam/Mogollon (ca. 300 B.C. to 1400 A.D.), Apache (ca. 1680 A.D. to 1873 A.D.), and Euroamerican (1875 A.D. to present). Little archaeological survey has been done on the planning area, and evidence of the different periods varies.

Today the San Pedro River Valley contains one of the highest concentrations of Paleo sites in the nation. Although conclusive evidence has yet to be discovered, the Muleshoe Ecosystem's proximity to the San Pedro River Valley makes it highly probable that Paleo-Indian bands visited the area to hunt game and collect wild plant foods.

Although evidence of human occupation on the planning area during the Archaic is not plentiful, some flaked and ground tools documented at several sites may represent this period when small nomadic bands roamed the area hunting and gathering.

The Muleshoe Ecosystem is located on what present day archaeologists consider the boundary between the areas inhabited by the Hohokam and Mogollon cultures. Pottery and stone tools collected from surface scatters and recovered from excavations in the planning area represent both Hohokam and Mogollon affiliation. Both of these groups practiced horticulture, cultivating corn, squash and beans and both built and lived in pithouse villages although the Hohokam were much more sedentary. The Hohokam and Mogollon farmers in the Muleshoe Ecosystem faced different challenges and solved different problems than their contemporaries growing crops at lower elevations and in different terrain. Comparatively little information exists on this subject, which makes these sites extremely valuable.

Historic narratives by Father Kino and others document the presence of Apaches in the vicinity of the Muleshoe indicating a high possibility of archaeological sites representing the Apache



occupation within the planning area. However, no sites have been documented so far.

The greatest amount of evidence is from the Euroamerican period including remains of several old homesteads throughout the planning area. The Muleshoe Ranch headquarters at Hooker's Hot Springs began as a homestead filed by Dr. Glendy King and was later developed into a health resort by Henry C. Hooker. It is now owned by The Nature Conservancy and provides staff and visitor facilities.

### Documented Sites

Only scattered locations in the planning area have been inventoried for archaeological resources. Approximately 347 acres on the southern and southeastern end of the management area were systematically inventoried (Class III inventory) by New Mexico State University's (NMSU) Cultural Resources Division for the All-American Pipeline right-of-way. A Class II cultural resource inventory has been conducted over approximately three-quarters of the Soza Mesa Allotment, and several small Class III inventories have been conducted for small-scale projects. The known cultural resources of the planning area include two occupation sites, two artifact scatter sites, four lithic scatter sites, three rock shelters, and six historic sites.

To date, eleven prehistoric sites have been documented in the planning area. All are located in drainages and appear to represent intensive resource utilization and seasonal occupation. Seven are located within a mile of the Hooker's Hot Springs. Five have been tested. One, identified as "a pithouse village with an anomalous, possibly ceremonial, communal structure," was excavated by the NMSU field crew. Those sites which produced ceramics represent both Mogollon and Mimbres affiliation. Some flaked and polished stone artifacts suggest an Archaic affiliation. No diagnostic evidence of Paleo-Indian occupation has been documented in the planning area.

The historic occupation of the Muleshoe Ecosystem is represented by six ranch and homestead sites, which includes Hooker's Hot Springs, Pride and Browning ranches and the

Paterson, Jackson and Bradbury cabins. Other historic resources include several line shacks, corrals and roads. Hooker's Hot Springs is the only site in the planning area that is listed on the National Register of Historic Places. Although the existing Pride Cabin is of fairly recent construction (1950s), several adjacent buildings and structures date back to the original homestead claim. As such, the Pride Ranch Homestead site is believed to be eligible for listing as a National Register Site. There is the possibility of having the Muleshoe listed as an Archaeological District which would result in the listing of all the Muleshoe's sites.

### Native American Concerns

The Muleshoe Ecosystem is located in what was once territory of the Aravaipa Band of the Western Apache. During a summer 1994 visit to the Muleshoe, Western Apache herbalists, along with the tribe's ethnobotanist, identified a number of medicinal and edible plants, mostly growing in the Muleshoe's riparian areas, that they would like to have protected. Many of the plants traditionally used by the Western Apache are no longer available on the reservation and the tribal herbalists must go elsewhere to find them.

No sacred sites were identified by the Apache. They did express concerns about the treatment of Native American human remains. As is standard procedure, if any remains are discovered, and for any reason threatened, the appropriate tribe will be notified. The Tohono O'Odham were also contacted but did not express any concerns about the area.

### Management of Cultural Resources

Cultural resources located on public land administered by the BLM are managed according to criteria set forth in numerous laws, regulations and policies, including the National Historic Preservation Act, the Archaeological Resources Protection Act, the American Indian Religious Freedom Act and the Native American Graves and Repatriation Act. The cultural resources on public lands are to be managed under three broad objectives: 1) information potential, 2) public values, and 3) conservation.



## I. LIVESTOCK GRAZING

### Background

In September 1987, the Record of Decision for the Eastern Arizona Grazing Environmental Impact Statement proposed placing the active grazing preference of 4,032 AUMs (336 cattle yearlong on the public lands) in the Muleshoe allotment (No. 4401) into a five-year suspension effective upon the signing of a cooperative management agreement. The purpose of the suspension of livestock grazing was to promote recovery of the riparian areas and to enhance important wildlife habitat and watershed conditions. This suspension of grazing was implemented in 1988 through approval of the Muleshoe Cooperative Management Agreement by the BLM, TNC, and FS. The Redfield Canyon Wilderness Area was designated by Congress in 1990 with existing grazing preferences on the Muleshoe and Soza Wash allotments. In 1992 an Ecological Site Inventory of the vegetation on the Soza Mesa portion of the Muleshoe was conducted by the BLM. As a result, a stocking rate was established of 44 cattle yearlong on the Soza Mesa portion of the Muleshoe. In 1993, TNC sold the portion of the base property for the Soza Mesa portion of the Muleshoe to Jack Hughes. The transfer was completed and the Soza Mesa allotment was created. Correspondingly the grazing preference on the remaining portion of the Muleshoe allotment was reduced to reflect the deletion of the 6,030 acres now in the Soza Mesa allotment. The fencing necessary to physically separate the Soza Mesa and Muleshoe allotment was then constructed. In July 1994, the Safford District RMP Record of Decision II was issued. It provided for resumption of active grazing use on the Soza Mesa portion of the Muleshoe, and the development of this Ecosystem Management Plan for the Muleshoe.

### Grazing Allotments

There are three BLM grazing allotments within the Muleshoe planning area. The Muleshoe allotment (No. 4401), Soza Mesa allotment (No. 4402) and Soza Wash allotment (No. 4409). The Muleshoe allotment includes the Hot Springs ACEC and the majority of the Redfield Canyon Wilderness. The Soza Mesa allotment is west of the Muleshoe allotment, and the Soza Wash allotment is at the

western edge of the Redfield Canyon Wilderness near the confluence of Redfield and Swamp Springs canyons.

#### Muleshoe Allotment

The Muleshoe allotment consists of a series of narrow steep-sided canyons and gorges which dissect very rough rocky mountains and ridges. The basin around Pride Cabin at the center of the unit is the only relatively level open area. The northern portion of the allotment drains to the San Pedro River through Redfield Canyon, while waters in the southern portion flow to the San Pedro through Hot Springs Canyon. Seven of the larger canyons flow perennially, sustaining unique riparian habitats.

The current permitted use on the Muleshoe allotment (No. 4401) is 267 cattle from March 1 to February 28 at 100% public land use. This equates to 3204 Animal Unit Months (AUMs). The permitted use is currently in suspended non-use status. Existing range improvements include wells, stock tanks, and boundary and pasture fencing (Appendix 3, Table 3-10).

#### Soza Mesa Allotment

The current permitted grazing use on the Soza Mesa allotment (No. 4402) is 44 cattle from March 1 to February 28 at 95% public land use. This equates to 502 AUMs. The existing range improvements include boundary fencing, stockpounds, wells, pipeline and a developed spring (Appendix 3, Table 3-11).

#### Soza Wash Allotment

A portion of the Soza Wash allotment is located within the planning area. The public lands in the allotment are leased for livestock grazing to Hope Jones of the C-Spear Ranch. The public and state lands in this ranch need to be addressed as they are located within the Redfield Canyon Wilderness boundary. The 440 acres of federal lands are: T.11S, R.20E., Section 29 S 1/2, Section 30 E 1/2 SE 1/4, and Section 31 NE 1/4 NE 1/4.

The current permitted grazing use on public lands within the Soza Wash allotment is five cattle from March 1 to February 28 at 100% public land use. This equates to 60 AUMs. The existing range improvements on public lands are some gap fences.

#### Ecological Condition

Ecological condition in the uplands adjacent to the creeks is generally Mid to High. Both the Muleshoe and Soza Mesa allotments were rested from livestock grazing from 1980 until 1993, when the

Muleshoe allotment was divided and livestock grazing was resumed on the Soza Mesa allotment. The rangeland is slowly recovering from the past overuse by livestock.

Ecological Site Inventories (ESI) were completed in 1990, 1992, and 1994 to determine existing and potential ecological condition. The results indicate that while sites in low condition have improved to mid condition, there has been very little change in the total acreage in high and PNC condition (Table 4).

TABLE 4  
Muleshoe Ecosystem  
BLM and TNC Private Lands within the CMA  
Upland Range Condition Summary  
1990 vs 1994

Condition	1990 Acres	1990 Percent	1994 Acres	1994 Percent
PNC	0	0	340	1
High	24,076	74	21,711	67
Mid	5,786	18	10,241	31
Low	2,430	7	0	0
Not Rated (Soza Wash Allot)	440	1	440	1
Total	32,732		32,732	

#### Muleshoe Allotment Rangeland Suitability and Ecological Site Assessment

As required by the Safford District RMP Record of Decision II (July 1994), a Range Suitability study of the Muleshoe allotment was completed in 1994. The suitability study assesses the rangeland resource to determine the areas within the allotment where vegetation is available to livestock as forage.

Based on Safford District Instruction Memorandum No. AZ-040-93-07, "Rangeland Suitability for Livestock Grazing," the following criteria were determined appropriate to assess those areas unsuitable for livestock grazing:

1. All rangelands that are inaccessible to cattle.
2. All slopes over 50%.
3. Current production of usable forage is less than two cattle yearlong per section.
  - A. Over 4.0 miles
  - B. Over 0.6 miles on 21 to 30 percent slopes
  - C. Over 0.4 miles on 41 to 50 percent slopes

The Muleshoe allotment was inventoried in the summer of 1994 using the Ecological Site Inventory procedures of BLM. The above criteria were applied to determine suitable and unsuitable rangelands (Table 5, Figure 6).

## FM age SUITABILITY

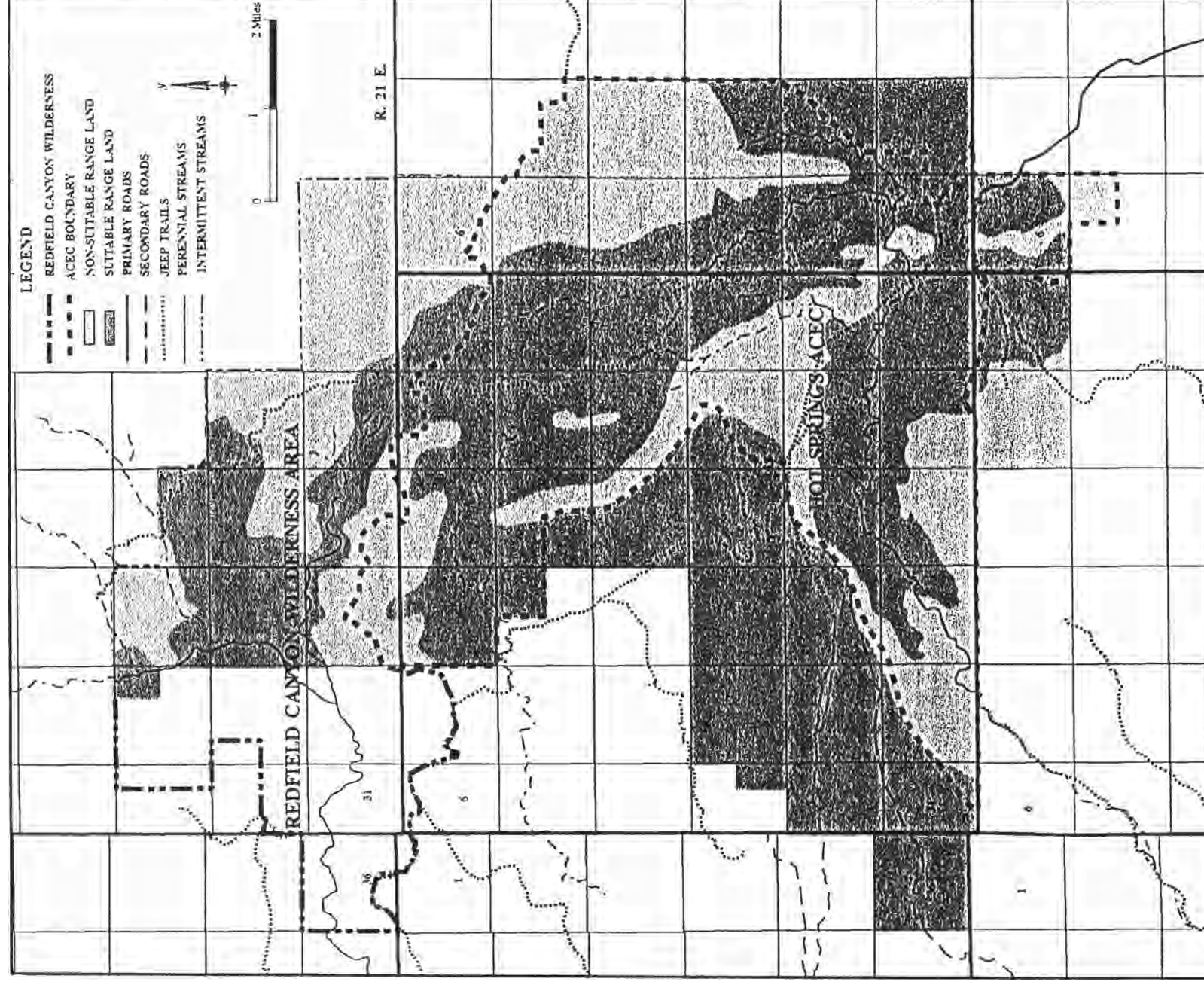


TABLE 5  
1994 Transect Data  
Muleshoe Portion  
Livestock Suitability

Range Site	Condition	Acres	Acres Suitable
Volcanic Hills	PNC	240	0
	High	14,713	9,130
	Mid	9,121	4,248
Loamy Uplands	High	366	366
	Mid	1,296	1,296
Riparian	See Riparian Conditions	624	624
Total		26,360	15,664

## J. RECREATION

### Current Recreation Use

The Muleshoe Ecosystem is used by a variety of outdoor enthusiasts who enjoy the area for hunting, hiking, horseback riding, birding and other wildlife observation, primitive camping and other related uses. An estimated 1700-1800 visitors a year visit the Muleshoe Ranch area for recreation purposes. These are estimates of use derived from visitor sign-in stations at The Nature Conservancy's Muleshoe Ranch headquarters and at the entrance to Jackson Cabin Road. The number is probably conservative considering there are other access points into the area and that many visitors probably do not sign the registers on every visit.

The only developed sites in the Muleshoe Plan area are those associated with The Nature Conservancy's headquarters and at Pride Ranch. The Muleshoe Ranch headquarters' facilities include a campground, casitas, nature trail and hiking trail. Fees are charged for the campground and casitas and advance reservations are required. The Hooker's Hot Springs are not open for public use. The Nature Conservancy also maintains a primitive cabin at Pride Ranch. A fee is charged and reservations are required for use of this site. Recreationists also use Jackson Cabin on FS lands. The primitive cabin is available on a first-come basis.

### Visual Resource Management

Visual Resource Management (VRM) Classes are categories assigned to public lands based on scenic quality, sensitivity level, and distance zones. There are four classes. Each class has an objective which prescribes the amount of change allowed in the characteristic landscape. The Safford District RMP designated the Muleshoe Ranch public lands (exclusive of wilderness) as a VRM Class II area to preserve scenic quality but to allow some modification of the landscape. The objective of Class II is to retain the existing character of the landscape. The level of change should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color and texture found in the predominant natural features of the characteristic landscape.

Lands within the Redfield Canyon Wilderness are designated as a Class I VRM area. The objective of Class I is to preserve the existing character of the landscape. This class provides for natural ecological changes; it does not, however, preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.

### Access and Off-Highway Vehicle Management

The Muleshoe CMA is 110 miles by road from Tucson. The Nature Conservancy's Muleshoe Ranch headquarters on the south end of the CMA, is located 29 miles northwest of Willcox, Arizona, in the southern foothills of the Galiuro Mountains.

Currently there is no legal vehicular access for public or administrative use onto public lands within the Muleshoe CMA. However, TNC and other landowners have been providing access through their private lands. The RMP calls for the BLM to pursue acquisition of legal access for public and/or administrative vehicular use in the following locations within the Muleshoe planning boundary:

Cherry Springs Canyon Road:  
T. 12 S., R. 20 E., secs. 4, 9. (public)  
Jackson Cabin Road

T. 12 S., R. 20 E., secs. 11, 12, 13. (public)  
T. 12 S., R. 21 E., secs. 19, 30, 31. (public)  
T. 13 S., R. 21 E., secs. 5, 6. (public)  
Muleshoe Pipeline Road

T. 12 S., R. 21 E., sec. 31. (administrative only)  
(The Muleshoe Pipeline Road is closed to motorized vehicular use by the public.)

The Safford District RMP calls for the preparation of a Transportation Plan which would identify additional access needs and closures, a road and trail numbering system, sign needs, maintenance needs and coordination with other agencies and landowners. Specifically, it calls for the reconstruction of the five and a half miles of Jackson Cabin Road on public land within the Muleshoe Ranch. The Plan allows road closures where needed to manage visitors, protect resources, and to meet other objectives.

The riparian area of Hot Springs Canyon (140 acres) has been designated closed to off-highway vehicle use. In a closed area, off-highway vehicle use is prohibited even if roads or trails exist within the closed area. The remainder of the public land within the Muleshoe CMA has been designated limited to existing roads for off-highway vehicle use. A limited to existing roads designation means motorized vehicles are restricted to existing roads

and trails occurring at the time of designation and on any new roads approved for construction during the life of the RMP (Safford District RMP Partial Record of Decision, September 1992). Vehicular travel into unroaded parts of the Muleshoe CMA is not currently a serious problem, probably because of the rugged terrain and remoteness of the area.

### Recreation Opportunity Settings

Four different recreation opportunity settings which provide the existing variety of recreational activities were identified in the Muleshoe planning area. The TNC headquarters area falls within the rural setting. The road corridors, including the Jackson Cabin Road, fall within the semi-primitive motorized setting. Soza Mesa falls within the semi-primitive non-motorized setting. The remainder of the planning area falls under the primitive setting. Each of these settings is composed of a resource (physical), social and managerial component as described below.

#### **TNC Headquarters Zone - Rural Setting**

##### Resource Setting

TNC headquarters area is developed, providing an urban interface as well as being a gateway to most of the Muleshoe CMA. Buildings include staff residences, casitas for visitors, a visitor center and dormitory, and workshop with storage. A campground with portable toilets, a nature trail, and corrals are also on site. A visitor information point is located at the beginning of the Jackson Cabin Road.

##### Social Setting

TNC headquarters serves as a staging point of use within the zone and to other portions of the CMA. Many visitors to the area do not travel beyond the headquarters zone, choosing to stay at the campground or casitas and use the nature trail. The area may be expected to have limited opportunities for solitude due to higher visitor levels.

## Managerial Framework

TNC preserve manager and staff live on site. They answer visitor questions and provide information about the CMA. The visitor information point contains a sign-in register, area map, and brochures giving information on the Muleshoe Ecosystem. A four-wheel-drive vehicle is recommended to travel beyond this zone on the Jackson Cabin Road. Management activities are concentrated in this zone.

## Road Corridors Zone - Semi-Primitive Motorized Setting

### Resource Setting

The road corridors have limited development. Structures are limited to the remains of the Browning, Pride and Jackson homesteads along the Jackson Cabin Road. There are also range improvements such as wells and corrals along the road corridors. The roads are dirt jeep trails. There is limited directional and informational signing in place.

### Social Setting

The road corridors are the travel routes to points within the Muleshoe and provide vehicular access to the Redfield Canyon and Galiuro wilderness areas. Visitors traveling the road corridors will encounter moderate solitude. Roads are primitive and four-wheel-drive vehicles are recommended. Car-camping can occur along the road corridors. There are no modern conveniences.

## Managerial Framework

There is very limited management along the road corridors. TNC or agency staff may be available infrequently in this zone to assist visitors. There is some regulatory signing.

## Soza Mesa Zone - Semi-Primitive Non-Motorized

### Resource Setting

There is limited development on Soza Mesa outside of the road corridors. Visitors may encounter pipelines and other livestock

improvements. Visitors will also encounter active livestock grazing. The riparian resources which attract visitors to the Muleshoe are not present on Soza Mesa.

### Social Setting

Most visitors to Soza Mesa are hunting. Other recreation use is infrequent. Soza Mesa is not a destination for most recreationists as it lacks some of the major resource values such as riparian areas which attract them to the remainder of the Muleshoe. Visitors could expect fairly high levels of solitude in this zone.

## Managerial Framework

Management is slightly less than along the road corridors. Management consists primarily of livestock grazing activities and law enforcement patrols.

## Remainder of Muleshoe - Primitive Zone (including wilderness)



### Resource Setting

There is little development in this zone. There are a few trails and trail markers and short stretches of fencing. Resource values are high and include visual resources, riparian areas, and wildlife.

### Social Setting

This zone has the highest level of solitude. Travel is on foot or by horseback only, and other people are rarely seen, especially in upland areas.

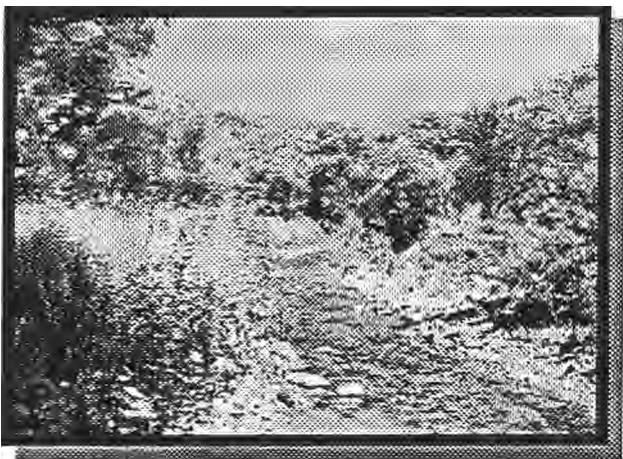
## Managerial Framework

There is very little management in this zone.

### K. SPECIAL DESIGNATION AREAS

#### Hot Springs Watershed ACEC

The Safford District RMP designated the 16,763 acre Hot Springs Watershed ACEC for the protection of riparian, cultural, and fish and wildlife values including threatened and endangered species values. The RMP prescribed management guidance for the ACEC, and the Muleshoe EMP serves as the activity plan for the ACEC.



#### Wild and Scenic Rivers

Segments of Hot Springs and Swamp Springs canyons were determined eligible for inclusion into the National Wild and Scenic River System (NWSRS) in the Safford District RMP (1992). Both segments were tentatively classified as "wild" and are under protective management prescriptions which will protect the free-flowing nature, the classification, and the outstandingly remarkable values. In the Arizona Statewide Legislative Environmental Impact Statement (1995), the State Director recommended to the Secretary of Interior that none of the segments of Hot Springs or Swamp Springs canyons was suitable as components of the NWSRS and that they should not be forwarded to Congress as part of a legislative package for consideration.

## Wilderness

The Redfield Canyon Wilderness was designated by Congress as part of the Arizona Desert Wilderness Act of 1990. The wilderness boundaries are not surveyed or signed. Few problems related to wilderness infractions have resulted, however, due mostly to the area's remoteness and ruggedness. No public facilities or designated parking areas are available at this time. Visitor use data has not been gathered, but use of the wilderness is thought to roughly parallel that of the Muleshoe CMA. The Muleshoe EMP will also serve as the Wilderness Plan for the Redfield Canyon Wilderness.

A portion of Muleshoe grazing allotment (No. 4401) is located within the Redfield Canyon Wilderness. The permitted livestock grazing was in suspension at the time of wilderness designation, and has remained in suspended nonuse since then. Livestock grazing on the adjacent Galiuro Wilderness was retired by the Forest Service in 1986. The range improvements within the Redfield Canyon Wilderness include the boundary fence with the FS lands and two wells located on the Jackson Cabin road.

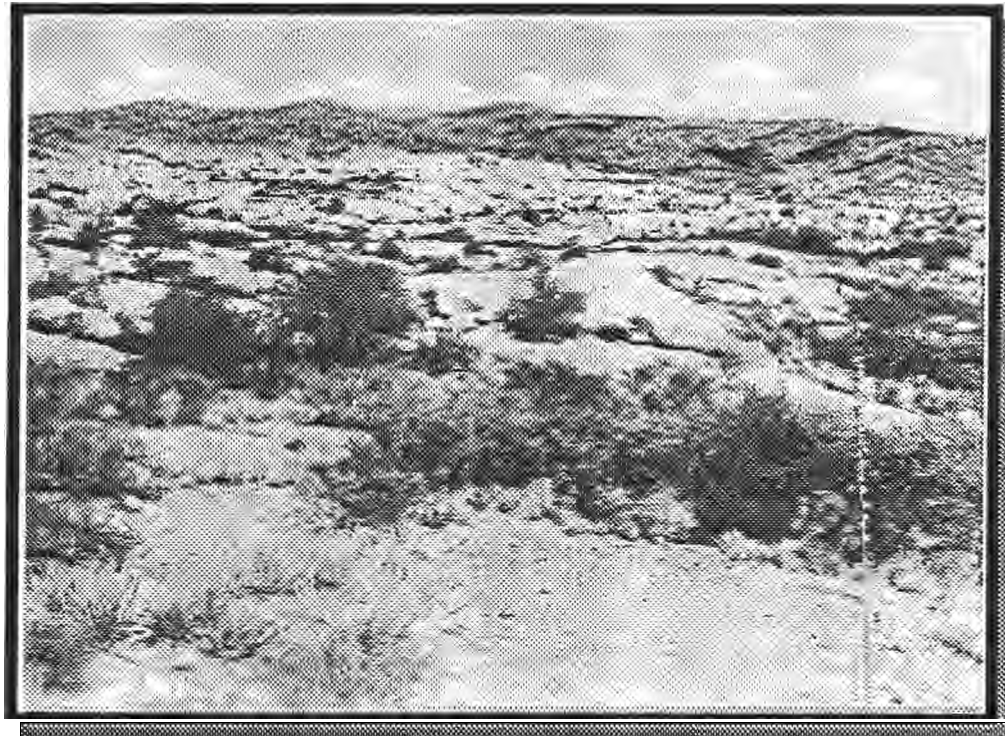
The Galiuro Wilderness was designated in Congress in 1964 and was enlarged in 1984. There are 76,317 acres of land within the Galiuro Wilderness. The 22,000 acres of the Galiuro Wilderness which comprise the upper Redfield Canyon watershed are included within the CMA and within the Ecosystem Planning Area boundary. The Safford Ranger District of the FS administers the wilderness and recently completed a Wilderness Implementation Schedule (WIS). The purpose of the WIS is to identify the management actions specified by the Coronado National Forest Plan for the Galiuro Wilderness and lay out how they are to be accomplished. In addition, the WIS plans the process by which management direction, objectives, standards, and guidelines specific to the Galiuro Wilderness which will be incorporated into the revision of the Coronado National Forest Plan.



## L. MINERAL DEVELOPMENT

As discussed in the Geology section, the mineral potential of the Muleshoe Ecosystem is low. The 21,600 acres of state land acquired by the BLM in 1986 were officially opened to mining in February 1988. The Redfield Canyon Wilderness was closed to new mineral entry when it was designated in 1990, and there were no active mining claims in the Wilderness at designation. This means that no mining for locatable minerals will occur in the Redfield Canyon Wilderness. In addition, mineral material sales and oil and gas leases will not be issued for the Redfield Canyon

Wilderness. Currently there are no active mining claims on non-wilderness lands within the Muleshoe planning area. The Safford District RMP prohibits surface occupancy for oil and gas leases and prohibits mineral material (sand and gravel) sales within the riparian areas of the Muleshoe public lands. The RMP also requires the submittal of mining plans of operation by the operator and approval by the authorized officer prior to commencement of any mining on public lands within the Hot Springs ACEC.





# V. ISSUES

## A. PLANNING ISSUES

### 1. Management of Riparian Areas

Properly functioning riparian areas reduce erosion, improve water quality, stabilize streambanks, improve groundwater recharge and floodwater retention, develop complex aquatic habitat, and support greater biodiversity. Riparian areas on the Muleshoe provide significant habitat for wildlife including many threatened and endangered species. They are also a major focus for recreation activities.

The plan will address the following questions related to riparian areas:

- a. How will riparian dependent and aquatic wildlife be protected?
- b. What measures can be taken to reduce the impact of roads on sensitive **riparian areas**?
- c. Should special management occur for recreation activities in riparian areas?
- d. What is the desired riparian plant community?
- e. How will properly functioning condition be achieved and/or maintained for riparian areas?
- f. Can perennial stream flow be increased?

### 2. Management of Upland Vegetation

The condition of upland areas has a major influence on the condition of riparian areas. Properly functioning uplands with good ground cover of vegetation will increase infiltration and extend base flows while reducing runoff, soil erosion and peak flows. Historic land uses on the Muleshoe have resulted in increased shrub invasion in **upland grassland communities** and a reduction in larger perennial bunchgrasses (Anderson, Warren & Reichenbacher 1985). Fire no longer plays a natural role. High peak flows from Hot Springs and Redfield canyons have contributed to road washouts and other flood damage along the **San Pedro River**. **Peak flows in**

these drainages frequently remove riparian vegetation before it is fully established.

The plan will answer the following questions relating to upland vegetation:

- a. What measures can be taken to restore and/or maintain natural disturbance regimes including fire?
- b. How will fire be managed?
- c. What measures can be taken to minimize soil erosion and peak flows?
- d. What are the desired upland plant communities?
- e. How will properly functioning condition be achieved and/or maintained for the watershed?

### 3. Livestock Grazing

Livestock grazing has not occurred for over 13 years on much of the planning area. The Safford District Resource Management Plan directs that determinations for suitability and compatibility of livestock grazing be made for the Muleshoe allotment in this planning effort. Management practices for the Soza Mesa allotment need to be established. Livestock grazing issues are also related to riparian and upland vegetation issues.

The plan will answer the following questions relating to livestock grazing:

- a. Which riparian and/or upland areas are suitable (have potential) for livestock grazing?
- b. Which of these suitable areas are compatible with livestock grazing?
- c. In areas where livestock grazing can and does occur, what level of vegetation utilization (forage allocation) is appropriate?

#### 4. Protection of Wilderness Values

Uses of wilderness are managed with the underlying principle to protect wilderness values of naturalness and outstanding opportunities for solitude and primitive recreation. Use of wilderness by visitors in a way that does not degrade wilderness values is required by the Wilderness Act. Special provisions of the Wilderness Act allow other uses to be authorized when managed to protect wilderness values. The Arizona Game and Fish Department has identified the need to reconstruct two bighorn sheep waters, and conduct aerial wildlife surveys and other operations in the wilderness.

The plan will answer the following questions relating to wilderness:

- a. Will recreation use levels, including group size limits, be set or permits required for wilderness use?
- b. To what extent are visitor facilities, including trails **and parking areas needed?**
- c. How will wilderness boundaries be identified and managed to prevent illegal vehicle use?
- d. How will opportunities for solitude be maintained?
- e. How will concerns about impacts to naturalness **from potential activities on those private and state lands within the Redfield Canyon Wilderness** be addressed?
- f. How **will existing range and wildlife** developments be maintained or reconstructed?
- g. How will wildlife management operations be conducted?
- h. What **information about the wilderness** will be provided?

#### 5. Recreation and Vehicle Access

Although **there is currently no legal public access** into the **BLM public lands on the Muleshoe Ecosystem**, **TNC provides visitor access** through their **deeded lands**. There are demands for vehicle

access for hunting and other recreation activities, research, livestock management, and administrative use. Concerns have been expressed about off-road use of vehicles, road maintenance, and management of recreation opportunities.

The plan will address these questions relating to recreation and access:

- a. What types of recreation use are appropriate; where and how much?
- b. What types of recreation facilities may be needed and where?
- c. How will public recreation opportunities be managed to minimize conflict between recreation users?
- d. How much, what type, and where should vehicular access occur?
- e. Can the Great Western Trail be accommodated?
- f. Which roads should be maintained; by whom and how?
- g. How will legal vehicular access to public lands be obtained?

#### 6. Cultural Resource Management

**Knowledge about the cultural resources on the Muleshoe is limited. There is concern that these resources need to be protected in context so that more can be learned about prehistoric and historic human occupation. Historic sites need to be evaluated for possible stabilization and/or restoration. Traditional use sites for Native Americans need to be identified and protected.**

The plan will answer the following questions relating to cultural resources:

- a. **How should we protect, preserve and/or restore cultural sites?**
- b. **What provisions should be made for Native American traditional uses?**

## 7. Management of Wildlife

The Muleshoe Ecosystem supports diverse fish and wildlife resources. The Muleshoe Ecosystem provides habitat for over 35 special status wildlife species including five native fish species. Healthy populations of game animals, including bighorn sheep, mule deer, javelina and quail, provide hunting opportunities. Potential habitat exists to support reintroductions of several threatened and endangered species and supplemental stockings of other wildlife.

The plan will answer the following questions related to wildlife management:

- a. What type of water sources (natural vs. constructed) are needed by wildlife and where?
- b. How and where should introductions and reintroductions of native wildlife species, including threatened and endangered species, occur?
- c. How should exotic aquatic species be managed so that native species are not adversely affected?

## 8. Socio-Economic

There are concerns that management activities on the Muleshoe may affect traditional lifestyles and local economies. **Many rural residents in the** local area depend on ranching, agricultural activities, and mining for their livelihood. Ecotourism has also been identified as having the potential to provide economic benefits.

The plan will answer the following question relating to socio-economics:

- a. How will resource uses and activities within the planning area affect rural lifestyles?

## B. ISSUES SOLVED BY LAWS, POLICY, OR PLANNING

The following issues are resolved below and will not be addressed further in the plan:

## 1. Minerals Management

Concerns were raised about whether additional closures to mining (mineral withdrawals) should occur on the Muleshoe Ecosystem to protect riparian resources. The Arizona Desert Wilderness Act of 1990 prohibited new mineral entry (for locatable minerals) into the Redfield Canyon Wilderness, and there were no active mining claims in the Wilderness when it was designated. This means that there will be no mining in the Redfield Canyon Wilderness. In addition, no mineral material sales and no oil and gas leases will be issued for the Redfield Canyon Wilderness. The remainder of BLM lands on the Muleshoe are open to mining. However, the Safford District RMP prohibits mineral material sales and surface occupancy for oil and gas leases within areas with riparian vegetation. The RMP also requires the submittal of mining plans of operation by the operator and approval by the authorized officer prior to commencement of any mining activities within the Hot Springs ACEC.

## 2. Access for Maintenance of All-American Pipeline

The All American Pipeline is operated with a right-of-way lease which ensures that access will be provided for maintenance.

## 3. Animal Damage Control

Concerns were expressed about whether predator control is appropriate for the area and who would have control over it. The Arizona Game and Fish Commission is the legal entity for state wildlife management on all lands in Arizona. Arizona State Laws ARS 17-302 and 17-239 authorize the take of predators when damage is occurring. Animal damage control activities on BLM lands within the planning area are covered under the Animal Damage Control (ADC) Plan for the Safford District and Environmental Assessment (EA No. AZ-040-0-10) dated August 2, 1994. The ADC Plan identifies where, when, and under what restrictions predator control operations can be carried out. The Redfield Canyon Wilderness and Hot Springs ACEC portions of the planning area are identified as restricted control areas in the

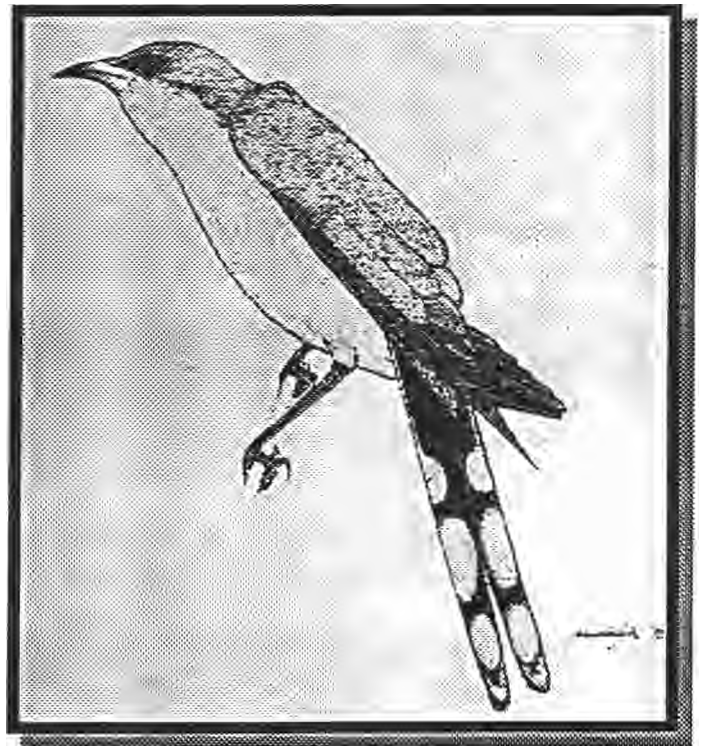
**ADC** plan. The Animal Plant Health Inspection Service (APHIS)-ADC will confer with the BLM Area Manager or designee prior to carrying out any requested control in any ACEC and with the BLM State Director for any wilderness area. Animal damage control activities are not anticipated to occur on FS lands within the planning area. Any **ADC** activities on FS lands require approval of the Regional Forester.

#### **4. Trapping**

Concerns were expressed about the compatibility of trapping on the planning area. Hunting and trapping are regulated by the Arizona Game and Fish Commission. Proposition 201 which was passed in Arizona's November 1994 general election amended Section 17-301 of the Arizona Revised Statutes and makes it unlawful to take wildlife with any leghold trap, any instant kill body gripping design trap, or by a poison or a snare on any public land.

#### **5. Wolf Reintroduction**

Both the BLM and FS have policies to support recovery efforts for threatened and endangered species including reintroductions. Reintroduction of Mexican wolves is being addressed in an Environmental Impact Statement being developed by the U.S. Fish and Wildlife Service. The Galiuros was one of several possible reintroduction sites examined; however it was not selected as a site to pursue for reintroduction. There are no current proposals.



## VI. VISION AND GOALS

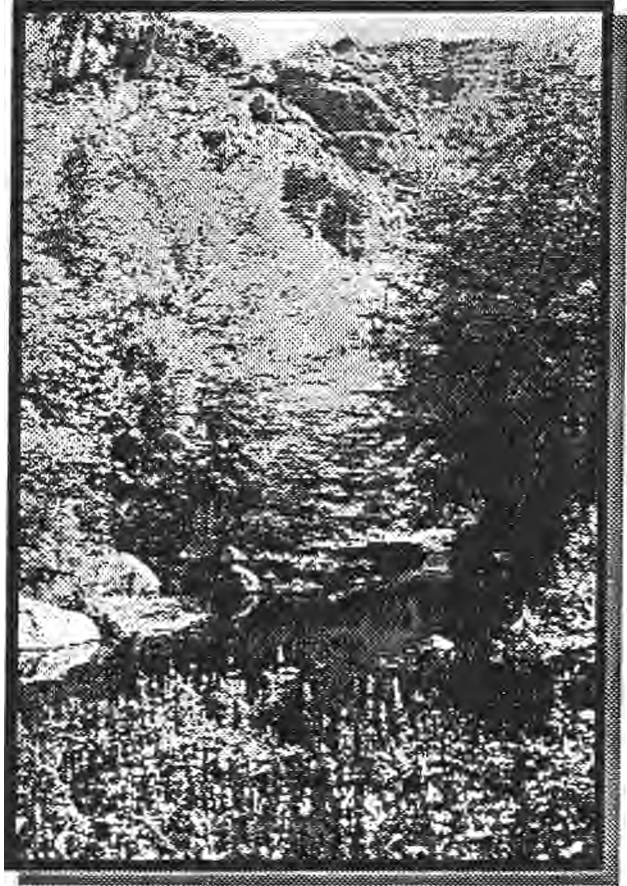
The vision of the Muleshoe Ecosystem Planning Team is "to sustain and enhance the natural resources and ecological processes on which they depend, to protect and preserve values of designated wildmesses, to protect and preserve cultural resource values, to maintain *lifestyles* that emphasize living in harmony with the ecosystem, and to achieve these through cooperative effort".

### Riparian Vegetation Goal

Maintain or improve riparian and aquatic zones in the Muleshoe Ecosystem to achieve properly functioning condition and an ecological state which provides high quality fish and wildlife habitat. The desired ecological state has the following components: a diversity of native riparian vegetation with all age classes of woody riparian vegetation well represented; dense vegetation with structural complexity; a diversity of aquatic habitats including pools, runs, and riffles; natural processes working near optimum while also allowing compatible levels of human uses which allow for the sustainability of these resources and processes.

### Upland Vegetation Goal

The upland vegetation goal is to restore the natural process of periodic fire in the grassland ecological sites of the Muleshoe Ecosystem and to produce a variety (mosaic) of transitional grassland and shrub/grassland states dominated by mid-to-tall stature perennial grasses (States I and II in Grassland State-Transition Model).



### Wilderness Goals

Provide for the long-term protection and preservation of the area's wilderness character under a principle of non-degradation.

Manage the wilderness for the use and enjoyment of visitors in a manner that will leave the area unimpaired for future use and enjoyment as wilderness.

Manage the area using the minimum tool, equipment, or structure necessary to successfully, safely, and economically accomplish the objective.

Manage nonconforming but accepted uses permitted by the Wilderness Act and subsequent laws in a manner that will prevent unnecessary or undue degradation of the area's wilderness character.



# VII. OBJECTIVES/ MANAGEMENT ACTIONS/ MONITORING

## A. RIPARIAN/AQUATIC AREA MANAGEMENT

### Objective 1A:

*Achieve or maintain proper functioning condition and high seral stage ecological states for the riparian areas in the Muleshoe Ecosystem by 1999 or within five years of a major flood event through:*

*Increasing the density of saplings and trees and improving sapling to tree ratios (of all woody riparian species) in key riparian segments on Upper Hot Springs, Lower Hot Springs, and Bass canyons as illustrated in Table 6.*

*Maintaining densities and sapling to tree ratios for key riparian segment B in Swamp Springs Canyon, and for the key riparian segment in Redfield Canyon as illustrated in Table 6.*

**Rationale:** Redfield Canyon and Swamp Springs Canyon were judged to be in properly functioning riparian condition during 1994 sampling. Redfield Canyon is the larger of the two streams and more closely compares to Hot Springs and Bass canyons. Therefore, Redfield Canyon was used as the target example for density of saplings and trees with a target ratio of three saplings to one tree.

**TABLE 6**  
Existing and Target Tree Densities  
Muleshoe Ecosystem Riparian Areas

Stream	1994 density (#/acre)	1994 ratio (saplings:trees)	target density (#/acre)	target ratio (saplings:trees)
Upper Hot Springs Canyon	60	6.5 (52:8)	>200	3.0 (180:60)
Lower Hot Springs Canyon	202	2.2 (138:64)	>450	3.0 (384:128)
Bass Canyon	116	1.6(71:45)	>425	3.0 (348:116)
Swamp Springs Canyon A)	150	1.5 (89:61)	>600	3.0 (450:150)
B)	760	2.8 (431:154)	>750	3.0
Redfield Canyon	474	3.0 (357:117)	>425	3.0

*Note: Swamp Springs segment B was sampled in 1992. Density is the number of saplings and trees per acre of any woody riparian species (ash, sycamore, cottonwood, alder, or willow) present in the drainage. Saplings are defined as greater than six and one-half feet tall or greater than one inch diameter at breast height (dbh). Trees are defined as greater than six inches dbh.*

In properly functioning riparian areas, vegetation is present in sufficient density to facilitate bank building, to armor banks, and to dissipate flood energy; the majority of banks are armored by vegetation or rock against flood forces; only a small amount of banks are eroded or broken away; and trees are

present in all three age classes at relatively high densities. Density of riparian trees is one of the best indicators to assess properly functioning condition of riparian areas. Riparian trees are a major contributor in bank and terrace development and stabilization.

The ratio of saplings to trees is a good indicator of a structurally diverse community. In addition, a healthy sapling-to-tree ratio indicates continued recruitment of seedlings to saplings and saplings to trees in the community. Recruitment of seedlings to saplings and saplings to trees are significant steps that ensure continued function and replacement of larger trees. These large trees (generally over 20 inches dbh) provide important nesting habitat for neotropical raptors such as gray hawks, black hawks, and zone-tailed hawks. Tree roots and fallen trees facilitate development of pools, which are important habitat for many of the native fish species including Gila chub and Sonora and desert suckers as well as for leopard frogs. Dense riparian vegetation from ground level to 20 feet adjacent to perennial water provides potential nesting habitat for southwestern willow flycatcher and other neotropical birds. Dense riparian vegetation and a structurally diverse community provide high quality wildlife habitat and contribute to increased biodiversity.

Based on the El Nino cycle and past flood events on streams in this geographic area, a major flood\* frequency of every 7-10 years for the Muleshoe streams was predicted. Major flood events are naturally occurring in a functioning riparian system and can remove large amounts of vegetation, change channel size and location, create new seed beds for species regeneration, and remove and build terraces. Following a major flood, a five-year cycle to achieve the target densities and ratios of saplings to trees based on 10 years of biannual riparian monitoring data in Redfield and Swamp Springs Canyon was anticipated. In the absence of a major flood, it was assumed that all saplings would be converted to tree age class within five years. Although a portion of the saplings and trees would be lost during the five years to natural thinning, recruitment from seedlings to saplings should also be occurring. After reaching a peak or near peak in density and sapling-to-tree ratio in approximately five years, it is expected that the sapling-to-tree ratio will decrease as will density. These decreases are due to the increased proportion of adult trees that shade out younger trees and natural thinning as the adults develop.

\*A major flood, as defined here, is an event that decreases tree density by at least 1/3 through scouring and removal.

The expectation is that the riparian community will recover from periodic flood disturbance by eventually reaching the target parameters, although only for a brief period, as the riparian forest develops. If the tree community passes through a period in which the parameters are met, then there is a high confidence in the assumption that the processes inherent to mixed broadleaf riparian communities are functioning at or near potential.

If the above objective is met, it is anticipated that habitat will be available to support the following numbers of selected breeding pairs of avian raptor species along Hot Springs, Bass, Double R, Redfield and Swamp Springs canyons:

Species	Current Projected	
Mexican Spotted Owl	1 pair	2-5 pair
Northern Gray Hawk	1 pair	2+ pair
Zone-tailed Hawk	2 pair	3-5 pair
Common Black-Hawk	2 pair	3-5 pair
Peregrine Falcon	1 pair	1-2 pair

Neotropical migratory birds which depend upon riparian vegetation have been shown to be declining in population or distribution throughout the western United States in recent years . Management of riparian breeding habitat is critical to recover populations of listed species or to prevent listing of these and other avian species. The densities of neotropical migratory birds listed below are based on studies of avian population dynamics and their relationship to riparian habitat quality within Bass Canyon from 1992 through 1994. Projected densities below are for Bass Canyon only. Hot Springs, Double R, Redfield, and Swamp Springs canyons may have small populations of these species presently, but these canyons have not been systematically surveyed to date. With successful implementation of this objective for all riparian habitats within the Cooperative Management Area, as measured by a positive population trend in Bass Canyon, other canyons' riparian obligate avian species are expected to respond in a similar manner. A positive population trend and/or establishment of breeding populations for these species in currently unoccupied habitat is the desired goal.



Species	Current	Projected
Yellow-billed Cuckoo	1 pair	5 pair
SW Willow Flycatcher		5 pair
N.Beardless-tyrannulet	1 pair	3 pair
Western Wood-Pewee	0 pair	20 pair
Bm-crested Flycatcher	10 pair	15 pair
Bell's Vireo	5 pair	10 pair
Yellow Warbler	40 pair	50 pair
Common Yellowthroat		10 pair
Yellow-breasted Chat	10 pair	15 pair
Song Sparrow		15 pair

**Objective 1B:**

*Maintain the presence of the following woody riparian species found in 1994 in the riparian plant communities at each key riparian site for the life of the plan:*

**Hot Springs Canyon:**

*ash, sycamore, cottonwood, willow*

**Bass Canyon:**

*ash, sycamore, cottonwood, willow*

**Swamp Springs Canyon:**

*ash, sycamore, alder*

**Redfield Canyon:**

*ash, sycamore, cottonwood, alder, willow*

**Rationale:** Maintenance of these woody riparian species is important for maintenance of biodiver-

sity along the streams. These woody species are generally the most susceptible to erosion and loss. When the riparian system is functioning, and these species are healthy and present, then other important riparian species such as hackberry, walnut, and mesquite will be present as well. The intent of this objective was to prevent the loss of tree species to manmade causes. It must be recognized that our understanding of the ecology of these tree communities is incomplete. Therefore, the loss of a species from natural causes such as succession may occur although such an outcome is not anticipated. Introduction of exotic woody riparian species such as salt cedar can result in the loss of native woody riparian species. Salt cedar invasions have occurred in the San Pedro and Gila rivers and in many tributary streams. This species is a particularly successful invader when riparian areas are in a degraded condition. Currently, small numbers of salt cedar are present in most streams on the Muleshoe and could pose a threat to the riparian communities.

**Objective 1C:**

*Provide a diversity of aquatic habitats to maintain or enhance the viability of the existing native fish communities within the Muleshoe Ecosystem by meeting or exceeding values for the aquatic habitat parameters shown in Table 7 in key riparian sites by 1999 or within five years of a major flood.*

**TABLE 7**  
Existing and Target Aquatic Habitat Parameters  
Muleshoe Ecosystem Streams

Habitat Parameter	Redfield Canyon		Bass Canyon		Hotsprings Canyon	
	1994	1999	1994	1999	1994	1999
Pools/Mile	44	>49	32	>49	7	>35
Linear Percent of Pool Habitat	27%	>25%	23%	>20%	2.5%	>10%
Percent of Pools with max depth >2 ft.	71%	>70%	14%	>50%	33%	>50%
Woody Cover (ft <sup>2</sup> /mile)	1413	>1000	2682	>1000	300	>500
Undercut Bank (ft/mile)	220	>200	0	>100	73	>100
Bank Stability	excel	excel	good	excel	excel	excel
Overstory (%)	50	40-60	41	40-60	8	20-30
Min monthly flow (cfs)	N/A		0.18 (July)		0.40 (June)	

\*Methodology from Plans 1983. Bank stability is based on the percentage of stream bank along a line intercept transect covered by vegetation, cobble or larger material.

See Appendix 6 for methodologies and full description of habitat parameters

**Rationale** Overall aquatic habitat diversity and stability is expected to increase if riparian and aquatic parameters listed above show improvement. Gila chub is the most sensitive of the 5 fish species that inhabit the area. Habitat parameters that will promote the health of this fish were selected. Since other species are dependant on pools and will benefit from improvement of other parameters as well, all five species are expected to maintain healthy populations.

Lack of pools are often a limiting factor in degraded riparian systems. Excessive sediment loads coupled with a poor differential in scour and deposition may prevent or inhibit pool formation and development. The development of a diversity of habitats which creates a wide array of physical attributes is expected to provide habitat for all life stages of each of the five fish species.

If the above objective is met, then it is anticipated that both juveniles and adult life stages of all five species will be well represented in these three fish communities. In addition, Redfield Canyon is anticipated to maintain a relative proportion of at least 40% chub to all other adult fish and a density of >45 chub per 330 foot seine haul (this is based on data collected in a different reach). In Bass Canyon it is anticipated that the relative abundance of adult chub will increase from 19% to 30% of all adult fish with a density of greater than 40 chub per 330 foot seine haul. In Hot Springs Canyon it is anticipated that the proportion of Gila chub will increase from a trace to 10% (adults and/or juveniles) of all fish with a density of greater than 25 chub per 330 foot seine haul. A stable to improving trend for Gila chub will indicate overall success of riparian/aquatic improvement.

**NOTE:** The data for the fish community and habitat was collected by TNC and BLM. Fish were collected by seining, and in some cases, numbers of chub estimated by counting fish in pools too large to sample. Habitats were classified and quantified by TNC where fish collections were made. BLM used a more extensive basin-wide survey method to classify and quantify fish habitat where riparian data (key areas) was collected and is presented in the objective table where as the TNC data is not. Areas where data were collected by TNC did not always correspond to areas

chosen for riparian and aquatic monitoring by BLM.

#### Riparian Management Actions:

1. Perfect instream flow water rights to obtain certificate on the following waters: Hot Springs (BLM and TNC), Bass (TNC), Redfield (BLM), and Wildcat (BLM).

**Rationale:** The Bureau and TNC are pursuing instream flow water rights in order to protect riparian/ aquatic habitats and their associated values. This type of water right is non-consumptive since the value of the water is to have it remain flowing down the channel. This will provide water to downstream users and to recharge aquifers. The lack of water resource allocation for fishes (instream flow protection) is the largest threat to fishery resources in the western U.S., where most of the water is allocated for human uses without provision for fishery resources. This means that streams and rivers that support fish are at risk of going dry, becoming fragmented, having altered flow regimes, having altered water chemistry and other detrimental influences of use without mitigation for fishery values.

2. Evaluate feasibility of installation of a stream gauge on Redfield Canyon and install if feasible. Identify an appropriate location for and install stream gauge on Hot Springs Canyon.

**Rationale:** Stream gauges will provide continuous (water level recording) or single event (crest gauge) data that will aid in perfecting water rights, evaluating effects of flooding on riparian function, and evaluating response of the fish community to the hydrologic regime.

3. In partnership with other agencies and entities, pursue development of riparian ecological site guides for Muleshoe riparian areas. Place surveyed cross sections in key riparian segments (geo-referenced).

**Rationale:** The development of ecological site guides for the riparian area will provide information important for understanding

riparian function and potential on the Muleshoe Ecosystem. This information coupled with permanent transects will provide a means for a detailed evaluation of riparian response to management of the Muleshoe CMA.

4. Remove non-native vegetation species where monitoring indicates a threat to native species and where control will not result in any long-term degradation of riparian function.

**Rationale:** Non-native species pose one of the most serious threats to native plant and animal communities. In some cases, the problem species is controlled by natural factors on the site. In other cases, the species needs to be controlled or eliminated in order to maintain the native plant or animal community

5. Post signs closing the Hot Springs Canyon riparian area to vehicles. Work with Saguaro-Juniper to limit or exclude vehicle traffic in riparian portion of lower Hot Springs Canyon.

**Rationale:** The Safford District RMP designated that 140 acres of the Hot Springs Canyon riparian area be closed to vehicular travel. Posting and enforcing a closure of this area to vehicles implements the RMP decision. Both the Saguaro-Juniper private lands and BLM public lands in Hot Springs Canyon are closed to vehicular travel. Cooperating on this closure is mutually beneficial.

6. Eliminate livestock use from the riparian areas.

**Rationale:** If cattle grazed in the riparian areas, they would likely spend an inordinate amount of their time along the creek bottoms because of the narrowness, rugged topography and steep-sided nature of the Muleshoe canyons. This activity pattern is expected to occur regardless of the season of grazing use and would likely result in more than acceptable levels of utilization on riparian vegetation (>40%) and trampling of banks (>25%).

The literature on grazing indicates that growing season grazing in riparian areas is not likely to meet the above riparian objective (Ames 1977, Behnke 1979, Dahlem 1979, Davis 1977,

Kindschy 1987, Szaro, 1980, Platts 1991). Regardless of the season, trampling of stream banks by cattle would adversely affect fish habitat (bank stability), riparian habitat, and archaeological sites. Exclusion of grazing should favor the reestablishment of cool-season, native, perennial grasses (such as the *Elymus* species) in the riparian areas and help displace exotic annuals such as red brome. Removing livestock from these sensitive habitats (where the impacts are unacceptable) and restricting grazing use to the adjacent uplands, will provide for continued livestock grazing in the long run through restoration and maintenance of a healthy watershed within the Muleshoe CMA.

7. Construct fencing necessary to control cattle to meet constraints and objectives before any grazing is initiated elsewhere on the allotment.

**Rationale:** The existing fencing is inadequate to control livestock grazing to the level necessary to meet the riparian objective. There is currently no interior fencing to separate riparian and upland areas.

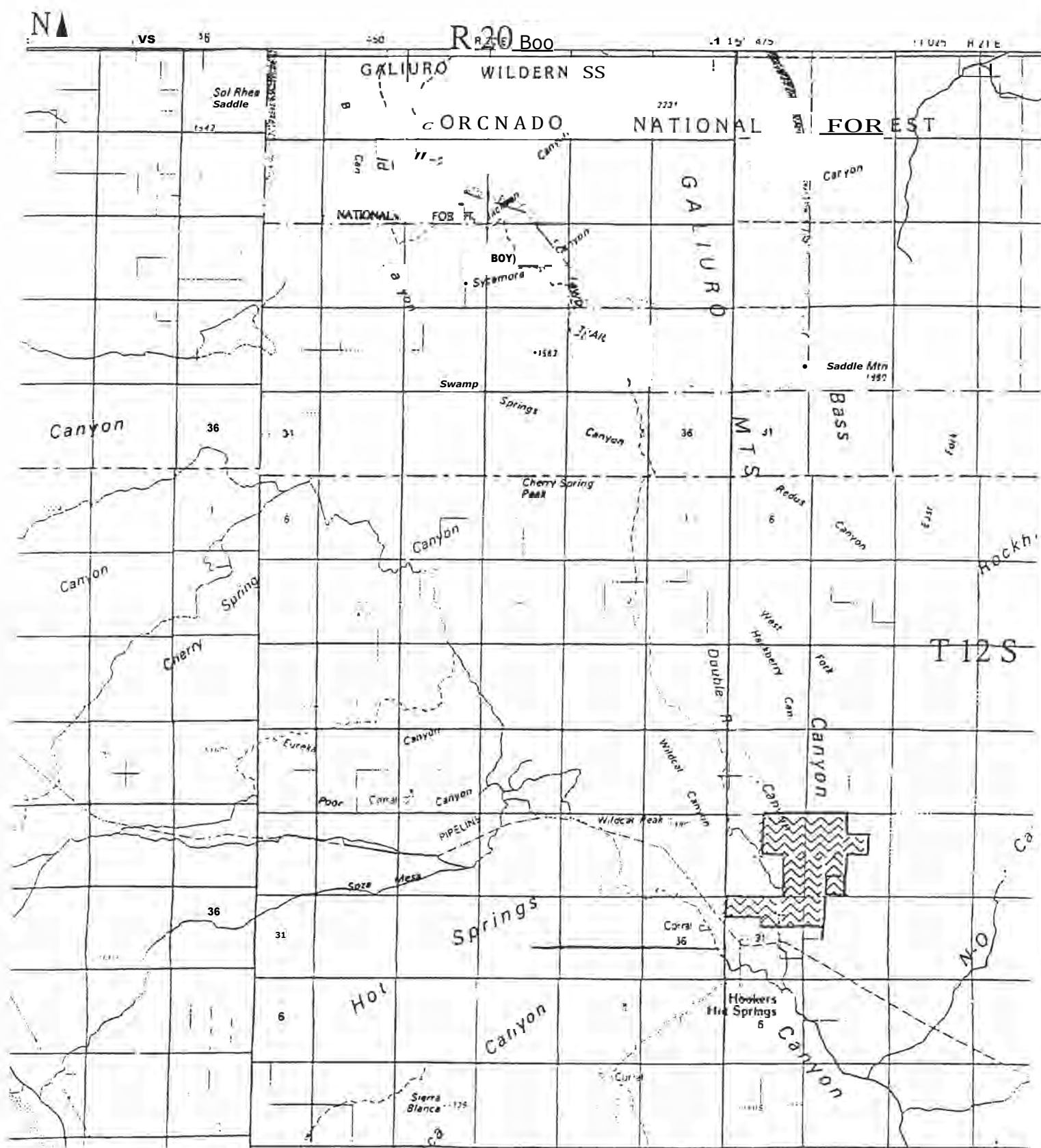
8. Emphasize low-impact camping techniques with signs and printed materials.
9. Designate Bass Canyon as a day use area only (Figure 7).
10. Ensure that recreation activities in riparian areas do not cause impacts to stream bank stability resulting in bank stability dropping below 75%. Methods to ensure this could include education, restrictions on numbers of users or seasons of use, or restrictions on a specific activity, if needed.

**Rationale (8-10):** Impacts from recreation can be minimized by promoting dispersed recreation. The Bass Canyon riparian area receives the highest level of recreation use. Making this a day use area will reduce impacts to native riparian wildlife and vegetation. Bank stability is a good indicator of impact from trampling by recreationists. Under the current levels of recreation use and current activities, bank stability is expected to remain in acceptable levels. However, this sets an acceptable level

# Muleshoe Ecosystem Management Plan

## Bass Canyon Day Use Area

Day use Area



of impact to monitor for and provides solutions if it is exceeded.

11. Prohibit commercial collection of plant materials.
12. Prohibit wood-cutting. Dead and down wood may be collected on public lands for campfires. Collection of dead and downed wood is not permitted on TNC deeded lands. Campers will be encouraged through signs and/or printed materials to collect only enough wood for their immediate need.

**Rationale (11-12):** Casual collection of plants and wood for fire is not likely to conflict with plan objectives. However, some plants are rare and the loss of trees to wood-cutting can become a serious problem. Commercial harvest of plants and trees is likely to affect watershed and wildlife values.

13. Maintain roads across riparian areas on an as-needed basis and in a way which causes the least impact to the riparian areas.
14. Construct waterbars as needed along the pipeline corridor to minimize erosion.

**Rationale (13-14):** Maintenance of riparian road crossings on the Jackson Cabin road ensures a minimal level of access to the CMA. Road maintenance has to be completed carefully in riparian areas to avoid impacts to these sensitive areas. Because of the steepness of the pipeline corridor, sections are subject to erosion which may impact downstream riparian areas in the Hot Springs watershed. Waterbars should minimize erosion and reduce maintenance for administrative access.

15. Designate prescribed (both natural and management ignited) fire units to include riparian areas where small portions may be burned on an experimental basis. Special considerations of burn units with riparian areas will be factored into the annual burning strategy. Operational burn plans will be designed to minimize the chance of fire damaging riparian areas.

**Rationale:** The role of fire in riparian areas is not well understood. Since fires occurred naturally without suppression, historically, it is likely that riparian areas adjacent to grasslands maintained by fire were directly impacted on a regular basis. However, the frequency and amount of impact historically are essentially unknown. The impacts from natural ignitions occurring at a localized source are likely to differ from those from management ignitions which usually are more widespread and burn more thoroughly. Only a small fraction of Arizona's original riparian acreage still remains. This is some of the most productive and valuable wildlife habitat, harboring a variety of rare plants and animals. The value of riparian areas must therefore be balanced with the need to learn more about the role of fire in this community. The above management prescription allows more to be learned about fire's role with minimal risk to the riparian areas.

## Riparian Monitoring

1. **Continue monthly instantaneous flow measurements on Upper and Lower Hot Springs, Redfield, Bass, and Wildcat to support instream flow water rights.**
2. Collect and download stream gauge data and service gauges each month to support instream flow water rights.
3. Riparian vegetation will be monitored at key sites every other year during the period of April through June. In the event of a major flood, the key sites will be sampled during the April-June period immediately following the flood event and then every other year. The riparian vegetation parameters sampled include density of woody riparian trees by age class and species, width and vegetative cover types of riparian ecological sites, and cover of key herbaceous species. The methodology is described in Appendix 6.
4. Photopoints within the key riparian sites will be retaken annually.
5. If established, the surveyed cross sections will be measured a minimum of every five years.

6. Low-level aerial photos (false color infrared) will be taken every five years.
7. Aquatic habitat monitoring (level III) will be done in conjunction with the riparian vegetation monitoring and will occur at least once every two years. Methods will follow the draft BLM Handbook 6720-1 modified intensive basin stream survey using the habitat classification of McCain et al. 1989 (Appendix 6).
8. Fish monitoring will continue annually in fall (Oct-Nov) in association with the AGFD fall fish count. Catch per unit effort (CPUE) will be used to follow population trend. Seining will be the primary method for monitoring and will follow the protocol in Gori (1993).

In addition habitat characteristics will be collected for development of model for fish populations that may be able to predict changes in relative abundances of fish species.

9. Bank stability will be monitored using the methodology in Plans et al 1983 (similar to BLM's Greenline method) at key riparian segments during the riparian vegetation monitoring. Additional monitoring sites for bank stability may be added to assess cultural site stability, recreation impacts, or other uses. This method quantifies the amount of stable and unstable bank in order to determine overall health (Appendix 6).

**Rationale:** Continuing monthly flow measurements is a requirement to support instream flow water right applications. Monitoring riparian vegetation and aquatic habitat is necessary to determine if progress is being made in achieving the riparian vegetation objectives. Retaking photopoints annually provides a relatively quick assessment of the riparian area in years when the more time-consuming vegetation monitoring does not occur. Monitoring fish populations provides information about whether improvements in riparian and aquatic habitats are having the desired positive impact on native fish populations. Monitoring will be completed cooperatively by the partners in the Muleshoe Cooperative Management Area.

10. In order to monitor the avian response to riparian recovery within the Muleshoe Ecosystem, the following avian monitoring schedule is recommended:

\* *Winter stick nest surveys will be conducted in January and February in Bass, Double R, Hot Springs, Redfield, Wildcat and Swamp Springs canyons. Raptor nests will be counted and recorded on maps. Based upon the previous year's raptor nesting surveys and characteristics of nest size and location within each tree, each nest will be identified to species.*

*Raptor surveys will be conducted on the above canyons in June to determine nesting success of common black-hawk, northern gray hawk, zone-tailed hawk, red-tailed hawk, Cooper's Hawk, and peregrine falcon.*

\* *Surveys for special status avian species such as yellow-billed cuckoo and southwestern willow flycatcher will be conducted in June in all canyons which display suitable habitat for these species.*

*Avian transect readings will be continued in Bass Canyon during the months of April through August yearly. Transect method will be Variable Circular Plot (VCP). The Bass Canyon transect will be read twice per month throughout the breeding season for a total of 10 readings per year. This will facilitate interpretation of data gathered from readings in 1992 through 1994. Positive or negative population trends of neotropical migratory bird species will be noted. Results of avian surveys in Bass Canyon can be used as indicators of overall population status of avifauna in other canyons if similar management actions are implemented in all canyons.*

**Rationale:** If the recommended avian monitoring schedule is implemented, it is anticipated that accurate measurements of avian population dynamics will be noted with respect to management actions. Neotropical migratory bird species have been shown to be indicators of habitat quality. The species which are dependent upon a functioning, stable riparian ecosystem will respond either in a

positive or negative manner to management actions. The avian monitoring schedule outlined above is the minimum effort to determine population status through time. Monitoring the neotropical migratory bird population of the Bass Canyon riparian system twice per month is essential to eliminate stochastic events and error in single readings. Monitoring populations of such species of special concern as southwestern willow flycatcher and yellow-billed cuckoo may help provide management information to prevent listing of these and similar species in the future.

## B. UPLAND VEGETATION MANAGEMENT

Because of the significant differences in the types, conditions, and potential of ecological sites and the physical separation of the watershed on Soza Mesa from significant riparian areas on the Muleshoe portion of the CMA, separate upland vegetation objectives were developed for the two areas. The Muleshoe portion includes the public lands of the Soza Wash allotment, the Hot Springs Riparian ACEC, the Muleshoe Ranch headquarters and the Redfield Canyon Wilderness. The Soza Mesa portion covers the Soza Mesa allotment encompassing Soza Mesa allotment encompassing Soza Mesa, Poor Canyon, and the western foothills of Wildcat Ridge.

### *Objective 2A:*

#### *Upland Vegetation - Muleshoe Portion*

*Manage the vegetation to obtain 80% of the total acreage on the Muleshoe portion of the CMA in States I (Grassland - dominated by tall and mid stature perennial grasses) and II (Shrubby grassland - dominated by tall and mid stature perennial grasses) with 64% in State 1 and 16% in State 2 within 30 years by:*

*Increasing the composition of the perennial grasses on State IV to greater than 70% of the herbaceous component.*

*Increasing the composition of the mid-to-tall stature perennial grasses on States III, IV, and V to greater than 50% of the herbaceous component.*

*\* Reducing the shrub canopy in States II, III, and IV to less than 20%.*

***Rationale:*** The 1994 ecological site inventory of the CMA identified significant differences both in the types and conditions of the sites on the Muleshoe and Soza Mesa portions. The Muleshoe sites have a greater potential to produce a grassland community, dominated by tall to mid stature perennial grasses.

As described in the Ecological Resources section under grassland processes, a modified Grassland State and Transition Model was used to set ecological objectives on the Muleshoe portion. This model allows us to more easily visualize the effects of fire and livestock grazing of the expression of the vegetation potential. The management goal is not to produce a single idealized state for the whole area, but rather to have a majority of the area (80%) in the most desired states (States I and II) and to restore periodic fires to maintain these states. No single state should dominate to the point of reducing the other desirable states (States III and V) to an undesirable low level. States IV and X should be avoided because the potential for soil erosion increases as the perennial herbaceous component is removed and replaced by annual vegetation. This mosaic of low shrub canopy with a high percentage of perennial grass understory should provide the greatest stability and protection for the soils in the watershed and offer the greatest diversity of habitats needed for the diverse wildlife species on the Muleshoe.

The present vegetation communities are an expression of the past disturbance regimes and land use practices. The grassland state (State I in the Transition Model) occurs as one of the states toward a shrub- or tree-dominated community (States II, III, and IV).

The past livestock grazing practices (particularly prolonged and continuous heavy use during the spring and summer growing seasons) has reduced the composition of the more desirable native grasses and palatable shrub species in the uplands. The mid-to-tall stature grasses (such as sideoats grama, Arizona cottontop, and plains

**TABLE 8**  
Existing & Desired Upland Vegetation

Vegetation State	Description	Existing		Desired	
	Shrub Canopy & Composition	Acres	Percent	Acres	Percent
State - I Grassland Dominated by mid grasses	Shrub Canopy <20% Peren Grass >70% Mid Grasses >50% Annual Plants <30%	400	1	16,471	64
State - H Shrubby Grassland Dominated by mid grasses	Shrub Canopy >20% Peren Grass >70% Mid Grasses >50% Annual Plants <30%	5,900	23	4,118	16
State - III Shrubby Grassland Dominated by short grasses	Shrub Canopy >20% Peren Grass >70% Mid Grasses <50% Annual Plants <30%	10,236	40		<20
State - IV Shrubland with and understory dominated by annual plants	Shrub Canopy >20% Peren Grass <70% Mid Grasses <50% Annual Plants >30%	7,000	27		<20
State - V Grassland Dominated by short grasses	<b>Shrub</b> Canopy <20% Peren Grass >70% Mid Grasses <50% Annual Plants >30%	2,200	9		<20
Total		25,736	100	25,736	100

lovegrass) were replaced by the shorter, more grazing tolerant grasses (such as curly mesquite and blue grama).

This reduction in the availability of the grass as fuel to carry wildfire through the community has reduced the occurrence of fire as an effective factor in stopping the increase in shrub canopy. Although many desert shrubs show a low tolerance and limited reproduction following fires, others such as mesquite and *catclaw* can be prolific sprouters following fire and can prove to be fairly tolerant to fire. Once established in the community, these species require repeated burns to be reduced or eliminated.

Once altered into shrubland with low growing annual or perennial grasses (Stages III and IV), upland communities change very slowly. With adequate moisture and rest from grazing, the

mid-stature grasses may revegetate gradually back into the community. Shrubs will continue to dominate until a drastic disturbance (ie fire, intense browsing, or herbicides) is introduced into the system to remove them. If moderate or heavy grazing continues during the growing season without sufficient rest periods, the composition of mid- and short-stature grasses will continue to decline until only shrubs and annual vegetation remains. Once this state is reached, it becomes difficult to get a fire to carry through the community. The perennial grass component must first be increased to restore the natural process of cyclic fire.



## Objective 2B:

### Upland Vegetation - Soza Mesa Portion

*Manage the vegetation on the Soza Mesa Portion of the CMA to obtain 80% of the total acreage at either the Potential Natural Community (PNC), or High ecological condition by:*

- \* *Maintaining the current PNC ecological site condition rating on 1,800 acres of limy upland ecological sites in the Soza Mesa allotment.*
- . *Maintaining the current High ecological site condition rating on 2,682 acres of limy slopes ecological sites in the Soza Mesa allotment.*
- . *Improving the Low ecological site condition rating on 350 acres of loamy upland ecological sites in the Soza Mesa allotment to good condition by 2007.*
- . *Maintaining the current High ecological site condition rating on 1,200 acres of volcanic hills ecological sites in the Soza Mesa allotment.*

**Rationale:** The Soza Mesa area is primarily composed of "limy" sites that are in high ecological site condition. Even in high ecological condition, these limy sites have a significant shrub component, and natural fire was less important in maintaining the balance between herbaceous and woody species than on the volcanic and granitic hills, and loamy upland sites which dominate the Muleshoe portion.

The existing ecological site conditions on the Soza Mesa allotment are either at the desired Potential Natural Community, or in High ecological site condition according to 1992 Ecological Site Inventory. These stages are satisfactory to maintain proper functioning condition of the watershed for this portion of the CMA, and are also considered satisfactory to meet livestock forage production and wildlife habitat objectives. The loamy uplands and volcanic hills sites which border the Muleshoe allotment could be included in prescribed management units for actions to increase the perennial grasses and to decrease the shrub component.

## Management Actions for Muleshoe and Soza Mesa

1. Implement a prescribed fire program for the grassland ecological sites (Volcanic Hills, Granitic Hills, and Loamy Upland Ecological sites) within the Muleshoe Ecosystem according to the following:
  - a. Allow only natural ignition prescribed fires within the wilderness. Implement management ignited prescribed fires or natural ignition prescribed fires for remainder of burn units outside of wilderness. Management ignited prescribed fires will be allowed on units which are partially in wilderness as long as the ignition occurs on the portion of the unit outside of wilderness and then burns into wilderness.
  - b. The prescription for management ignited fires is:

	Acceptable Prescription Range		
	Low	High	Desired
Temperature (Fahr.)	70	95	90
Relative Humidity (%)	20	8	10
Wind Speed (MPH)	5	15	10
Wind Direction*	S-SW	S-SW	S-SW
Live Fuel Moisture	60	30	30

**Narrative Forecast:** Mild day with temperatures 70-95 degrees F., 8-20% relative humidity, with good recovery during night hours. In most units, winds steady from south or southwest 5-15 mph. For some units, acceptable wind direction may be difficult due to topography. Gusts above 20 mph should be minimal. No thunderstorm forecast.

- c. The prescription for prescribed fires with natural ignition is:

	Acceptable Prescription Range	
	Low	High
Temperature (Fahr.)	50	95
Relative Humidity (%)	40*	5
Wind Speed (MPH)	0	20
Wind Direction	Any	Any

\* Spread would not occur above 40% relative humidity.

Narrative Forecast: Mild day with temperatures 50-95 degrees F., 5-40% relative humidity, winds steady from any direction at 0-20 mph; gusts above 20 mph should be minimal.

- d. An operational site-specific burn plan will be prepared prior to the prescribed burn and a smoke permit will be obtained. As much as possible, natural features and existing roads will be used to confine the fire. Fire control lines which are necessary within wilderness areas will be constructed with the minimum tools needed to do the job. Special considerations of burn units with riparian areas will be factored into the annual burning strategy. Operational burn plans will be designed to minimize the chance of fire damaging riparian areas. Operational burn plans will consider areas with sensitive wildlife species such as desert tortoise and will be designed to minimize impacts to these species.
- e. There are 15 designated fire units within the planning area (Figure 8). Each unit will be burned on a 5-10 year cycle (based on plant response) until it has reached the desired ecological state. Then less-frequent burns, preferably through prescribed natural fire will be used to maintain desired states. Three to six units on average will be burned annually. For the first five years, no more than 20% of the total acreage within all burn blocks will be treated with prescribed fire annually.
- f. Unit rotation will be based on minimum fire frequency and drought. Fire units will be alternated using sequencing and checkerboard patterning to ensure that burn blocks are spread across different watersheds. If wildfires occur, the acreage lost to wildfire will be considered in determining the amount of area to be treated with prescribed fire for the year.
- g. Prescribed fires used to improve upland condition will be ignited by hand or aircraft.

Helicopters may be used to ignite larger or more complex units. Naturally ignited fires which fall within prescription (prescribed natural fires) will be managed to meet annual fire objectives.

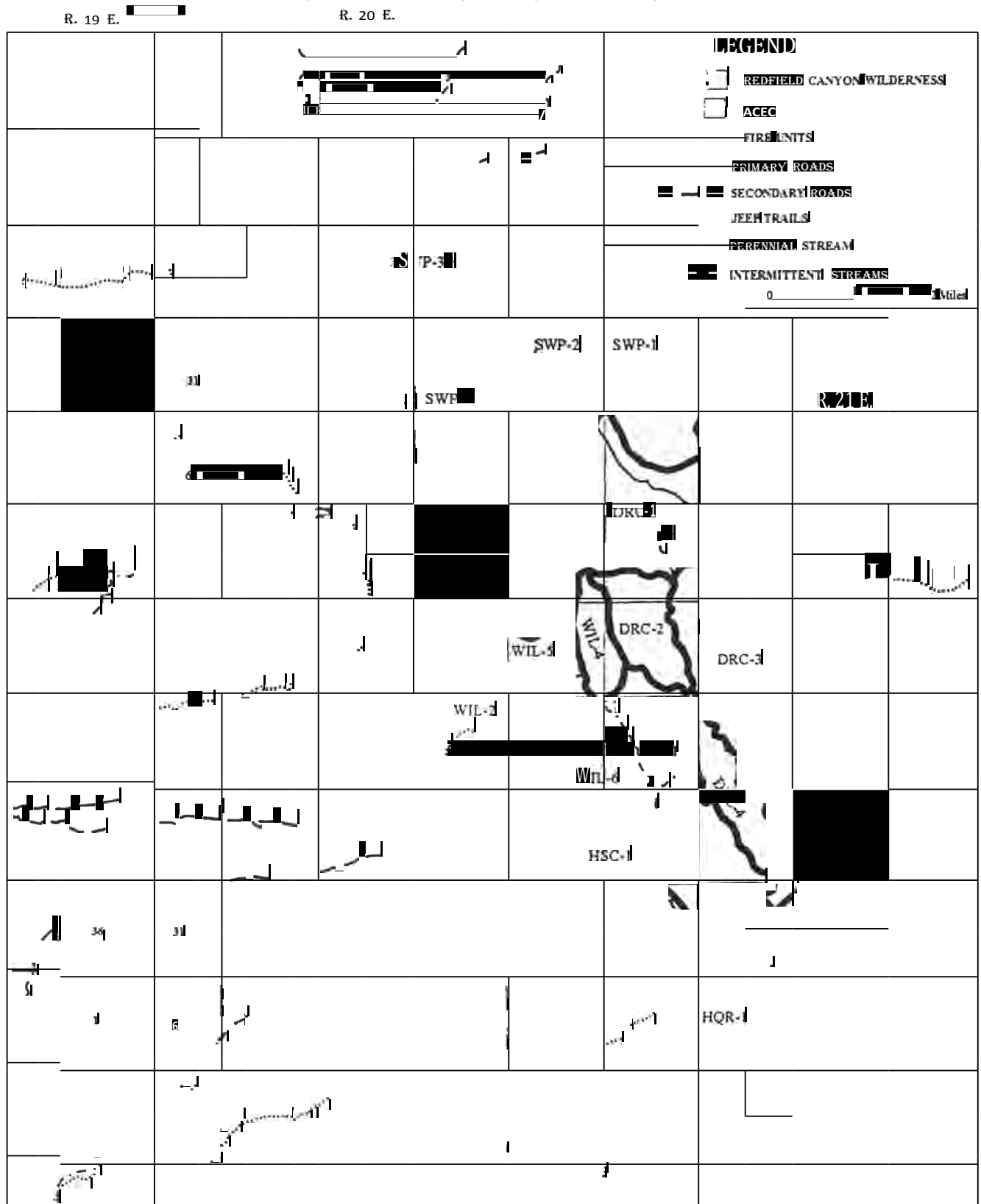
- h. Agreements addressing the use of fire on the Muleshoe CMA that may affect other lands will be pursued with the state of Arizona, adjacent private land owners and the local Natural Resource Conservation District (NRCD). This agreement should be a proactive, multi-year fire agreement with annual review. The opportunity for cooperative efforts to restore grassland vegetative components using fire on other lands in the watershed will be encouraged.
  - i. The safety of structures will be considered before burning and the necessary precautions taken to avoid property damage. To ensure protection of cultural resources, all prescribed burn areas will be inventoried for archaeological sites, historic structures, and traditional use plants. Areas surrounding such cultural properties will be pretreated to avoid destruction during a prescribed burn. These requirements are specified by Instruction Memorandum No. AZ-90-52, Requirements for Cultural Resource Inventory of Prescribed Burn Areas.
- Sediment control will be applied to burn units following BLM National guidelines and requirements. Pre-burn and post-burn treatments will be evaluated in the operational burn plan for each unit or block of units. Treatments may include seeding, construction of physical structures, mechanical treatments, or biological treatments.
- k. Natural fires out of prescription or that threaten to escape the planning area will be suppressed.

*Rationale:* Fire is a natural process within desert grassland ecological sites. The goal on the Muleshoe is to restore this process and restore and maintain the grassland communities. Because of the degree of

FIGURE 8

# MULESHOE ECOSYSTEM MANAGEMENT PLAN

## PROPOSED PRESCRIBED FIRE UNITS



shrub invasion on the Muleshoe, prescribed management ignited fires are necessary in order to burn the areas initially, perhaps for several burn cycles. Prescribed natural ignition fires can also be used to meet upland objectives on the Muleshoe portion of the planning area and ultimately will be the preferred method for maintaining grassland communities. In order to meet upland vegetation objectives, fire will be used as a tool to promote vegetative change through decreased shrub cover and increased cover by mid-to-tall stature perennial grasses. Rotation of burn units and carefully planned sequencing will allow for impacts to be distributed to different watersheds annually and will spread burns throughout the watershed. Large burns are generally more cost effective than small burns but can usually be done more effectively with air support. The use of fire as a tool has some inherent risk associated with its use. It is prudent to have a formal agreement with adjacent land owners and to provide opportunity for cooperation and/or protection of property.

2. Manage livestock grazing on the Muleshoe Allotment (No. 4401) according to the following:

- a. Eliminate livestock grazing use in riparian areas on the Muleshoe allotment No. 4401 (see management actions under Riparian Objectives). Construct pasture fencing necessary to isolate the Pride Basin area, and modify the grazing allotment boundary to include only the Pride Basin area (Figure 9). Establish an initial grazing preference of 346 AUMs on the public lands in the new Pride Basin allotment (No. 4401). This would equate to an authorized use of 43 cattle yearlong at 67% public land use = 346 AUMs, or 129 cattle if run seasonally during the non-growing season from November through February.
- b. Suspend active grazing use in Pride Basin until the upland vegetation objective is achieved (80% of vegetation in States 1 and 2, with 64% in State 1 and 16% in State 2). Once this objective is met, authorize livestock use under management consistent with achieving the objectives of the plan.

- c. Once livestock grazing is authorized the following constraints will apply:
  - *No more than 40% utilization on key perennial warm-season and cool-season grasses and other key herbaceous species. The key species will be determined prior to permitting active use, and will be dependent on which perennial grass species have reestablished on the sites within the Pride Basin Allotment.*
  - *Implement a rotational grazing system in Pride Basin which incorporates either development of internal pastures to allow for rest, or allows only seasonal use of Pride Basin during the non-growing season (November through February).*
  - *Construct approximately three miles of boundary fence to segregate Pride Basin allotment from riparian areas (Figure 10).*
  - *Develop livestock waters and ensure adequate permanent waters are available for wildlife (Table 9).*

**Rationale:** Portions of the Hot Springs watershed in the Muleshoe Ecosystem were designated as an Area of Critical Environmental Concern (ACEC) by the BLM to protect the high quality riparian resources found there and to accelerate the recovery of the adjacent upland watershed. The exclusion of livestock grazing in the riparian zones is necessary to promote maximum stability of stream banks by reducing the bank trampling and harvest of vegetation attributed to livestock grazing. It was determined that, even under a grazing strategy that allowed moderate grazing of the adjacent uplands, the soils and vegetation in the riparian zones would be adversely affected.

The upland areas around Pride Basin can be rather easily isolated from the riparian zones by the use of natural barriers and the construction of approximately three miles of pasture fencing. This area was determined to be suitable for livestock grazing and, if the livestock operation is conducted properly, would be compatible with the objectives of the

# Muleshoe Ecosystem Management Plan

## Livestock Management Decisions

### Grazing Allotments




 **Current Allotments**  
 **Grazing Eliminated**  
 **Proposed Pride Basin Allotment**

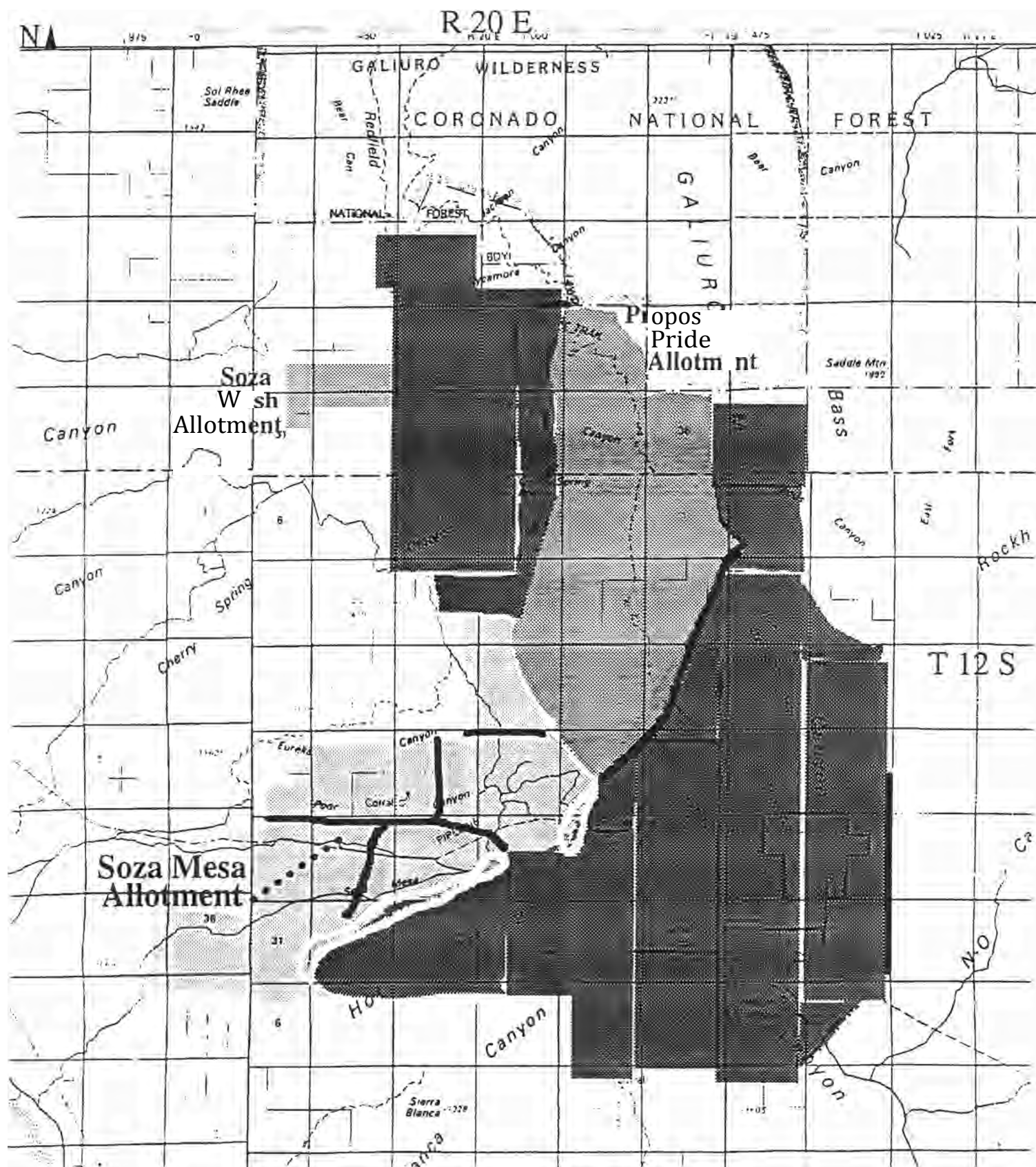


FIGURE 10

# Muleshoe Ecosystem Management Plan Legend

Livestock Management Decisions  
Fencing and Pipelines

Proposed Fence  
Proposed Pipeline





**TABLE 9**  
Proposed Range Improvements  
Proposed Pride Basin Allotment

Project Name	Location (Legal Description)	Units
Wilderness Gap Fence	T11S, R20E, Section 27	.75 mile
Swamp Springs Gap Fence	T11S, R20E, Section 34	.25 mile
Cherry Peak Gap Fence	T11S, R20E, Section 34	.25 mile
Cherry Springs Gap Fence	T12S, R20E, Section 3	.25 mile
Double R Canyon Fence	T12S, R20E, Sections 1, 12, 13	2.5 miles
Wildcat Gap Fence	T12S, R20E, Section 14	.25 mile
Swamp Springs Canyon Well Re-equip	T11S, R20E, Section 35 SE	
Sycamore Canyon Well Re-equip	T11S, R20E, Section 22 SE	
Pride Cabin Well Re-equip	T12S, R20E, Section 11 SE	
SW Boundary Completion Fence	T12S, R21E, Sections 21, 28, 33	

Muleshoe CMA. Either a rotational grazing strategy or grazing during the period when the perennial grasses are dormant (November through February) would be sustainable. Initially livestock grazing would **continue to be left in suspension** to facilitate the prescribed burning in the uplands on the Muleshoe. The continued rest from grazing may allow build up of sufficient fuel to carry a fire through vegetation and meet upland objectives for shrub reduction. Rest from grazing will also be necessary for units following burning to enhance establishment of new perennial grasses and **increase the vigor in those grasses present prior to burning. Rest will** also allow accumulation of litter to serve as a mulch and ground cover to protect the soil and enhance the seed bed. Once the desired plant communities have been obtained, livestock grazing will be resumed in the Pride Basin area in accordance with the plan objectives.

3. Manage livestock grazing on the Soza Mesa Allotment (No. 4402) according to the following:

Implement a rotational grazing strategy on the Soza Mesa allotment to provide adequate rest and pasture deferment through development of four pastures by cooperatively developing (through cooperative agreements, grants,

and/or cost sharing) the facilities in Table 10.

The proposed grazing system for the Soza Mesa Allotment is a deferred-rotation management strategy (Table 11). There would be four pastures, two large ones (1 & 3), and two smaller ones (2 & 4) (Figure 10). The two larger pastures would each support the cattle for four months. The smaller pastures would each support the herd for two months. Grazing use and deferments would be alternated between pastures as follows (after two years the cycle is repeated):

**Rationale:** Livestock grazing was resumed on Soza Mesa in 1992, through decisions in the Safford RMP. Boundary fencing was constructed to separate the Soza Mesa Allotment from the Muleshoe Allotment, in order to control livestock and protect the sensitive riparian areas. An Ecological Site Inventory was completed and the upland vegetation conditions were determined to be satisfactory. An initial stocking rate for cattle was agreed upon.

**Properly** managed livestock grazing is consistent with the vision statement for the Muleshoe Ecosystem, which seeks to promote rural lifestyles and activities that can occur in the ecosystem, while achieving the vegetation and watershed of the plan.

**TABLE 10**  
Proposed Range Improvements  
Soza Mesa Allotment

<b>Project Name</b>	<b>Location (Legal Description)</b>	<b>Units</b>
Pasture 1/4 Division Fence	T12S, R20E, Section 21	1 mile
Pasture 1/2 Division Fence	T12S, R20E, Sections 21, 27, 28	1 mile
Pasture 1/2 Cattleguard	T12S, R20E, Section 27	1
Pasture 2/3 Division Fence	T12S, R20E, Sections 29, 32	1 mile
Pasture 2/3 Cattleguard	T12S, R20E, Section 29	1
Pasture 3 Pipeline	T12S, R20E, Sections 29, 30	1 mile
Pasture 3/4 Division Fence	T12S, R20E, Sections 20, 29	1 mile

Currently the Soza Mesa allotment is grazed yearlong. There are no interior pasture fences and water development is limited to one well with a short pipeline, and two earthen reservoirs. This makes it difficult to move cattle in any planned rotation to provide adequate rest for grazed forage plants, or to defer livestock use of specific wildlife habitats during portions of the year. Development of four pastures and implementation of a rotational grazing program should provide the livestock operator the ability to continue yearlong grazing and achieve the above objectives.

On southwestern ranges grazed yearlong experimental results and climatic conditions indicate that a deferred-rotation grazing system will be effective (Schmutz, 1977). This system divides the pastures into grazing units and then alternately defers grazing on pastures during periods critical to plant growth and health. The deferments can also be scheduled to avoid livestock use in specific wildlife habitats during periods critical to certain animal species.

The critical periods for perennial grasses in the Muleshoe Ecosystem are the spring and summer growing seasons (March through June and July through October). Critical events during these periods are root growth and formation of basal buds, initiation of and rapid vegetative growth,

formation and production of seed, and storage of food reserves in the roots. The critical periods of the year identified for sensitive wildlife on the Soza Mesa allotment are in June and July during the deer fawning period in pastures 1 and 4, and the period of J4 through September when the desert tortoise is most active in pasture 1.

### **Upland Objectives Monitoring**

For the Muleshoe portion, upland vegetation monitoring will be conducted to determine the success of the management actions in achieving the plan objectives of producing a mosaic of Vegetative States I and II. Baseline data was obtained in 1994. Transects will be repeated as necessary following fires or over time as trend studies indicate that significant vegetative changes are occurring. Trend studies will be conducted at least every five years. Trend studies will consist of measuring changes in the relative occurrence of plant species. The categorizing of the vegetative states will require vegetative production, composition, and cover data. Utilization of forage plants will be measured in grazed pastures before and after a grazing treatment.



**TABLE 11**  
Soza Mesa Allotment  
Proposed Livestock Rotation

<b>Year 1:</b>				
Season	<b>Pasture 1</b>	<b>Pasture 2</b>	<b>Pasture 3</b>	<b>Pasture 4</b>
7/16 to 11/15 Warm-Season Species Growth Period	Rest	Rest	Graze	Rest
11/16 to 1/15 Dormant Winter Period	Rest	Graze	Rest	Rest
1/16 to 5/15 Cool-Season Species Growth Period	Graze	Rest	Rest	Rest
5/16 to 7/15 Dormant Spring-Summer Period	Rest	Rest	Rest	Graze
<b>Year 2:</b>				
Season	<b>Pasture 1</b>	<b>Pasture 2</b>	<b>Pasture 3</b>	<b>Pasture 4</b>
7/16 to 11/15 Warm-Season Species Growth Period	Graze	Rest	Rest	Rest
11/16 to 1/15 Dormant Winter Period	Rest	Rest	Rest	Graze
1/16 to 5/15 Cool-Season Species Growth Period	Rest	Rest	Graze	Rest
5/16 to 7/15 Dormant Spring-Summer Period	Rest	Graze	Rest	Rest

For the Soza Mesa portion, upland vegetation monitoring will be conducted to determine the success of the management actions in achieving the plan objectives of achieving PNC or High ecological site condition on 80% of the total acreage in the Soza Mesa Allotment. Baseline data was obtained in 1992. Transects will be repeated as necessary following fires or over time as trend studies indicate that significant vegetative changes are occurring. Trend studies will be conducted at least every five years. Trend studies will consist of measuring changes in the relative occurrence of plant species. When trend studies indicate significant changes have occurred, BLM's Ecological Site Inventory procedures will be used to determine the new ecological site condition ratings. This will require collecting plant composition and current species production. Ground cover measurements will also be collected during the trend studies to help determine

watershed condition. Utilization of forage plants will be measured in grazed pastures before and after a grazing treatment.

The following parameters will be measured to determine the success of management actions (Refer to Appendix 6 for studies protocol) on both the Muleshoe and Soza Mesa portions of the planning area :

Trend - Pace frequency transects (100 plots per transect - 40 cm X 40 cm plots)

Ground Cover - Point intercept (100 points per transect) - Measure shrubs (canopy and basal), grasses (canopy and basal), litter, bare ground, gravel, and rock.

Plant Composition - Dry weight rank method (100, 40 cm by 40 cm plots)

Plant Production -clipping and/or comparative yield methods

Grazing Utilization of Vegetation - Grazed class photo guides (perennial grasses), key forage plant method (shrubs), grazed or not grazed - apical meristem (tree seedlings)

**Rationale:** Upland vegetation monitoring will provide scientific data on changes in the vegetation in the Muleshoe Ecosystem which are occurring naturally, and as prescribed by this plan. It will be necessary to evaluate these changes to determine if the results of our actions are moving us towards or away from the desired future vegetation and watershed conditions we seek. If the results are not being achieved, the proposed management actions will have to be assessed to see why the expected outcome was not achieved. The actions can then be modified or dropped in favor of other strategies which look promising.

## C. FISH AND WILDLIFE POPULATION MANAGEMENT

### **Objective 3:**

*Maintain and enhance the diversity of native fish and wildlife species of the Muleshoe Ecosystem over the life of the plan.*

### Fish and Wildlife Population Management Actions

- 1a. By 2000, evaluate habitat conditions in order to assess the feasibility of re-establishing, extending the range of, or supplementing populations of the following wildlife species on the Muleshoe planning area:

*Desert bighorn sheep (Ovis canadensis mexicana)*  
*Turkey (Meleagris gallopavo mexicana)*  
*Gila topminnow (Poeciliopsis occidentalis)*  
*Desert pup fish (Cyprinodon macularius)*  
*Loach minnow (Rhinichthys cobitis)*  
*Spikedace (Meda fulgida)*  
*Gila chub (Gila intermedia)*

- 1b. Determine the population status and resources available to those wildlife species proposed for re-establishment, range extension, or supplementation.

- 1c. Where habitat conditions have been determined to be suitable for the survival of any of the above species, the appropriate action (re-establishment, range extension, supplementation) will be coordinated through established procedures and coordination with the appropriate combination of agencies and landowners: Arizona Game and Fish Department, U.S. Fish and Wildlife Service, Bureau of Land Management, Forest Service, The Nature Conservancy, Arizona State Land Department and various affected private landowner(s).

**Rationale:** The list of species above is not necessarily complete, but merely represents those species identified for possible action at this time. Recovery plans for four of the fish species identify the need to increase the number of self-sustaining populations in order to downlist or delist the species. Increased security will result from the introduction of fish into areas that can support self-sustaining populations. Gila chub are found in only 13 locations worldwide; by creating new populations (= range extension) or supplementing/re-establishing those populations that are at risk of being lost (Bass Canyon) to random natural events (flood, fire, drought etc.), the security of the species will increase, which may negate the need for formal listing as threatened or endangered. Supplementation of existing populations of bighorn sheep will improve herd viability. Action item #1b will allow agencies to determine the potential for success of any of the above population actions based on biological as well as logistical/monetary constraints. Data concerning important habitat parameters will be obtained based on known requirements for individual species. In some cases, habitat improvements such as water catchments or removal of an exotic species may be needed before the population action can be carried out. Action item #1c allows the agencies and private partners to proceed with required administrative procedures followed by the appropriate on-site actions needed for re-establishment, range extension or supplementation of a species or population. Each agency has established protocols for accomplishing re-establishments, range extensions, and supplementations. A high degree of coordination among all partners will be required to accomplish these actions.

2. Inventory stock tanks in Redfield, Hot Springs, and Cherry Springs canyons for exotic fishes and amphibians to ascertain threats to native fish and amphibians. Coordinate with AGFD concerning the need to renovate waters that pose a threat to any of the native fisheries.
3. Coordinate with AGFD to remove other non-native species (vegetation or wildlife) where monitoring indicates a threat to native species.

*Rationale:* The inventory for and control of non-native fish and amphibian species introduced to the area will have a large positive impact to the native fish community through increased security from foreign diseases carried by or displacement by aggressive, competitors and predators.

4. Inventory all natural and developed water sources within the planning area to determine their reliability as a wildlife water source.

*Rationale:* Many upland animal species use livestock waters or artificial waters developed for wildlife in otherwise inhospitable environments for watering during the dry months of the year. Mule deer, javelina, mountain lion, bighorn sheep and upland game birds all use wildlife waters at some portion of the year within the Muleshoe Ecosystem. To ensure that adequate water is available to animal populations during dry seasons or drought conditions, the natural and developed water sources within the planning area need to be inventoried to determine their status and scheduled maintenance requirements, as well as to determine if any additional waters are needed. This knowledge will also help in habitat assessments for re-establishing, extending the range of, or supplementing wildlife populations.

5. Annually review wildlife survey results at the Muleshoe coordination meeting to determine if there are any management changes needed.
6. Record incidental observations of special status species or species of concern and provide to the AGFD Heritage Data Management System.

## Monitoring for Fish and Wildlife Objective

1. In the past, aerial surveys have facilitated the collection of population trend data on deer, javelina, and bighorn sheep in and around the Muleshoe planning area. AGFD will, as annual funding and priority schedules allow, continue collecting information on these species. Data will be shared with the land management agencies. Overflight days will be coordinated with the appropriate land management agency.
2. AGFD will establish ground survey routes within the Muleshoe Ecosystem planning area to collect data on wildlife population trends. Unless otherwise dictated by resource and personnel limitations, AGFD will annually perform these surveys to collect data on deer and javelina.

## D. CULTURAL RESOURCE MANAGEMENT

### Objective 4:

*Protect and preserve the cultural resources within the planning area, making them available for scientific, public, and socio-cultural uses over the life of the plan. This will be accomplished by:*

- *Developing a site data base containing detailed information describing protection, stabilization, and preservation needs for the planning area's prehistoric and historic properties. This will include an assessment of the Jackson and Browning cabins for eligibility for listing on the National Register of Historic Places.*
- *Using information from the data base to identify and allocate certain sites for research, educational and interpretive use.*
- *Accumulating ethnographic and historic information about the planning area and using it for management, scientific and educational purposes.*
- *Accommodating traditional uses which have been identified by members of the San Carlos Apache Tribe.*

- \* *Preventing impacts which will diminish the cultural resource values caused by people, livestock and, as much as is possible, nature.*

**Rationale:** The planning area has never been intensively inventoried for cultural resources. Therefore knowledge about both prehistoric and historic cultural resources is limited. The known prehistoric sites span a time period of almost 7,000 years and have produced valuable information about the earliest human occupation of the area. Additional information will likely be recovered from other, yet to be discovered sites. The historic resources in the planning area represent an important era in the Euroamerican settlement of Arizona, as well as development of the state's economic and political systems.

Little is known about the ethnoecology of the area as it relates to the prehistoric and protohistoric Western Apache Indians, or the Euroamericans who inhabited the planning area during the late 19th and early 20th centuries. Following an invitation from the BLM, Apache herbalists from the San Carlos reservation visited the planning area and identified a number of plants that they would like to have protected. Protecting these plants is important because they are needed for traditional uses by the San Carlos Apaches. Preventing site impacts is necessary to prevent their destruction and preserve them for future use.

#### Cultural Resource Management Actions

1. Conduct a Class II Cultural Resource Inventory of the planning area by the end of 2000. This inventory will include assessment of cultural properties to determine their stabilization needs, and will also include collection of ethnographic and historic information.
2. Conduct an ethnoecological study of the planning area by the end of 2000.
3. Post signs at entrances to the planning area, and at allocated sites, which explain to visitors the scientific and social values of the sites, the need to protect them and the laws under which they are protected.

4. Identify traditional use plant species and locations.
5. Create a partnership education program with the University of Arizona, Arizona State University, Northern Arizona University, and/or other accredited institutions to facilitate archaeological and anthropological research in the planning area.

**Rationale (1-5):** In order to develop the data base necessary to protect, study, and interpret the planning area's cultural resources, a site inventory must first be conducted. Since, the planning area has not been intensively inventoried, the locations of only a few sites are known at this time. A Class II inventory will facilitate site location and documentation, provide information needed for protecting, monitoring and interpreting sites, and increase scientific understanding. Information collected through an ethnoecological study of the planning area will be used to develop a broader understanding of how people used and impacted the area's natural resources. Educational partnerships provide an opportunity for university and college students to participate in formal research projects, interact with the U.S. government and gain valuable knowledge that they can use once they graduate.

6. Erect fences around specified cultural sites within areas grazed by livestock to keep livestock from degrading the site by trampling and/or consuming traditional use plants.

**Rationale:** Most archaeological sites on the Muleshoe are expected to be located along stream terraces. Most traditional use plants are located within the riparian areas as well. These sites will be protected from trampling and grazing as cattle will not be allowed within the riparian areas. Potentially, some significant sites may be found on upland areas. Cattle and other livestock may trample sites, disturbing surface provenance, breaking surface artifacts, and compacting subsurface materials. Fences will protect archaeological sites from livestock.

7. Protect known cultural sites from fire damage by pre-treatment such as black-lining around the site.

### Monitoring for Cultural Objective

1. Following completion of the Class II Inventory, the plan will be updated to include monitoring for cultural resources.

**Rationale:** A systematic monitoring program will provide an on-going assessment of site status and impacts, and permit a timely response to reducing or stopping most impacts. Possible exceptions would include natural phenomena such as floods, droughts or fires which are beyond human control. This program will also include placing signs that explain the social and scientific values of the planning area's cultural resources, the laws under which they are protected, and also encourage visitors to cooperate in their preservation.

## E. WILDERNESS MANAGEMENT

### Objective 5:

*Long-Term Protection of Wilderness Values*  
*Maintain and improve wilderness values of naturalness and outstanding opportunities for solitude and primitive, non-motorized types of recreation in the Galiuro Wilderness and Redfield Canyon Wilderness by:*

- *Ensuring unauthorized vehicle use remains at zero intrusions annually.*
- *Minimizing impacts to wilderness values from potential uses of inholdings.*
- *Providing for wildlife operations and maintenance activities while minimizing low-level aircraft use (below **2,000** feet above ground level) and impacts to wilderness values.*

**Rationale:** Uses of wilderness are managed with the underlying principle to protect wilderness values of naturalness and outstanding opportunities for solitude and primitive recreation. Coordination with the Forest Service will ensure consistent

management in relation to the adjacent Galiuro Wilderness.

### Management Actions

1. Post signs along the boundary of the Redfield Canyon Wilderness as follows: one sign (carsonite post) per 1/4 mile along the Jackson Cabin Road corridor, one sign (carsonite post) on each side of the Redfield Canyon bottom at the wilderness boundary and carsonite signs in other locations along the boundary which are used as access points. Place one larger wilderness sign at the southern Redfield Canyon Wilderness boundary where it first intersects the Jackson Cabin Road.

**Rationale:** The wilderness boundary is currently not signed. Placing signs will allow visitors to know when they are entering wilderness.

2. No group larger than 15 persons will be allowed within the Redfield Canyon Wilderness.

**Rationale:** The FS currently recommends a group size of 15 persons within the Galiuro Wilderness. This restriction for the Redfield Canyon wilderness provides consistency in these adjoining wilderness areas and helps maintain solitude for wilderness visitors.

3. In accordance with the Master MOU between BLM and AGFD, provide for the following wildlife operations and maintenance activities:

*Conduct annual low-level big game species monitoring flights for 1-2 days per year during mid-September through the end of October for bighorn sheep, and for 1-3 days per year during the beginning of January to mid-February for javelina. The Arizona Game and Fish Department will notify the BLM in advance and will coordinate flight days to minimize potential conflicts with visitors.*

- *AGFD has identified the potential need for at least one additional bighorn sheep water and two big game waters along the western edge of the Galiuros. If the wildlife water needs assessment determines that additional waters*

*are needed in wilderness, they may have to be constructed with the use of helicopters to fly in materials and supplies.*

- \* *Based on the results of the wildlife water needs assessment, determine if redevelopment of the upper and lower Redfield Canyon (Coati) wildlife catchments is necessary. Redevelopment would include increasing storage capacity and replacing troughs with walk-in drinkers at both locations. A helicopter would be necessary to transport materials to the site and to remove old materials. Following redevelopment, routine maintenance and inspection would be accomplished using the minimum tool or equipment necessary to successfully, safely, and economically accomplish the objective.*

*Rationale:* Allowing the wildlife operations as outlined will ensure that necessary wildlife data is gathered to ensure proper management with the least impact to the naturalness of the wilderness. Redeveloping or maintaining the current facilities will ensure that adequate water will be available for bighorn sheep and other wildlife. The improved designs for the facilities will decrease the maintenance requirements and the need for motorized equipment use.

4. By 2000, maintain the following fences and repair the following water developments:

*Coordinate with the Forest Service and permittee to maintain the existing forest boundary fence in T. 11 S., R. 20 E., Section 26 (approximately one-half mile) and construct the additional one-half mile of fencing in Section 27 necessary to separate the proposed Pride Basin allotment.*

*Redevelop the Sycamore Canyon well to provide water for wildlife and special recreation use (eg. equestrian).*

- \* *Redevelop the Swamp Springs Canyon well to provide water for livestock, wildlife, and special recreational uses.*

To minimize wilderness impacts, the following special construction and maintenance

stipulations would be placed on the above actions:

The materials for fence construction would be driven to the project site up the Jackson Cabin Road. The construction of the fence would be done manually, with any needed materials moved by pack animals from the road. Clearing of the brush along the line would also be done manually, with as little vegetation removed as possible. The fence posts would be green without white tops, to blend in with the vegetation. The gate in the road would be wooden and designed to have a rustic appearance (rather using a steel or aluminum gate) to be more aesthetic. A cattleguard is not planned, but could be used if determined necessary by the BLM based on visitor use levels. The fence would be constructed to BLM standards for safe passage of wildlife. The grazing lessee would be responsible for construction and maintenance of the fence. BLM would provide the materials. The project would be authorized under a cooperative agreement. Any maintenance would be done using the same methods and materials as above and would be on foot or horseback.

The redevelopment of the two wells along the Jackson Cabin Road would be done to minimize the visual impact of these facilities. The windmills would be replaced with solar electric pumps. The solar panels, storage and drinking troughs, and any other structures would be located to reduce their visibility.

*Rationale:* A portion of the fence between the BLM and USFS jurisdictions needs to be maintained for future livestock control. A portion of the existing boundary fence will be needed in Section 26, as well as construction of an additional 1/2 mile of fence necessary to enclose the proposed Pride Basin allotment where livestock grazing will be authorized.

The two wells along the Jackson Cabin Road are not currently functional, but are proposed for redevelopment. The Sycamore Canyon well would provide dependable water for wildlife and special recreational uses (such as for domestic horses or mules). The Swamp Springs Canyon well would be necessary to

implement livestock grazing, but would also provide a dependable water source for wildlife and special recreational uses. The physical presence of these watering facilities would have little impact on the wilderness values. The increase in wildlife resulting from the availability of reliable water would be a positive impact.

5. Continue efforts to acquire private and state land inholdings within the Redfield Canyon Wilderness as identified in the Safford District RMP.

*Rationale:* The Safford District RMP identifies private and state inholdings within wilderness for acquisition. Obtaining these inholdings eliminates potential negative impacts from non-wilderness inholdings on wilderness values. It also allows these areas to be added to wilderness.

6. Prescribed fires within wilderness will be from natural ignition sources only unless ignition occurs outside wilderness boundaries. Natural ignition fires will be permitted to burn if they meet the prescription specified under the upland objective. Otherwise, they will be suppressed with the appropriate suppression response. Fire suppression activities in the Redfield Canyon Wilderness will adhere to the following general guidelines.

*All wildfire will be suppressed with the appropriate suppression response. These responses would be based on the resources at risk, location of the fire, fuel conditions, weather, and time of year. Appropriate suppression responses usually range from the use of hand tools to the use of helicopters, air tankers, water pumps and chain saws.*

- \* **Suppression actions will be executed to minimize surface disturbance and alterations of the natural landscape and will be consistent with management objectives and constraints.**

*Suppression facilities and improvements will be located outside wilderness boundaries.*

*Fire-line construction with motorized equipment will only be used as a last resort.*

- *Surface disturbance from suppression actions will be rehabilitated to as natural a state as possible.*
- *Aerial retardant applied in wilderness will be the fugitive type that fades quickly.*

*Rationale:* This management action permits lightning-caused fires to play, as **nearly** as possible, their natural ecological role within the Redfield Canyon Wilderness. Allowing only natural ignition within the wilderness minimizes impacts to wilderness values of naturalness and solitude. This action also ensures that appropriate suppression activities occur for wilderness which are sensitive to wilderness values.

#### Monitoring for Wilderness Objective

1. Evaluate use by monthly analysis of visitor sign-in sheets (same as for social environment). Enter monthly data in BLM's Recreation Management Information System Data Base for the Muleshoe Planning Area.
2. Conduct monthly patrols to evaluate impacts to wilderness values and to gather information from visitors. Utilize a visitor response card which asks about the quality of experience, parties encountered etc. Make these available at kiosk or other visitor contact points. They can be dropped off there or mailed in after trip.

## F. MANAGEMENT OF SOCIAL ENVIRONMENT

### Objective 6:

*Maintain or improve the current range of open-space recreation opportunity settings (rural, semi-primitive motorized, semi-primitive non-motorized, and primitive) that provide existing recreational activities (as described in the Ecosystem Resources section) in the Muleshoe Ecosystem for the next ten years by:*

- ' *Determining recreation use levels which can be maintained in each setting to maintain natural and social environment.*
- ' *Limiting motorized vehicle use to the Jackson Cabin Road and the **Soza Mesa Road Complex.***

- . *Providing legal access.*
- \* *Providing additional facilities (signs, camp areas, pull-outs, trails) which will enhance recreational experiences in zones 1 and 2.*

*Eliminate (rip and seed) all unnecessary roads.*

**Rationale:** The area's remoteness, rugged topography and moderate to light public use dictates development for semi-primitive recreation. Public comment supports this conclusion. Facilities would be limited to development of parking and camping areas removed from biologically or culturally sensitive resources. Signs would be limited to marking trailheads, interpreting important features, and providing direction.

#### Management Actions

1. Sign the Jackson Cabin Road and the Soza Mesa Road Complex as open to motorized vehicle use.
2. Sign the Hot Springs Canyon Road as closed to motorized vehicle use (Figure 11).
3. Sign the Pipeline Road as open to administrative use only and closed to public use. Locked gates and public walk-throughs will be established to identify the closed portion (east end at Jackson Cabin Road and west end at Soza Mesa boundary fence).
4. Develop pull-outs for parking and vehicle turn-around along the Jackson Cabin Road at (Figure 11):
  - . Pipeline crossing
  - . Bass Canyon
  - Between Bass Canyon and Browning turn-off
  - . High Lonesome Trailhead near Pride Ranch and Browning Homestead
  - Southern Wilderness boundary
  - . Swamp Springs Canyon
  - Sycamore Canyon
  - . the saddle above Jackson Cabin

**Rationale:** Developing pull-outs provides small parking sites at visitor access points and

locations for vehicles to turn around or allow another vehicle to pass. Developing the vehicle pull-outs limits environmental damage from vehicles driving off road to turn around or to park and, improves safety for visitors.

5. Develop informational brochures and maps detailing resource values; recreation opportunities including locations of roads and trails, trailheads, pull-outs, closed roads, ACEC and wilderness boundaries, day-use areas, and open hunting areas; restrictions and precautions including permit requirements, wilderness regulations, and low-impact camping techniques. Products will be designed to meet specifications of the Americans With Disabilities Act of 1990.
6. Place an informational kiosk at the beginning of the Jackson Cabin road (Figure 11 which includes resource, recreation, and wilderness information and regulations. Maintain visitor sign-in station at kiosk. Kiosk will be designed to meet specifications of the Americans With Disabilities Act of 1990.
7. Develop visitor sign-in station on Soza Mesa to gather information on visitor numbers and activities.
8. Maintain hunting opportunities on public lands and provide improved hunting opportunities on TNC deeded lands (Figure 12):

All public lands remain open to hunting.

The following TNC deeded lands are open for hunting: Cherry Springs Section (T12S, **R20E**, section 3 SW 1/4, Section 4 SE 1/4, section 9 NE 1/4, Section 10 NW 1/4. Pride Ranch (T12S, **R20E**, Section 14 (all), Section 13 (w of Jackson Cabin Road only), Section 11 (w of Jackson Cabin road except within 1/4 mile of Pride cabin). Sierra Blanca T13S, **R20E**, Section 1 (all).

9. Pursue legal access over the following existing roads through acquisition of rights-of-way or easements by cooperative agreement, purchase, or donation:



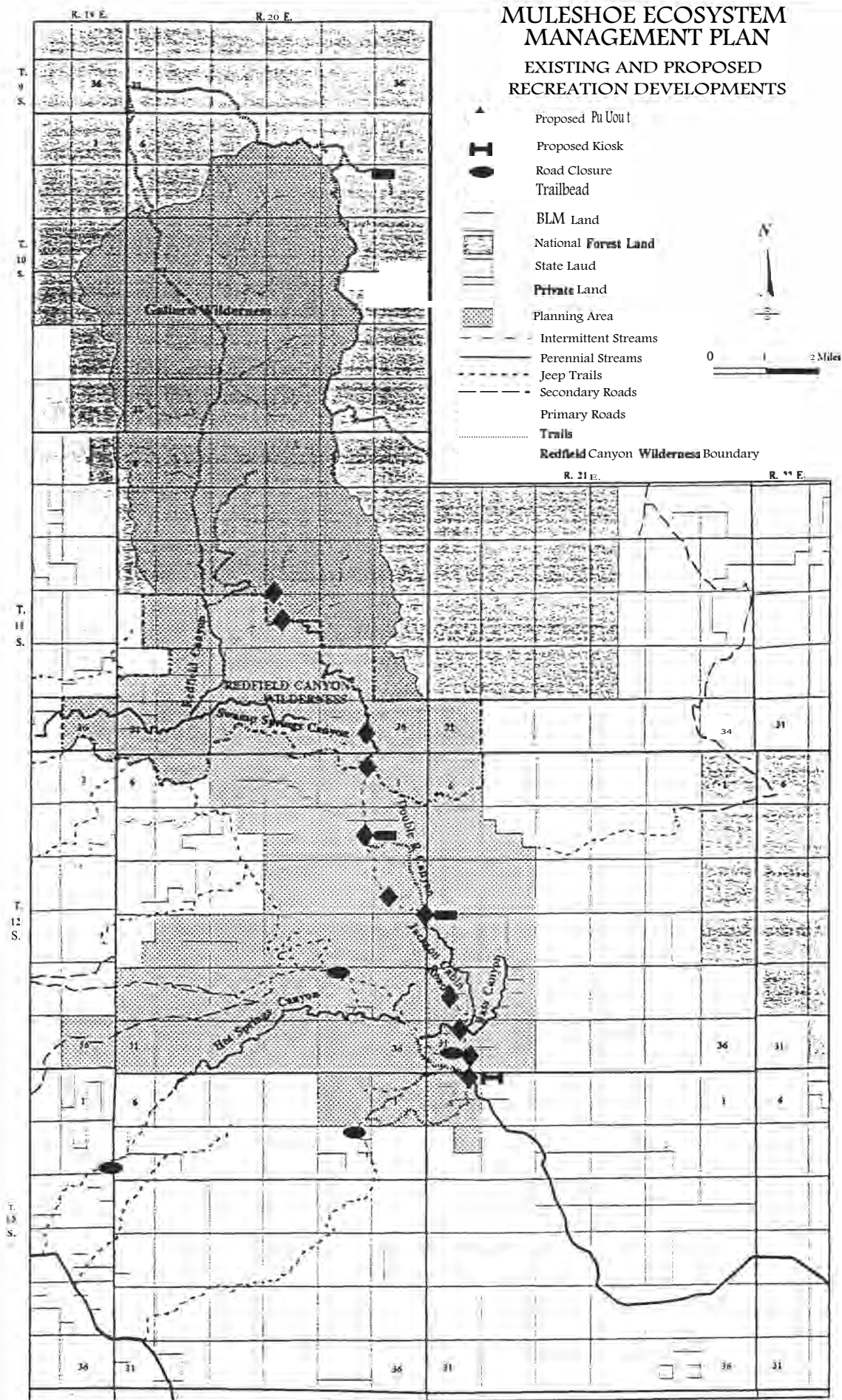
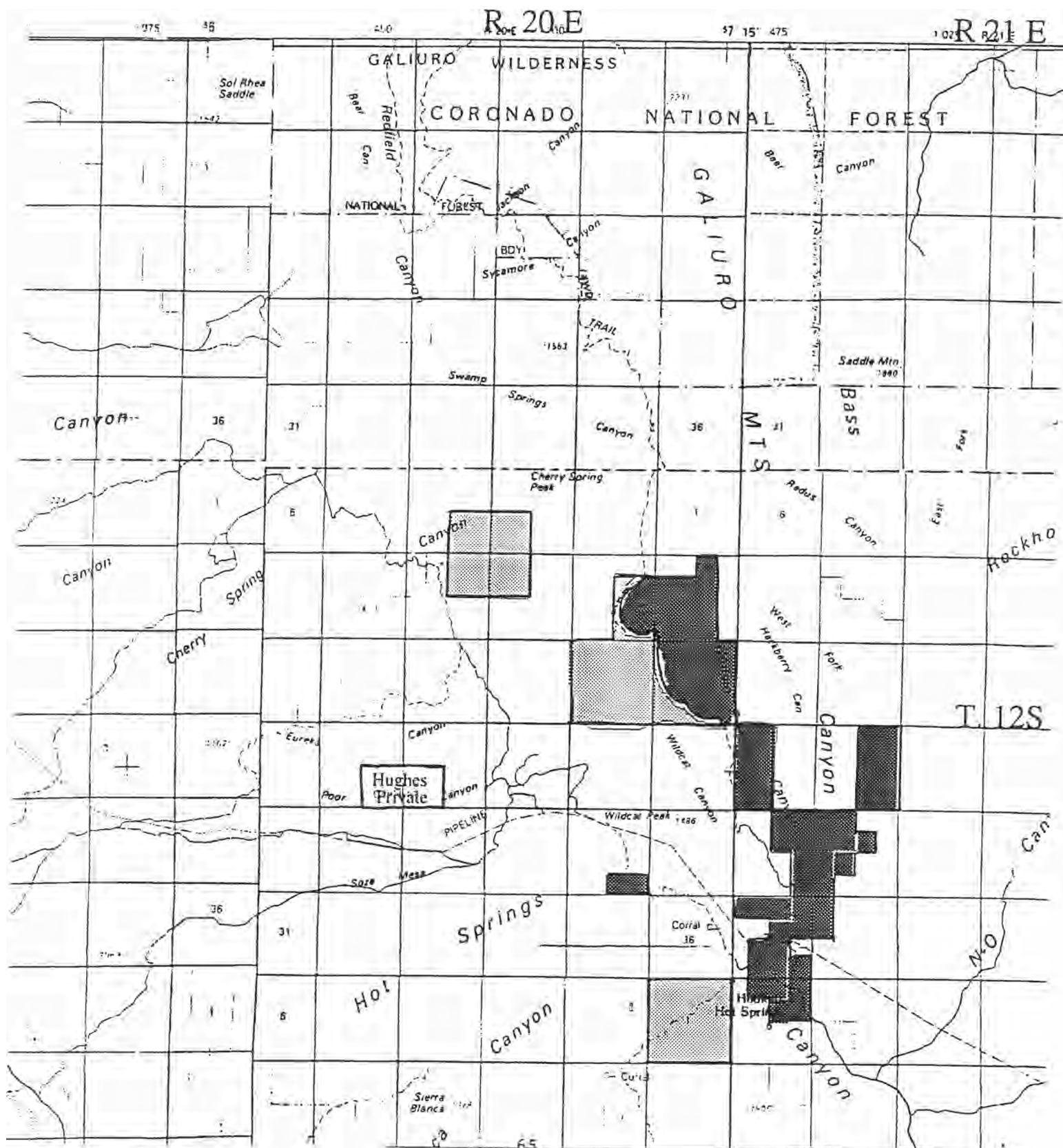


FIGURE 12

# Muleshoe Ecosystem Management Plan Open and Closed Areas to Hunting on TNC Deeded Lands

## Legend

closed  
open



Jackson Cabin Road (public)  
T. 12 S., R. 20 E., Secs. 11, 12, 13;  
T. 12 S., R. 21 E., Secs. 19, 30, 31;  
T. 13 S., R. 21 E., Secs. 5, 6.

Muleshoe Pipeline Road (administrative use only)  
T. 12 S., R. 21 E., Sec. 31.

Cherry Springs Canyon Road (public)  
T. 12 S., R. 20 E., Secs. 4, 9.

The following roads will be examined as alternate routes to pursue legal access on by the above methods, if legal access cannot be obtained over the above routes.

Redfield Mesa Road  
Soza Mesa Road  
Redfield South Rim Road  
Deer Creek  
High Creek

10. Maintain Jackson Cabin Road and Soza Mesa Road to four-wheel-drive standard with minimal maintenance on an as-needed basis. Work with interested volunteer groups to provide low-cost road maintenance while continuing to provide access.

**Rationale:** Actions #1-3 and 10 are implementing decisions made in the Safford District RMP. The actions represent the minimum necessary to satisfy public need and to meet budget and personnel constraints. Future needs, within the limits of the social environment objective, will be evaluated through monitoring and visitor survey information.

### **Monitoring for Social Environment Objective**

1. Gather and categorize visitor use information from sign-in stations monthly. Enter monthly data in BLM's Recreation Management Information System Data Base for the Muleshoe Planning Area.
2. Conduct monthly patrols to contact visitors personally to assess the quality of their visit and to monitor off-road vehicle use and potential environmental impacts. Utilize a visitor response card which asks about the quality of experience, parties encountered etc. Make these available at kiosk or other visitor contact points. They can be dropped off there or mailed in after trip.



## VIII. PLAN EVALUATION

The BLM, FS, TNC and AZGFD will conduct informal evaluations of monitoring data and resource conditions on an annual basis during the coordination meeting for the Muleshoe CMA. They will report significant findings to the Muleshoe Ecosystem Management Team and any other interested agency or public. At a minimum, a formal evaluation will be completed every five years. This evaluation will be conducted by the Muleshoe Ecosystem Management Team and will include the actions below:

1. Document management actions that have been completed.
2. Identify and prioritize management actions for future implementation.
3. Analyze monitoring data to determine if plan objectives are being met.
4. Propose new management actions if objectives are not being met.
5. Identify new issues or concerns that may have arisen for the Muleshoe Ecosystem and determine whether modifications to the plan are necessary to address them.

New issues or proposals not contained in this plan will be analyzed to determine if they are consistent with the objectives. If they are, an environmental analysis will be conducted and the actions implemented.

Newly developed actions identified for implementation will become plan revisions or amendments. Plan amendments will be available for public review for 45 days before being implemented.



## **IX. PLAN IMPLEMENTATION AND COST ESTIMATES**

This section outlines time frames and cost estimates for implementing the planned management actions and monitoring. The actions are grouped into special projects and annual projects. The order of implementing planned actions may change as funding changes.

**THIS SECTION WILL BE DEVELOPED IN THE FINAL PLAN.**





# **MULESHOE ECOSYSTEM MANAGEMENT PLAN**

## **APPENDICES**

## APPENDIX 1 MULESHOE ECOSYSTEM PLANNING TEAM PARTICIPANTS

### **Bureau of Land Management**

#### **Tucson Resource Area**

Karen Simms\*, Planning Team Leader

Tom Collazo\*, Director,  
Stewardship and Preserve Programs

Grant Drennen\*, Range Specialist

Dave Gori, Field Office Ecologist

Rebecca Drennen, Support Services Assistant

Russell Hooten\*, Muleshoe Preserve Manager

Don Ducote\*, Natural Resource Specialist  
(Recreation and Wilderness)

**Arizona Game and Fish Department, Region 5**  
Sherry Rutherford\*, Habitat Specialist

Jesse Juen, Area Manager

Mike Holleran, Field Supervisor

Dave Krueper\*, Wildlife Biologist

Bayless-Berkalew Company  
Jack Smallhouse

Ben Lomeli, Hydrologist

**Soza Mesa Ranch**  
Jack Hughes

Jeff Simms\*, Fisheries Biologist

**Saguaro-Juniper Association**  
Pat Corbett\*

Max Witkind\*, Archaeologist

Anita Lyerla, Secretary

**U.S. Geological Survey, Tucson Field Office**  
Leslie Cox, Geologist

Safford District

Rick Belger, Fire Control Officer

Brenda Houser, Geologist

Diane Drobka, Public Affairs Specialist

\* Denotes member of planning team.

Mike McQueen,  
Planning and Environmental Coordinator

Greg Merchant, GIS Specialist

### **Arizona State Office**

Marilyn Casiano, Civil Engineering Technician

Ken Mahoney\*, Wilderness Specialist

Dave Wilson, Cartographer

### **Forest Service, Safford Ranger District**

Dick Streeper\*, Wilderness

Carrie Templin, Public Affairs Officer

Genice Froehlich, Wildlife Staff

### **The Nature Conservancy**

## **APPENDIX 2**

### **PUBLIC PARTICIPATION IN MULESHOE ECOSYSTEM PLAN**

Extensive public participation was solicited in preparation of the Muleshoe Ecosystem Plan. A scoping open house was held in Benson, Arizona in November 1990 to initiate the planning process. The purpose was to solicit issues that needed to be addressed during planning. The plan was delayed for several years due to higher priorities. The plan was reinitiated in December 1993. At this time, an extensive mailing to solicit new or additional scoping comments occurred. Scoping letters were sent to a mailing list of over 500 including individuals in 52 Arizona communities, individuals in 12 other states, 60 public agencies, 61 organizations and special interest groups, and 66 businesses. Recipients were asked to reply if they wished to remain on the mailing list. Through this process, the mailing list was reduced to approximately 150. In June 1994, invitations were mailed to the reduced list, inviting them on two field trips to the Muleshoe. The field trips, to discuss resource objectives on the ground, were held in July and August 1994. Finally, various public interests were represented by agencies and private landholders on the planning team.



**APPENDIX 3**  
**MULESHOE ECOSYSTEM RESOURCE DATA**

**WATERSHED DATA: TABLES 3-1 THROUGH 3-3**

**TABLE 3-1**  
**SUBSTRATE COMPOSITION**  
Muleshoe Allotment 1994

SUBSTRATE	PERCENT
Soil	32
Gravel	43
Rock	25

**TABLE 3-2**  
**GROUND COVER (Raindrop Intercept)**  
Muleshoe Allotment 1994

TYPE COVER	PERCENT
Bare ground	3
Gravel	12
Rock	10
Grass (basal)	5
Grass (canopy)	26
Shrub (canopy)	28
Litter	16

**TABLE 3-3**  
**WATER RIGHTS SUMMARY**

SOURCE	APPLICANT	PRIORITY DATE & #	AMOUNT	USE(S)	STATUS
Redfield Canyon	BLM	12/01/88 33-94369	15 cfs	ISF	APP
Redfield Wilderness	BLM	11/28/90 39-14413	1659.06	FED	QUANTIFIED
Bass Canyon	BLM	12/01/88 33-94371	3 cfs	ISF	APP
Hot Springs Canyon	BLM	33-94372	21 cfs	ISF	
Swamp Springs Canyon	BLM	33-94370	7 cfs	ISF	PERMIT
Wildcat Canyon	BLM	06/06/90 33-95454	0.625 cfs	ISF	APP

**RIPARIAN AND AQUATIC RESOURCE DATA: TABLES 3-4 THROUGH 3-9**

**TABLE 3-4**  
**RIPARIAN ECOLOGICAL SITE DEVELOPMENT**  
 Muleshoe Ecosystem 1994  
 (BLM and TNC lands)  
 (Percent of Floodplain)

<b>Riparian</b>	<b>Aquatic Zone</b>	<b>Regen Zone</b>	<b>Riverwash</b>	<b>Sand Bottom</b>	<b>Sandy Woodland</b>	<b>Loamy Woodland</b>
Upper Hot Springs	10	10	34	18	0	28
Lower Hot Springs	11	14	23	38	14	0
Bass Canyon	5	5	43	13	4	30
Swamp Springs	11	0	5	33	0	51
Redfield Canyon	7	7	32	26	23	5
<b>AVERAGE</b>	<b>9</b>	<b>7</b>	<b>27</b>	<b>26</b>	<b>8</b>	<b>23</b>

**TABLE 3-5**  
**SWAMP SPRINGS CANYON RIPARIAN MONITORING**  
 Density' of Woody Riparian Species

	1984	1986	1988	1990	1992
# trees	103	95	127	81	154
# sapling	12	44	128	181	431
# seedling	58	1,092	1,879	557	8,692
<b>TOTAL</b>	<b>173</b>	<b>1,231</b>	<b>2,134</b>	<b>819</b>	<b>9,277</b>
<hr/>					
<u>trees + saplings</u> acre	149	181	331	340	760
sapling:trees	0.12	0.46	1.0	2.2	2.8

This is a complete count of all woody riparian species along the entire transect length. In 1990, only a portion of the transect was sampled.

**TABLE 3-6**  
**REDFIELD CANYON RIPARIAN MONITORING**  
 Density' of Woody Riparian Species

	<b>1983</b>	<b>1985</b>	<b>1987</b>	<b>1989</b>
# trees	100	32	69	75
# sapling	64	78	344	97
# seedling	94	122	130	6
<b>TOTAL</b>	<b>258</b>	<b>232</b>	<b>543</b>	<b>178</b>
<hr/>				
<u>trees+saplings</u> acre	252	169	635	265
sapling:trees	0.64	2.4	5.0	1.3
This is a complete count of all woody npanan species along the entire transect length.				

**TABLE 3-7**  
**SYCAMORE CANYON RIPARIAN MONITORING**  
 Density' of Woody Riparian Species

	<b>1984</b>	<b>1986</b>	<b>1988</b>	<b>1990</b>	<b>1992</b>
# trees	<b>187</b>	178	178	176	154
# sapling	143	188	162	113	105
# seedling	120	70	89	192	156
<b>TOTAL</b>	<b>450</b>	<b>436</b>	<b>429</b>	<b>481</b>	<b>415</b>
<hr/>					
<u>trees + saplings</u> acre	71	79	73	62	56
sapling:trees	0.76	1.06	0.91	0.64	0.68

<sup>1</sup> This is a complete count of all woody riparian species along the entire transect length.

TABLE 3-8  
1994 RIPARIAN INVENTORY  
Muleshoe Ecosystem  
(BLM and TNC lands)

Stream	1994 density (# / acre)	1994 ratio (saplings:trees)
Upper Hot Springs Canyon	60	6.5 (52:8)
Lower Hot Springs Canyon	202	2.2 (138:64)
Bass Canyon	116	1.6 (71:45)
Swamp Springs Canyon	150	1.5 (89:61)
Redfield Canyon	474	3.0 (357:117)

Note: Density is the number of saplings and trees per acre of any woody riparian species (ash, sycamore, cottonwood, alder, or willow) present in the drainage. Saplings are defined as greater than 6.5 feet tall or greater than one inch dbh. Trees are defined as greater than six inches dbh.

TABLE 3-9  
AQUATIC HABITAT INVENTORY  
Muleshoe Ecosystem 1994  
(BLM and TNC lands)

Habitat Parameter	Redfield Canyon 1994	Bass Canyon 1994	Hot Springs Canyon 1994
Pools/mile	44	32	8
Linear Proportion of Pool Habitat	.20	.21	.03
Proportion of Pools w/ max. depth > 2 ft.	.71	.14	.33
Woody cover (ft <sup>2</sup> /mile)	1,413	2,682	300
Undercut bank (ft/mile)	220	0	73
Bank stability	excel	good	excel
Overstory (%)	50	41	8

RANGELAND RESOURCE DATA: TABLES 3-10 THROUGH 3-11

TABLE 3-10 MULESHOE ALLOTMENT  
EXISTING RANGE IMPROVEMENTS

PROJECT NAME	Township	Range	Section	Land Status	Units
Sycamore Canyon Well	11 S	20 E	22 SE	BLM	1 Well, 1 Tank
Swamp Springs Canyon Well	11 S	20 E	35 SE	BLM	1 Well
Old Pride Well	12S	20 E	11 NE	Private	1 Well
Pride Cabin Well	12 S	20 E	11 SE	Private	1 Well, 1 Tank Corral, Cabin
NE Boundary Fences	11 S	20 E	20,28,33		Gaps
NE Bradberry Fence	12 S	20 E	4,9		2 Miles
Muleshoe Division Fence	12 S	20 E	10,15,23 26,27,28 32		6 Miles
Forest Boundary Fence	11 S	20 E	21,22,23 25,26		5 Miles
	11 S	21E	31		1 Mile
Redus Canyon Fence	12 S	21 E	8		1 Mile
SW Boundary Fence	13 S	21 E	5,6,7		2 Miles
HQ Pasture Fences	13 S	20 E 21 E	1,2,6		3 Miles, 2 Miles



**TABLE 3-11**  
**SOZA MESA ALLOTMENT**  
**EXISTING RANGE IMPROVEMENTS**

<b>PROJECT NAME</b>	<b>Township</b>	<b>Range</b>	<b>Section</b>	<b>Land Status</b>	<b>Units</b>
Muleshoe Division Fence	12 S	20 E	10,15,23 26,27,28 32		6 Miles
West Boundary Fence	12 S	20 E  19E	10,15,19 20,21,30 36		10 Miles  2 Miles
Mesa Reservoir 1	12 S	20 E	28 SW		1
Mesa Reservoir 2	12 S	20 E	29 SE		1
Poor Canyon Well	12 S	20 E	21 SE		1 Well, 1 Pump 1 Tank, 1 Drinker
Poor Canyon Pipeline	12S	20 E	20,21,28 29		1 Mile, 1 Corral 1 Tank, 1 Drinker
Poor Canyon Wing Fence	12 S	20 E	28,29		.5 Mile
Lower Well Facility	<b>12 S</b>	<b>19 E</b>	<b>36 NW</b>		<b>1 Well, 1 Tank</b>
Eureka Spring Development	12 S	20 E	20 NW		1 Drinker

## APPENDIX 4 GRASSLAND STATE-TRANSITION MODEL

The Muleshoe planning group decided to use a modification of "The State and Transition Model for Semidesert Grasslands of Southern Arizona and Northern New Mexico" (Dr. Richard Young, The Nature Conservancy, Arizona Chapter, 300 E. University Blvd. # 230, Tucson, Arizona 85705) to explain some of the significant processes and changes that occur in the semidesert grasslands. Young's model applies generally to the semidesert grasslands which occur on the Muleshoe CMA. The Muleshoe modified version applies specifically to the Volcanic Hills, Granitic Hills, and Loamy Upland Ecological Sites in the 12 to 16 inch precipitation zone of the Chihuahuan Semidesert Grasslands of the Southeastern Arizona Basin and Range (MLRA 41-3).

The major differences between the models are that the Muleshoe planning team found it necessary to define parameters for the vegetation "states" identified in Young's model in order to develop measurable upland vegetation objectives. The team also decided to plot the model on an "X, Y" coordinate system to make it easier to understand the transitions from one state to another. The following descriptions of the grasslands states are taken directly from Young's model:

### Catalog of States



**State 1**

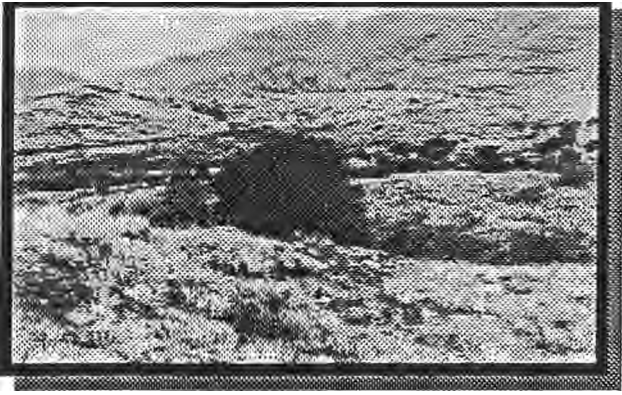
*State I.* Grasslands (co-)dominated by any of several native perennial grasses (mostly caespitose grasses). A wide variety of shrubs,

cacti, and Stem and leaf succulents are common but not abundant in this community. Certain oaks and pinyon pines may also occur in this community. Except on certain aspects or edaphic conditions, woody and succulent species are not sufficiently abundant to dominate the structure or functioning of the community. Grass species dominance is maintained by a fire regime of moderate to high frequency. Grazing by large ungulates (native or domestic) is light to moderate during the summer growing season.



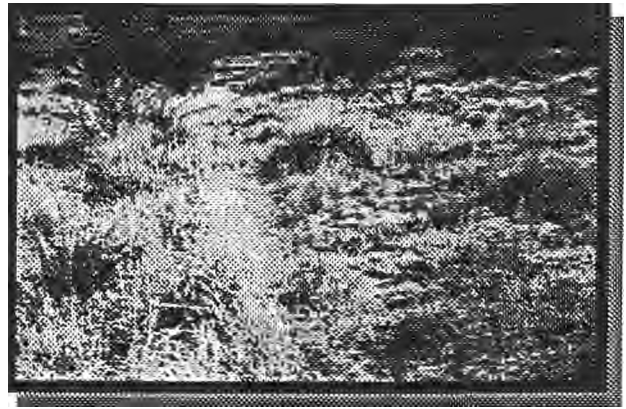
**State 2**

*State II.* A mixed shrub-perennial grass community is composed largely of the same species as are present in State I. The principle difference is the greater abundance and dominance of shrubs and succulents. Pinyons and oaks may be more abundant, but not to the degree that a savannah type is evident. This community is maintained primarily by lower fire frequencies than that which occurs in the maintenance of State I; that is, a moderate fire frequency.



**State 3**

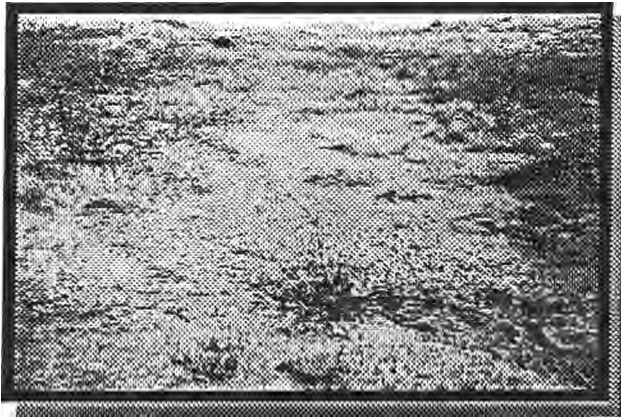
*State III.* A mixed shrub-grass community. Shrub and succulent species are more abundant than in State II, dominating the aspect and ecosystem functioning of these communities. Annual grasses, especially red brome (*Bromus rubens*), co-dominate with perennial grasses in the herbaceous layer. Composition of the perennial grasses differs from States I and II. Formerly dominated by long-lived, caespitose species, the perennial grass component now consists largely of shorter-lived and lower statured species, including threeawns (*Aristida* spp.) and curly mesquite (*Hilaria belangen*). This state is maintained by moderate to heavy grazing during the growing season, and with low incidence of fire.



**State 5**

*State V.* A grassland community co-dominated by the same annual and perennial grasses found in State III. This state is maintained by moderate to heavy grazing during the growing season, and with moderate to high fire frequency.

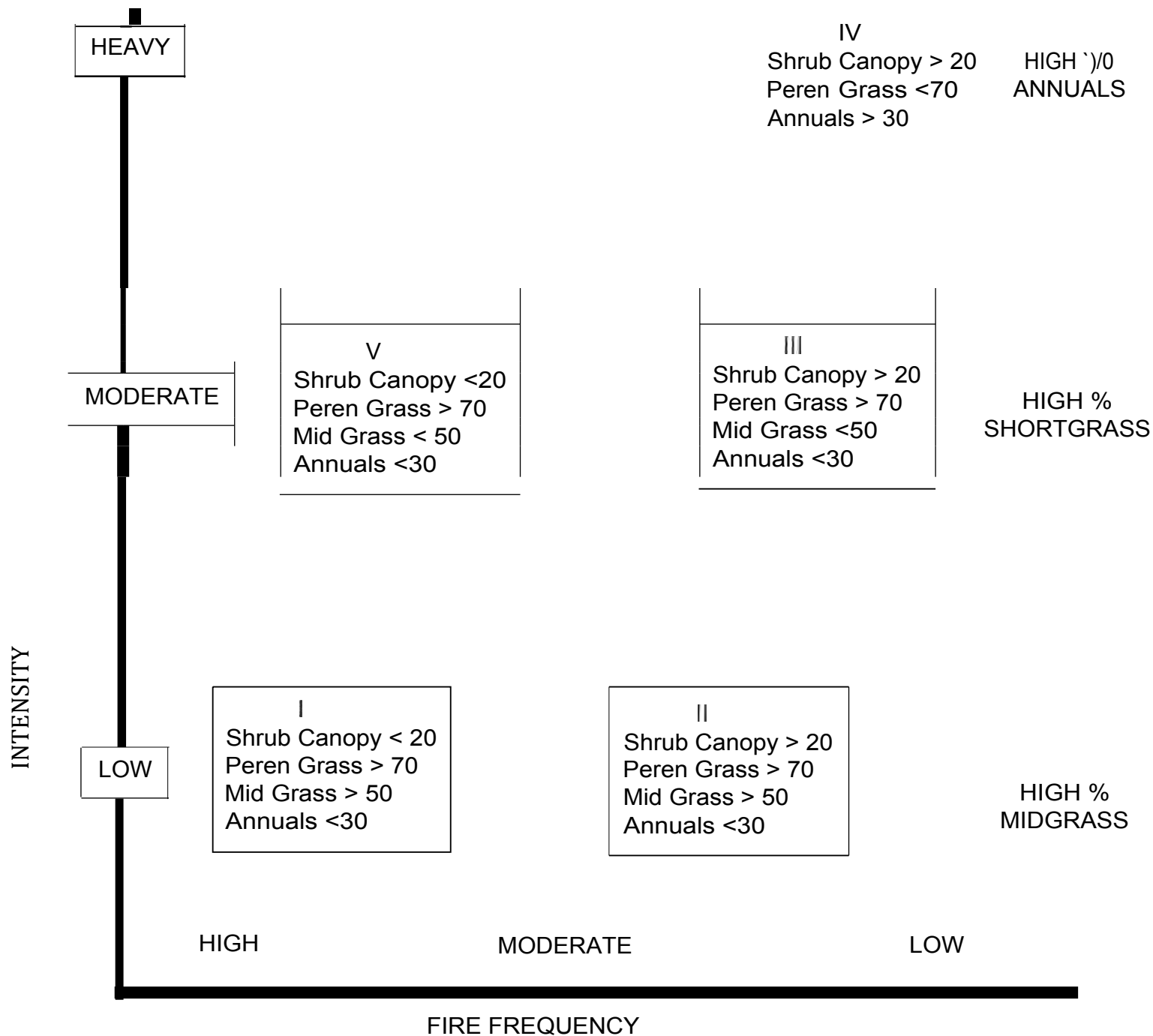
Young identified two additional states in his model, States VI and VII, which addressed the invasive exotic, Lehmann's lovegrass. Currently, this species is not present in significant amounts on the Muleshoe and therefore these states were not included in the modified model.



**State 4**

*State IV.* A mixed shrub-annual grass community. Composition differs little from State III, with the exception of the dramatic reduction of all perennial grasses. This state is maintained by moderate to heavy grazing during the growing season, and with low incidence of fire.

LOW SHRUB CANOPY \_\_\_\_\_ HIGH SHRUB CANOPY



## APPENDIX 5

### LIST OF SCIENTIFIC PLANT AND ANIMAL NAMES USED IN THIS DOCUMENT

#### PLANTS

##### Common Name

##### Scientific Name

#### Trees

Arizona sycamore	<i>Platanus wrightii</i>
Fremont's cottonwood	<i>Populus fremontii</i>
Goodding willow	<i>Salix gooddengii</i>
Bonpland willow	<i>Salix bonplandiana</i>
coyote willow	<i>Salix exigua</i>
black willow	<i>Salix nigra</i>
yew willow	<i>Salix taxifolia</i>
Arizona black walnut	<i>Juglans major</i>
velvet ash	<i>Fraxinus pennsylvanica</i>
Arizona white oak	<i>Quercus arizonica</i>
Mexican blue oak	<i>Quercus oblongifolia</i>
juniper	<i>Juniperus</i> spp.
Arizona cypress	<i>Cupressus arizonica</i>
pinyon pine	<i>Pinus edulis</i>
ponderosa pine	<i>Pinus ponderosa</i>
paloverde	<i>Cercidium</i> spp.
mesquite	<i>Prosopis glandulosa</i>
hackberry	<i>Celtis</i> spp.
Arizona alder	<i>Alnus oblongifolia</i>

#### Shrubs and Cactus

snakeweed	<i>Gutierrezia sarothrae</i>
burroweed	<i>Isocoma tenuisecta</i>
creosote bush	<i>Larrea tridentata</i>
manzanita	<i>Arctostaphylos</i> spp.
buck brush	<i>Ceanothus fendleri</i>
snowberry	<i>Symphoricarpos oreophilus</i>
whitethorn	<i>Acacia constricta</i>
Mormon tea	<i>Ephedra</i> spp.
Acacia	<i>Acacia</i> spp.
Mimosa	<i>Mimosa</i> spp.
cat-claw	<i>Acacia greggii</i>
seepwillow	<i>Baccharis salicifolia</i>
beargrass	<i>Nolina</i> spp.
amole, shindagger	<i>Agave schottii</i>
saguaro	<i>Carnegiea gigantea</i>

#### Grasses and Grasslike

sideoats gramma	<i>Bouteloua curtipendula</i>
curly mesquite grass	<i>Hilaria belangeri</i>
plains lovegrass	<i>Eragrostis intermedia</i>
cane beardgrass	<i>Andropogon barbinodis</i>

black grama  
 slender grama  
 sprucetop grama  
 bush muhly  
 vine mesquite grass  
 three-awns  
 wild rye  
 deergrass

*Bouteloua eriopoda*  
*Bouteloua filiformis*  
*Bouteloua chondrosioides*  
*Muhlenbergia portedi*  
*Panicum obtusum*  
*Aristida* spp.  
*Elymus* spp.  
*Muhlenbergia rigens*

## Forbs

Aravaipa sage

*Salvia amissa*

## ANIMALS

### Common Name

### Scientific Name

Desert pupfish  
 Gila topminnow  
 Gila chub  
 Loach minnow  
 Spikedace  
 Longfin dace  
 Speckled dace  
 Sonoran sucker  
 Desert sucker  
 Lowland leopard frog  
 Desert box turtle  
 Desert tortoise  
 Southwestern earless lizard  
 Texas homed lizard  
 Canyon spotted whiptail  
 Desert grassland whiptail  
 Gila monster  
 Desert kingsnake  
 Mexican garter snake  
 Common black-hawk  
 Northern gray hawk  
 Zone-tailed hawk  
 Peregrine falcon  
 Scaled quail  
 Gambel's quail  
 Montezuma quail  
 Gould's turkey  
 Mourning dove  
 Western yellow-billed cuckoo  
 Mexican spotted owl  
 Brown-crested Flycatcher  
 Western Wood-Pewee  
 Southwestern willow flycatcher  
 Northern Beardless-tyrannulet

*Cyprinodon macularius*  
*Poeciliopsis occidentalis*  
*Gila intermedia*  
*Rhinichthys cobitis*  
*Meda fulgida*  
*Agosia chrysogaster*  
*Rhinichthys osculus*  
*Catostomus insignis*  
*Catostomus clarki*  
*Rana yavapaiensis*  
*Terrapene omata luteola*  
*Gopherus agassizzi*  
*Cophosaurus texanus scitulus*  
*Phrynosoma comutum*  
*Cnemidophorus burti*  
*Cnemidophorus uniparens*  
*Heloderma suspectum*  
*Lampropeltis getulus splendida*  
*Thamnophis eques*  
*Butegallus anthracinus*  
*Buteo nitidus maximus*  
*Buteo albonotatus*  
*Falco peregrinus*  
*Callipepla squamata*  
*Callipepla gambelii*  
*Cyrtonyx montezumae*  
*Meleagris gallopavo mexicana*  
*Zenaida macroura*  
*Coccyzus americanus occidentalis*  
*Strix occidentalis mexicanus*  
*Myiarchus tyrannulus*  
*Contopus sordidulus*  
*Empidonax traillii extimus*  
*Camptostoma imberbe*

Loggerhead shrike	<i>Lanius ludovicianus</i>
Bell's Vireo	<i>Vireo bellii</i>
Yellow warbler	<i>Dendroica petechia</i>
Common Yellowthroat	<i>Geothlypis trichas</i>
Yellow-breasted Chat	<i>Icteria virens</i>
Baird's sparrow	<i>Ammodramus bairdii</i>
Song Sparrow	<i>Melospiza melodia</i>
Botteri's sparrow	<i>Aimophila aestivalis</i>
Northern oriole	<i>Icterus galbula</i>
Summer tanager	<i>Piranga ludoviciana</i>
Western yellow bat	<i>Lasiurus ega</i>
Red bat	<i>Lasiurus borealis</i>
Spotted bat	<i>Euderma maculatum</i>
Southwest cave myotis	<i>Myotis velifer brevis</i>
Occult little brown bat	<i>Myotis lucifugus occultus</i>
California leaf-nosed bat	<i>Macrotus californicus</i>
Lesser long-nosed bat	<i>Leptonycteris curasoae yerbabuenae</i>
Mexican long-tongued bat	<i>Choeronycteris mexicana</i>
Greater western mastiff bat	<i>Eumops perotis californicus</i>
Yellow-nosed cotton rat	<i>Sigmodon ochrognathus</i>
Coyote	<i>Canis latrans</i>
Mexican wolf	<i>Canis lupus baileyi</i>
Black bear	<i>Ursus americanus</i>
Coati	<i>Nasua nasua</i>
Badger	<i>Taxidea taxus</i>
Mountain lion	<i>Felis concolor</i>
Bobcat	<i>Felis rufus</i>
Javelina	<i>Tayassu tajacu</i>
Mule deer	<i>Odocoileus hemionus</i>
White-tailed deer	<i>Odocoileus virginianus</i>
Desert bighorn sheep	<i>Ovis canadensis mexicana</i>

## APPENDIX 6 MONITORING PROTOCOLS

### Riparian Monitoring Protocol Muleshoe Riparian Areas

In 1994, key monitoring sites for riparian vegetation were established and sampled in Hot Springs Canyon (2 sites-1 in Upper Canyon, 1 in Lower Canyon), Swamp Springs Canyon (1 site), Redfield Canyon (1 site), and Bass Canyon (1 site). An additional site will be established in Double R Canyon in 1997. Ten belt transects, 10 feet in width, and spanning the entire floodplain, perpendicular to the stream, were set up at each site; the distance between transects was approximately 250 feet. Within each belt transect, the total number of seedlings, saplings, mature and old trees were counted by species. The length of each transect (across the flood plain) was also recorded so that densities of the different age-classes could be calculated for each site. Seedlings were defined as plants < 1 inch diameter at breast height (dbh) or < 6 feet tall; saplings were defined as plants 1-6 inches dbh or > 6 feet tall; mature trees were 6-20 inches dbh; and old trees were > 20 inches dbh. For seedlings, utilization (based on browsing of apical stem) was measured on a subsample of 50 or 100 seedlings (depending on availability) spread over the 10 bands. At each band, the lengths of 6 different ecological sites (aquatic, regeneration zone, river wash, lower terrace sand bottom, mid terrace sand bottom, upper terrace loamy bottom, upper terrace loamy woodland) were also measured across the flood plain. These lengths were used to calculate the percentages of each ecological site at each key location. Two photopoints were established at each site and 2 photographs were taken at each photopoint, 1 facing upstream and 1 downstream.

### Aquatic Habitat Monitoring Muleshoe Streams

Permanent monitoring stations have been established in stream reaches in conjunction with riparian monitoring stations. No less than  $\frac{1}{4}$  mile

will be monitored at each station in order to get a representative sample of aquatic macrohabitats present. Within each monitoring segment, habitats will be classified sequentially using the stream habitat classification schemes in McCain et al.(1989) and Hawkins et al.(1993); additional habitat types applicable to Muleshoe streams may be described and used once they have been reviewed and accepted. The following information will be recorded by habitat: length, average channel width and water depth, maximum depth, canopy cover overhanging grass/shrubs (ft<sup>2</sup>), floating vegetation(ft<sup>2</sup>), emergent vegetation(ft<sup>2</sup>), debris cover(ft<sup>2</sup>), overstory canopy cover(ft<sup>2</sup>), the 3 dominant substrate types estimated to the nearest 10% (boulder, cobble, pebble, gravel, sand, and silt cover), and primary contribution to pool formation (either bedrock or vegetation). Bank stability will be evaluated by measuring the linear quantity of stable and unstable (or disturbed) stream bank and its apparent cause following methods of Platts et al. (1983).

### Monitoring Streamflows Muleshoe Streams

Streamflows (base-flows) will be measured, using a Marsh-McBimey or Pygmy meter at established sites: Hot Springs Canyon (2 sites), Bass (1 site), Double R (1 site), and Redfield Canyon (1 Site). These sites will be monitored on a monthly basis at specific points of compliance recognized by ADWR. Once a stream gauge is installed on Hot Springs Canyon and is accepted by ADWR as a new point of compliance, the two stream discharge monitoring sites will be phased out. Standard procedures for quantifying stream discharge will be followed (Buchanan and Somers, USGS, 1980).

### Monitoring Native Fish Muleshoe Streams

Since 1991, 5 permanent monitoring stations were established for native fish monitoring along the perennial portion of Hot Springs, 8 permanent



stations along Bass, 2 permanent stations along Double R and 2 permanent stations along Wildcat Creek. At each station, 100-200 m of aquatic habitat is sampled for native fish using fine meshed (1/8 inch) seines or a backpack electroshocker, depending on the stream conditions. Prior to sampling, the stream transect is divided into macrohabitats using the same classification system employed for the Aquatic Habitat Monitoring. Afterwards, each macrohabitat is sampled independently by a single pass of the appropriate sampling equipment. Fish numbers are enumerated by species and age-class (juveniles vs. adults). These data are recorded for each macrohabitat along with the distance of individual seine hauls or the number of shocking seconds in that macrohabitat. From these data, the relative abundance by species and age-class is calculated and an index (catch per unit effort) to absolute abundance is estimated by normalizing fish numbers by the distance or time sampled. Two photopoints have been established at each monitoring station, 1 on the downstream end of the transect and on the upstream end. Two photographs are taken at each photopoint, 1 looking upstream, the other looking downstream, to document riparian habitat along the transect and adjacent to it. All monitoring stations on all streams are sampled annually in October.

**Monitoring Note:** In addition to fish monitoring, TNC has been monitoring habitat features in relation to fish abundance and species composition. Each of the sequential macrohabitats along a stream transect is recorded along with the length of that macrohabitat (McCain et al. 1989), width, 8-10 random depth measurements, maximum depth, areal cover of woody debris (in m<sup>2</sup>) and length of undercut bank (in meters). After collecting several years of these data, TNC plans to analyze them for relationships between fish abundance and habitat characteristics. In 1992, TNC augmented the habitat measurements to include estimates of current velocity, substrate composition, and percent cover by riparian vegetation along monitoring transects. They are also collecting biweekly stream flow measurements. Their goal is to develop a model for fish

populations that can predict changes in the relative abundances of fish species with changes in habitat characteristics. Using this model, the agencies involved with the Muleshoe CMA will be able to better interpret monitoring data and evaluate whether changes in the relative abundance of species is due to natural or human-caused changes in aquatic habitat or to the impact of exotic fish. Thus, the model along with continued collection of monitoring data will provide an "early warning" system for identifying threats to native fish populations.

*The aquatic habitat monitoring associated with the Riparian Objective in this plan does not correspond to that for the fish monitoring due to differences in monitoring goals. The fishery monitoring was put in place in 1991 based on fish abundance, while the aquatic habitat monitoring associated with the Riparian Objective was put in place to observe changes in habitat characteristics with changes in riparian habitat in segments with the least geologic channel control (i.e., areas with wide flood plains influenced primarily by vegetation).*

## 1. Ecological Site Inventory

The purpose of the Ecological Site Inventory was to provide baseline data of the soil and terrestrial vegetation on the Muleshoe CMA for use in management decisions for current and future use. The inventory includes mapping soils, vegetation and important botanical characteristics.

### Soils Mapping

An Order 3 Soil Survey was completed for the Muleshoe CMA by Norgren and Spears in 1990. This survey is on file at the Tucson Field Office. The mapping units are delineated on aerial photographs and USGS 7.5' topographic maps at a scale of 1:24,000. Each unit is identified by a map symbol which is composed of one, two, or more major soil components. The following legend correlates the map units with their respective Ecological site:

**TABLE 6-1**  
SOIL SURVEY - MULESHOE CMA  
Mapping Units and Ecological Sites

<u>Map Symbol</u>	<u>Map Unit</u>	<u>Ecological Site</u>
1	Greyeagle Cobbly Loam	Limy Upland
2	Argiustolls-Haplustolls Complex	Volcanic Hills
3	Greyeagle-Eloma Complex	Limy Upland
		Clay Upland
5	Arizo-Brazito-Riverwash Complex	Sand Bottom
		Loamy Bottom
6	Caralampi Gravelly Loam	Loamy Upland
7	Ustorthents-Haplargids- Rock Outcrop Complex	Volcanic Hills
		Clay Hills
8	Rock Outcrop-Torriorthents Complex	Granitic Hills
9	Lemitar-Rock Outcrop Complex	Tuff Hills
11	Ustorthents-Rock Outcrop Complex	Volcanic Hills
12	Romero-Haplargids- Rock Outcrop Complex	Volcanic Hills
13	Lampshire-Argiustolls Complex	Volcanic Hills
14	Cumulic Haplustolls	Loamy Upland

Vegetation Mapping and  
Ecological Site Condition Ratings

Field mapping of vegetation consisted of correlating soil complexes with ecological sites, then delineating the ecological sites on USGS 7.5" topographic maps. The ecological sites were then inventoried to determine the ecological condition rating. Ecological condition was determined by comparing the present plant community with that of the Potential Natural Community for that ecological site. The Range site **descriptions** used to determine PNC were those developed by the Natural Resources Conservation Service (See the **SCS** National Range Handbook for discussion of range condition determinations).

An ecological site classification provides a basis for **identification** and delineation of distinct land units, in order to predicting potential values, management needs, and responses of a given area. The ESI provides a means of stratifying the present character or status of vegetation and soil in such a way as to provide an estimate of present resource values and to predict the consequences of a change in management or the continuation of present management.

Four classes were used to express the degree to which the composition of the present plant community reflects that of the potential:

**TABLE 6-2**  
ECOLOGICAL CONDITION CLASSES

<u>Condition Class</u>	<u>Estimated % Existing Plant Community that is Potential for the Site</u>
PNC	<b>76 - 100</b>
High	<b>51 - 75</b>
Mid	<b>26 - 50</b>
Low	<b>0 - 25</b>

## Vegetation Sampling Procedures

The following vegetation sampling procedures were followed in the delineated ecological site write-up areas to determine the current conditions:

A 500 foot long transect (or 2 parallel transects - 250 feet each) was run in each ecological site where there was a notable difference in appearance. 100 sample plots (40 cm X 40 cm) were read along the transect at 5 foot intervals. Vegetation composition, production, species frequency, and ground cover were measured in each plot.

### Vegetation Composition

The Dry Weight Rank method of estimating plant species composition was used (Methods of monitoring rangelands and other natural area vegetation by G. Ruyle (University of Arizona, Division of Range management, Extension Report 9043).

100 - 40 cm X 40 cm quadrants were sampled along each 500 foot transect. The three most abundant species on a dry weight basis were identified in the quadrant and ranked. The species yielding the highest annual above ground production was given a rank of 1, the next highest a 2, and the third highest a 3. If a quadrant had less than three species, more than one rank was assigned to some species. The dry weight rank method assumes that a rank of 1 corresponds to 70% composition, rank 2 to 20%, and rank 3 to 10%. These weighing factors were derived empirically (Mannetje and Haydock, 1963). To estimate percent composition for the species within the write-up area, the ranks for each species were summed, multiplied by the weighing factor for each rank, and divided by the sum of the weighted ranks for all species combined.

### Vegetation Production

The comparative yield method for estimating range productivity was used (Methods of monitoring rangelands and other natural area vegetation by G. Ruyle (University of Arizona, Division of Range management, Extension Report 9043).

Five reference quadrants or standards (40 cm X 40 cm) were selected adjacent to the transect to represent the range in dry weight of standing plant biomass which was likely to be encountered along the 500 foot transect. The five standards were clipped and weighed to document the production. The transect was then run sampling 100 quadrants along the transect. The vegetation yield in each plot was then compared to the standards and placed in the closest rank.

To estimate the total plant production in lbs/acre, the number of quadrants in each of the comparative yield standards is summed and multiplied by the number of grams clipped for that standard. This total is then multiplied by 0.557 to convert the grams to lbs/acre for that standard. This is done for all five standards. These totals are then added together to calculate the total lbs/acre for the ecological site. To calculate the production of an individual species, the percent composition of the species can be obtained by multiplying the percent composition for that species by the total production for the site.

### Plant Species Frequency

The relative abundance of each plant species in each ecological site write-up area was determined using the Pace Frequency sampling method (Methods of monitoring rangelands and other natural area vegetation by G. Ruyle (University of Arizona, Division of Range management, Extension Report 9043).

Again 100 quadrants (40 cm X 40 cm) were sampled along a 500 foot transect. The frequency of occurrence for each species was calculated. Herbaceous vegetation species (grasses and forbs) were counted as occurring if they were rooted in the quadrant. Trees and shrubs were counted if they were either rooted in or had canopies that overhung the quadrant. The probability of occurrence for a species (total frequency) was calculated by dividing the number of occurrences by the total number of quadrants (100) sampled

### Ground Cover

Ground cover was measured using along the same 500 foot transect by collecting point

intercept data. A pointer was attached on the quadrant frame used for sampling. 100 points were recorded along the transect. The following categories were used to group cover:

TABLE 6-3  
Ground Cover Categories

Bare Ground	0 to 0.24 inches
Gravel	0.25 inches to 3 inches
Rock	>3 inches
Litter (includes annual plants)	
Live Vegetation	
Grass/Forb Basal Cover	
Canopy Cover	
Shrubs/Trees	
Basal Cover	
Canopy Cover	

The ground cover "hit" was determined by visualizing the pointer from a raindrop viewpoint. The first category of cover that the raindrop would intercept on its path to the ground was counted as the "hit". The percent cover was then calculated by dividing the number in each category by the total number of points sampled (100).

In addition to the data collected in the ESI conducted by the BLM, The Nature Conservancy has collected additional vegetation and cover data on the Muleshoe CMA in order to track changes in the composition and structure of semi-desert grasslands over time and to relate the changes to different management activities (Monitoring Upland Vegetation on the Muleshoe Ranch CMA: Summary of 1991 Results, by Dave Gori. The Nature Conservancy, Arizona Chapter, 1994). Most of the studies and their respective protocols are essentially the same as those conducted by the BLM in the Ecological Site Inventory. The future monitoring protocol will combine the two agencies methodology so that data collection is standardized.

## 2. Proposed Vegetation Monitoring

The monitoring methodologies to be used and the timeframes and responsibilities for collection are as follows:

TABLE 6-4  
Upland Vegetation Monitoring Schedule

STUDY TYPE	METHOD	TIMEFRAME	RESPONSIBILITY
Trend Studies	Pace Frequency	Every 5 Years	BLM/TNC
Ecological Condition	BLM - ESI	As Necessary	BLM
Plant Composition			
Herbaceous Species	Dry Weight Rank		BLM/TNC
Woody Species	Clipping Tables		BLM
Plant Production			
Herbaceous Species	Comparative Yield		BLM/TNC
Woody Species	Clipping Tables		BLM
Substrate Composition			TNC
Shrub Canopy Cover	Need protocol		TNC
Ground Cover	Point Intercept		BLM

**MULESHOE ECOSYSTEM  
MANAGEMENT PLAN**

**ENVIRONMENTAL ASSESSMENT**

**EA-AZ-046-96-001**

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*Prepared by:*  
***The Muleshoe Ecosystem Planning Team***  
***Karen Simms, Team Leader***

## I. INTRODUCTION

### A. Background

The Muleshoe Ecosystem is located in the Galiuro Mountains in southeastern Arizona within northern Cochise County and southern Graham County. The Ecosystem planning area encompasses the Muleshoe Cooperative Management Area (CMA) which is jointly managed by the Bureau of Land Management (BLM), U.S. Forest Service (USFS), and The Nature Conservancy (TNC). The planning area includes approximately 26,500 acres of BLM public lands, 22,000 acres of USFS forest lands, 6000 acres of private lands and 3000 acres of Arizona State lands. These lands comprise major portions of the Redfield, Hot Springs, and Cherry Springs watersheds. Included within the planning boundary are the Redfield Canyon Wilderness and Hot Springs Area of Critical Environmental Concern (ACEC), administered by the BLM, and a portion of the Galiuro Wilderness, administered by the USFS.

The Muleshoe Ecosystem Management Plan (EMP) was developed to provide guidance for the Muleshoe CMA, including the Redfield Canyon Wilderness and Hot Springs ACEC, in conformance with the Safford District Resource Management Plan (RMP) (1994). This environmental assessment analyzes the potential impacts of proposed actions and management alternatives that were considered for the Muleshoe EMP.

More detailed background information on the ecosystem is provided on pages 12 to 41 of the proposed Muleshoe Ecosystem Management Plan.

### B. Purpose and Need for the Proposed Action

The purpose of the actions proposed in the Muleshoe Ecosystem Plan is several fold: to provide management direction for the Muleshoe CMA, implement decisions made in the Safford RMP, implement multiple use management in a manner that ensures ecosystem health and integrity with an emphasis on **riparian** and grassland biotic communities, to fulfill the intent of Congress to protect and preserve the area for the

use and enjoyment of present and future generations as wilderness, and to maintain the character of streams found eligible for status as "wild and **scenic**" until Congress acts on designation.

### C. Conformance to Land Use Plans

The proposed plan is consistent with the approved Safford District RMP and Final Environmental Impact Statement (EIS) (BLM 1994). The Safford RMP directs that a Coordinated Resource Management Plan be developed for the Muleshoe (CMA) including the Hot Springs (ACEC). The plan is to be prepared by an interdisciplinary team of BLM resource specialists, landowners, permittees, academia, and representatives of other state and federal agencies with management responsibilities in the planning area. The plan will propose specific resource allocations and prescriptions for multiple uses to achieve identified resource objectives. Range suitability will be determined through a range evaluation process as part of the resource inventory for the plan, but suitability will not be used to establish livestock carrying capacity.

The RMP leaves livestock use on the Hot Springs ACEC in suspension pending resource allocations made in the interdisciplinary activity plan. The RMP authorizes livestock use on the new Soza Mesa allotment at an initial stocking rate of 44 cattle yearlong. The **RMP** directs that watershed conditions in the upland areas of the Muleshoe CMA will be improved by vegetation manipulation and sound range management practices. Prescribed natural fire will be one of the tools used to achieve the resource objectives for the Muleshoe CMA.

### D. Relationship to Statutes, Regulations, or Other Plans

The proposed plan actions comply with mandates of the Federal Land Policy and Management Act (FLPMA) of 1976 which require the Bureau of Land Management to manage public lands for multiple use on a sustained yield basis.

The Muleshoe EMP includes interdisciplinary activity planning for the Muleshoe CMA including the Redfield Canyon Wilderness, Hot Springs ACEC, and the Soza Mesa Allotment. This approach eliminates the need to develop separate wilderness, ACEC, wildlife habitat, allotment, recreation or cultural activity plans. In the Muleshoe EMP, resource objectives are integrated and management prescriptions include actions to achieve resource objectives as well as constraints to achieve compatible and sustainable levels of public land uses.

Those actions pertaining to the Redfield Canyon Wilderness comply with the Wilderness Act of 1964, the Arizona Desert Wilderness Act of 1990, and are guided by wilderness management policy as outlined in BLM Manual 8560. Those actions relating to cultural resources are managed according to mandates set forth by the National Historic Preservation Act, the Archaeological Resources Protection Act, the Native American Graves and Repatriation Act, management policy specified in BLM Manual 8100, and the Programmatic Memorandum of Agreement between the BLM, Arizona State Historic Preservation Officer (SHPO) and the President's Advisory Council on Historic Preservation. Those actions pertaining to threatened and endangered species management conform to regulations of the Endangered Species Act of 1973 as amended, BLM manual 6840, and relevant Endangered Species Recovery Plans which include the following: The Desert Pupfish Recovery Plan (USFWS 1993), Sonoran Topminnow [Gila and Yaqui] Recovery Plan (USFWS 1984) (soon to be replaced with Gila Topminnow revised recovery plan now in final stages of draft), Spikedace Recovery Plan (USFWS 1991), Loach Minnow Recovery Plan (USFWS 1991), **draft** lesser long-nosed bat recovery plan, Mexican Gray Wolf Recovery Plan (USFWS 1982), and American Peregrine Falcon Recovery Plan (USFWS 1984). The plan meets the Sikes Act (1974) requirements for a wildlife habitat management plan. Those actions pertaining to range management are consistent with the Eastern Arizona Grazing EIS (1986), conform to provisions of the Taylor Grazing Act of 1934, and meet requirements of the Public Rangeland Improvement Act of 1978. All

proposed grazing and rangeland improvement practices conform to the Best Management Practices developed by The Arizona Department of Environmental Quality for grazing activities.

## **II. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES**

### **A. Proposed Action Alternative**

The proposed action is the adoption and implementation of the Muleshoe Ecosystem Management Plan. In general, the proposed action would provide for the protection and enhancement of ecosystem resources, processes and function including riparian and upland vegetation, wildlife, wilderness, cultural and social environment values while allowing for compatible and sustainable levels of use. Proposed management actions that could have environmental effects are listed below. These actions are described in greater detail in pages 48 to 77 of the Muleshoe Ecosystem Management Plan.

#### **1. Riparian Objective**

Proposed actions to achieve the **riparian** objective include pursuing instream flow water rights, installing stream gauges, developing ecological site guides, removing non-native vegetation and implementing closure of Hot Springs Canyon **riparian** area to vehicles. Management constraints include eliminating livestock grazing in riparian areas, designating Bass Canyon as a day use area, prohibiting recreation activities that cause substantial stream bank impacts, and prohibiting commercial collection of plant materials or wood-cutting in riparian areas; collection of these materials for casual use by the public and traditional use by native Americans will be allowed. Road maintenance in riparian areas will use the least impacting practices. Prescribed fire units will include riparian areas, but special practices will be used to avoid burning them except for small experimental areas.

#### **2. Upland Objective**

Proposed actions to achieve the upland objective include implementation of a prescribed fire

program and livestock grazing management. Livestock management actions include modification of the current grazing allotment boundary of the Muleshoe Allotment (No. 4401) to exclude the riparian areas and create a new allotment on 4127 acres of upland area within the Pride Basin, establishing a grazing preference of 346 AUMs on the public lands for the new Pride Basin Allotment, placing the grazing preference on Pride Basin in suspended nonuse until desired upland vegetation conditions are achieved, and constructing the proposed allotment boundary fence and water developments necessary to implement proper livestock grazing once the desired vegetative states have been achieved. In addition, the existing active grazing preference of 502 AUMs on the Soza Mesa allotment will be recognized and the range improvements necessary to implement the proposed rotational grazing system will be constructed on Soza Mesa. Natural and artificial water sources for wildlife will be inventoried to assess the adequacy of permanent water for wildlife.

### **3. Fish and Wildlife Objective**

Proposed actions to achieve the fish and wildlife objective include evaluating habitat potential for reintroduction, reestablishment, range extension or supplementation of fish and wildlife including several native fish species, bighorn sheep, and turkey. Following habitat inventory, initiating procedures for reintroduction, reestablishment, range extension or supplementation as necessary for recommended species. Other actions include a cooperative inventory of stock tanks for exotic aquatic species to assess threats to native aquatic species and cooperative removal of exotic wildlife threatening native species with **AGFD**.

### **4. Cultural Resources Objective**

Proposed actions to achieve the cultural objective include conducting a class III inventory of the planning area, completing an ethnoecology study of planning area, posting regulatory and interpretive signs about cultural resources, classifying traditional use plants and areas, and creating a partnership education program with universities. Management constraints include

fencing livestock out of significant cultural sites and pre-treating cultural sites that could be impacted by prescribed burns.

### **5. Wilderness Objective**

Proposed actions to achieve the wilderness objective include installing wilderness boundary signs, developing informational brochures and kiosks, limiting group size to 15 persons, providing for wildlife operations in wilderness including annual surveys and maintenance and development of waters, attempting to acquire wilderness inholdings if they become available, and implementing a prescribed burn program which limits prescribed burns in wilderness to those occurring by natural ignitions.

Livestock grazing would be eliminated on about 3600 acres of Public Lands in the Redfield Wilderness Area, by modifying the boundary of the Muleshoe allotment to exclude the riparian areas and restrict grazing to Pride Basin. A livestock grazing preference about 321 AUMs would be allocated from the 2560 acres of the wilderness within the proposed Pride Basin allotment.

### **6. Social Environment Objective**

Proposed actions to achieve the social environment objective include implementing road closure decisions in the Safford RMP, developing pullouts along Jackson cabin road, constructing visitor kiosk with a sign in station at beginning of Jackson Cabin road, developing informational brochures, maintaining and improving hunting opportunities, pursuing legal public access as identified in Safford RMP, and maintaining Jackson Cabin and Soza Mesa roads to 4x4 standard.

### **B. No Action Alternative**

Under the no action alternative, current management would continue under the guidance of the Safford RMP and Muleshoe CMA. An integrated, interdisciplinary approach would not be pursued for the ecosystem. Individual activity plans for wilderness, ACEC, wildlife habitat, recreation, cultural and allotment management



would be prepared as needed, and implementation would likely be disjunct and relatively uncoordinated.

### **1. Current Riparian Management**

Full suppression of all wildfires on BLM public lands including riparian areas would continue. Suspension of livestock use would continue indefinitely including within riparian areas (see Upland Management).

### **2. Upland Management**

Full suppression of all wildfires on BLM public lands would continue. Prescribed fires could be implemented in upland areas on a case by case basis through individual environmental assessments. TNC would continue their fire program on their deeded lands. USFS would continue modified suppression on USFS lands.

The current grazing preference of 3204 AUMs (267 Cattle Yearlong) on the public lands in the Mule-shoe allotment No. 4401 would be recognized. Suspension of livestock use would be continued indefinitely. The existing grazing allotment boundaries would remain as they are, and no range improvement projects would be constructed. Active livestock grazing use would be authorized at some date in the future when the resources in the upland and riparian areas have recovered sufficiently. The BLM would authorize active use of the 267 cattle on a yearlong basis at this point. Any future adjustments in the number of livestock allowed would be based on BLM's monitoring and evaluation procedures.

The current grazing preference of 502 AUMs (44 Cattle Yearlong) on the Soza Mesa allotment No. 4402 would be recognized and authorized. Range improvements on the allotment would be constructed on a case by case basis. Rangeland monitoring would be continued and future adjustments of livestock numbers would be made based on evaluation of the trend and utilization studies.

Wildlife waters and other wildlife habitat projects would be constructed on a case by case basis.

### **3. Current Fish and Wildlife Management**

The BLM would respond to species reintroduction proposals made by other agencies and institutions. Limited fisheries monitoring would occur in response to identified problems facing specific fishery resources at specific locations. Inventory of aquatic habitat and aquatic resources throughout the CMA would occur. AZGFD would continue monitoring of wildlife populations on the CMA.

### **4. Current Cultural Resources Management**

Selected sites would be identified for scientific and educational use through a separate cultural resources activity plan. Some interpretation and stabilization of cultural sites could be accomplished through educational partnerships and private funding. A study of the CMA's ethnoecology could also be accomplished in this manner.

### **5. Current Wilderness Management**

Pending the development of a separate Wilderness Management Plan, visitation to the wilderness would be uncontrolled. Monitoring would continue on a non-routine basis to record problems occurring primarily through lack of boundary fencing, signing, and literature explaining wilderness rules and regulations. All wildfires, whether human caused or natural, are suppressed using the appropriate response from the Interim Guidelines for Wildfire Suppression in Wilderness (BLM 1995).

### **6. Current Social Environment Management**

Extensive recreation opportunities of an unstructured and dispersed nature would continue to be available throughout the planning area. Except for closed areas designated in the Safford District RMP, off-highway vehicle (OHV) use on the public land portions of the planning area is limited to existing roads and trails. Two OHV closed areas are designated within the Muleshoe Planning Area. These are Hot Springs Canyon and the Pipeline Road. The Pipeline Road can be used only for administrative purposes.

No provisions for special designations or developed recreation areas are proposed under this alternative. Visitor information is available through the various offices having jurisdiction. Little public information is available at the site or on the ground.

Road maintenance is allowed as provided by the Safford District **RMP** for the public land portion of the road between Hooker Hot Springs and Jackson Cabin. However, such maintenance is done as needed depending upon available funding.

### **C. DESCRIPTION OF OTHER ALTERNATIVES CONSIDERED BUT NOT ANALYZED**

#### **1. Riparian Objective**

##### **Alternative Actions for Fire Management in Riparian Areas**

1. Prescribed, both natural and management ignited, fire units will include riparian areas. Riparian areas will be burned as part of the units used to manage upland vegetation. If fire leaves the pre-determined boundary, then the fire must be suppressed.

**Rationale for not pursuing alternative:** The role of fire in riparian areas is not well understood. Historically, fires occurred naturally in the grassland areas of the Muleshoe Ecosystem without suppression. It is likely that portions of riparian areas adjacent to grasslands maintained by fire were directly impacted on a regular basis. However, the frequency **and amount of impact** are unknown. The impacts from natural ignitions occurring at a localized source are likely to differ from those from **management** ignitions which usually are more widespread and burn more thoroughly. Riparian habitat is a rare habitat type which has been diminished greatly over the last 150 years. This is some of the most productive and valuable wildlife habitat, harboring a variety of rare plants and animals. It is too important to fish and wildlife to impact on a large scale with controlled burning. Spring burning in riparian areas is likely to kill or displace rare wildlife species and may cause fish kills.

2. Prescribed, both natural and management ignited, fire units will not include riparian areas. Riparian areas will not be burned.

**Rationale for not pursuing alternative:** This management action is more conservative than the preferred in its approach to protecting riparian habitat. However, it neglects to address the need to understand the role of fire in riparian areas adjacent to fire maintained semi-desert grasslands.

##### **Alternative Action for Management of Livestock Grazing in Riparian Areas**

1. No livestock use in the riparian areas during the growing season (March through October). The goals in the ACEC are to manage to enhance riparian and aquatic habitats. If livestock grazing during the growing season is **determined** to be incompatible with achieving the resource objectives in riparian zones, an alternative would be to change the season of grazing use for the allotment to winter use only, or defer grazing use in the riparian pastures. Numerous different grazing strategies could be proposed for the area which would result in winter grazing of the riparian areas.

##### **A. Seasonal Grazing Strategy (Winter Grazing - October through March)**

Under this strategy, no new pasture fencing would be required. The entire allotment would be used for grazing as one large pasture from October through March. If this strategy is selected, the grazing preference would be 334 cattle from 11/01 to 3/31 at 78% Public Land Use. This equates to **1563 AUMs** for the Muleshoe Allotment.

**Rationale for not pursuing alternative:** It was anticipated that the amount of streambank disturbance resulting from the livestock trampling, and utilization of riparian plant species would exceed the amount allowable in the riparian objective. Due to the narrow steep sided nature of the canyons along the riparian corridors, even in the cooler winter weather

cattle would tend to spend an excessive amount of time in the creek bottoms. Exposed loose soil would be subject to erosion resulting from winter flood events. Livestock **distribution** would be poor across the allotment without additional fencing. Cattle would find preferred areas which they would tend to overuse, while other areas would be only lightly used. The overuse of the preferred upland sites (loamy upland range sites) would result in increases in shrub cover and reduction in the composition of the tall-mid stature perennial grass species. The upland objectives would not be achieved.

#### B. Yearlong Grazing Strategy - Riparian pastures used during non-growing season.

Under this alternative, pasture fencing could be constructed to isolate those areas adjacent to the perennial stream segments. These **riparian** pastures could be incorporated into a pasture rotation where they could be used during the non-growing season (October through March). Approximately eight (8) miles of fencing would be required. This strategy would use the Pride Basin area during the growing season, then either moving the cattle through a series of **riparian** pastures or scattering the cattle in all the **riparian** pastures through the winter. Under this strategy, the grazing preference would be 86 Cattle yearlong at 65% Public Land Use. This equates to 671 AUMs. If a cow-calf operation is being run, the herd size would be limited to the total number of animals that could be run in the Pride Basin area during the growing season (86 Cattle for the allotment for the entire year).

**Rationale for not pursuing alternative:** While this strategy would reduce the selective grazing habits of the livestock and improve distribution over the range, the impacts resulting from the higher stock densities in **riparian** pastures during use periods would exceed those allowable under the riparian and aquatic objectives. Use limits on **riparian** plant species and the amount of streambank disturbance would be too high. Even if a

rotation was developed that provided yearlong rest of riparian pastures after use, it was anticipated that damage to streambanks and riparian vegetation in the year of high intensity grazing would not be restored by the subsequent rest from grazing (Impacts of grazing on wetlands and riparian habitat, Jon M. Skovlin 1984).

## 2. Upland Objective

### Alternative Actions for Fire Management in Uplands

- A. Allow only natural ignition fires to burn within a specified prescription (No management ignited fire for both wilderness and non-wilderness portion of the CMA).

**Rationale for not pursuing alternative:** Natural ignition may not occur frequently enough and fires may not burn hot enough under the current ecological conditions to effectively burn units. In addition, the timing of the ignitions would not be controlled. Wildfires could occur during periods **when** desirable perennial grasses would actually be harmed, or during periods which would expose excessive areas of bare soil to wind and water erosion.

- B. Management ignited prescribed fires in wilderness also.

**Rationale for not pursuing alternative:** It is not known whether or not natural prescribed fire will occur frequently enough to improve vegetative characteristics of the Redfield Wilderness. The team opted for natural prescribed fire with periodic evaluation to determine the adequacy of such a fire regime. In order to promote the wilderness value of naturalness, lightning caused ignition of fires is preferred to management caused ignition.

### Alternative Actions for Management of Livestock Grazing in Uplands

- 1. Under this alternative, the existing grazing preference of 267 cattle yearlong (CYL) would remain. All of the lands in the Muleshoe would be grazed, and the necessary pastures and

waters to implement a rotational grazing plan would be developed. There are a variety of different options for implementing this alternative. Two options are discussed below:

- A. Under the first option, livestock grazing use would be initiated while the prescribed fire program is implemented

**Rationale for not pursuing alternative:**

There would not be enough pastures to allow implementation of the prescribed fire program if livestock grazing is initiated at the full active preference. Pastures to be burned would need to be rested from livestock grazing for a year or two prior to ignition to allow sufficient fine fuels to accumulate to carry a fire. The burned pasture would also need to be rested from livestock grazing for another year or two following a burn treatment to allow new perennial grass seedlings to become established and gain vigor. Because the proposed prescribed burning program could burn up to 20 percent of the burn units each year through 3 to 5 cycles over 20 years, the cattle operation would quickly be restricted to too small an area to make it feasible.

- B. Under the second option, the area would be grazed immediately without implementing the management ignition prescribed fire program.

**Rationale for not pursuing alternative:**

Under this alternative, proper livestock grazing would be initiated which could eventually increase the composition of the desirable perennial grass species. However, if the prescribed fire program is not implemented and livestock grazing is initiated, it is unlikely that sufficient fine fuels (grass cover and litter) would accumulate to allow natural ignition of wildfires on a broad enough scale to reduce the current shrub cover. The upland vegetation objective would not be achieved, and fire would not return as a natural process in the ecosystem.

2. Under this alternative, the Muleshoe Allotment

would be reduced to the Pride Basin only with a preference of 346 AUMs, and the remainder of the allotment would be retired. This strategy would involve using the Pride Basin Pasture (non riparian area pasture) for yearlong grazing use and excluding livestock grazing on the rest of the Muleshoe allotment. The necessary pastures and waters would be developed to implement a rotational grazing plan. This alternative differs from the proposed action in that the prescribed fire program would not be implemented.

**Rationale for not pursuing alternative:**

Under this alternative, proper livestock grazing could be initiated which could increase the composition of the desirable perennial grass species. However, if the prescribed fire program is not implemented and livestock grazing is initiated, it is unlikely that sufficient fine fuels (grass cover and litter) would accumulate to allow natural or managed ignition of wildfires in the Pride Basin livestock use area to reduce the current shrub cover. The upland vegetation objective would not be achieved in the Pride Basin area, and fire would not return as a natural process in the ecosystem.

3. Under this alternative, the Muleshoe allotment would be retired and the existing grazing preference would be cancelled on public lands.

**Rationale for not pursuing alternative:**

A livestock grazing operation can be conducted within the Muleshoe Cooperative Management Area in the Pride Basin Area on a sustainable basis, while achieving the resource objectives identified in the proposed action.

**SOZA MESA PORTION**

1. Under this alternative the season of livestock grazing use would be changed to winter use only on the Soza Mesa portion of the CMA.

**Rationale for not pursuing alternative:** The current BLM grazing lessee is conducting a yearlong grazing operation on the allotment. Since he has no grazing lands owned or

leased apart from this allotment, he would have no place to go with the cattle during the rest of the year. He has proposed a rotational grazing program, that would provide proper management and achieve the objectives stated in the plan. The Soza Mesa allotment does not contain significant riparian habitat, and is not located in the Hot Springs Watershed ACEC.

#### 4. Wild and Scenic Rivers

### 3. Social Environment Objective

#### Alternative Action for OHV Management

- A. Designation of segment of Great Western Trail (OHV Trail) along pipeline road or any other suitable route.

**Rationale for not pursuing alternative:** A proposal to include the pipeline road as a segment in the proposed Great Western Trail OHV system was rejected for safety and cost reasons. The "road" was cut during the laying of a gas pipeline and was not intended to be used as part of the transportation network of the planning area. This road is not engineered for vehicle traffic and presents a liability. The proposed segment traverses very rough terrain with extremely steep inclines. To modify and maintain such a road to allow general OHV traffic would not be cost effective. In its present state, the pipeline road is eroding and allows for unregulated vehicle access to adjacent riparian areas.

### III. AFFECTED ENVIRONMENT

A description of the affected environment can be found on pages 12 to 41 of the Muleshoe Ecosystem Management Plan.

### IV. ENVIRONMENTAL CONSEQUENCES

The following critical elements have been analyzed and would not be affected by either the Proposed Action or No Action Alternatives:

1. Prime or Unique Farmlands
2. Native American Religious Concerns
3. Solid or Hazardous Wastes

Potentially affected would be:

1. Air Quality
2. Areas of Critical Environmental Concern
3. Cultural Resources
4. Floodplains
5. Threatened or Endangered Species
6. Water Quality
7. Wetlands or Riparian Zones
8. Plants identified as Traditionally Useful by Native Americans (Western Apache Indians).
9. Wilderness

## **A. IMPACTS OF THE PROPOSED ACTION**

### **Impacts to Air Quality**

Implementation of the prescribed fire program under the upland and **riparian** objectives will have short-term negative impacts on air quality. During the ignition period of each burn unit (generally 2-3 days), air quality in the immediate area will diminish. During the burning period, the fires will produce a cloud of smoke which will be visible in nearby communities. Since the prescription requires winds be from the north or northwest the smoke from most units will drift in a southeasterly direction across the **Willcox** valley and dissipate without posing a significant human health risk. Down slope winds in the evenings may result in smoke drifting into the small communities of Redington and Cascabel for some units. In the long-term, air quality will not be significantly affected by the prescribed fires due to the dissipation of smoke following the short burn periods. No other actions under the other objectives will impact air quality either positively or negatively.

### **Impacts to Watershed Functions and Processes**

Continuous yearlong livestock grazing in the past on the Muleshoe ranch has had a negative effect on watershed hydrologic function by removing protective vegetation and by causing trampling disturbances. Reductions in the vegetation cover increases raindrop impact, decreases soil organic matter and soil aggregates, and decreases

infiltration rates (Blackburn 1984). Other detrimental impacts include increased overland flow, reduced soil water content, and increased erosion. Continuous yearlong grazing also resulted in large sacrifice areas around water sources, and creation of established trails to and from points of livestock concentrations.

Implementing the management actions to achieve the riparian and upland vegetation objectives would have positive long-term effects on watershed functions and processes. These objectives are closely interrelated, and achieving the riparian objectives is largely dependent on achieving the upland objectives. Implementing the prescribed fire program and livestock management program should result in the desired conversion of shrub-invaded grassland to more open grassland dominated by mid-tall statured perennial grasses.

The proposed grazing and fire management under the **riparian** and upland objectives should generally improve the protection of the soils, by increasing the vegetative ground cover and litter components (Martin 1978). The increase in the taller bunchgrasses would increase the ground cover, produce better shading of the soils, reduce evaporation by wind, and produce greater stability by increasing the biodiversity of the existing plant communities. These higher seral plant communities which are expected due to improved management would contain the taller bunch grasses such as plains lovegrass, sideoat grama, and cane beardgrass. These species are deeper rooted than the lower seral species like curly mesquite and threeawns, and will better hold the soils together. The expected improvement in range condition under the proposed management would result in an increase in the density and vigor of perennial grass plants. The increase in plant densities and size of plants would slow overland flow of water, impede formation of rills and gullies, and trap sediments. With the improved infiltration of moisture into the soil, and the reduced evaporation resulting from the expected accumulation of plant litter, more water will be retained for use by plants or, potentially, for deposition into underground aquifers.

Restoration from shrub cover to grass cover should result in increased infiltration rates and improved ground water recharge as well as a gradual enhancement of riparian function. Improved groundwater recharge results in water being ultimately transmitted to streams or aquifers located lower in the basin. (Lewis 1968, Bosch and Hewelett 1982, Johnson and Carothers, Stabler 1985). This is expected to result in some increase in baseflow and reduced peakflows. Increases in riparian vegetative cover, vegetative structure and composition will result in improved stream bank stability and a channel morphology that is more stable and flood resistant (Platts 1991). As a result of improved riparian function, increased overbank flow, increased shallow aquifer water capacity and recharge may result. This is anticipated to provide benefits of increased drought resistance of the creeks and springs, as well as, enhanced riparian development. Upstream improvement may benefit downstream segments through indirect and cumulative positive impacts such as reduction of flood peak discharge, attenuation of flood discharge and increased base discharge (Hendrickson and Minckley 1984).

The effects of fire are largely unpredictable as they are subject to a large number of factors including: topography, soil characteristics, fuel loads and moisture, vegetation density, variability in weather and microclimates on slopes. These factors and more alter fire severity and leave a mosaic of post fire conditions across the burned landscape (Beschta 1987). The hydrologic response of a watershed influences stream function. Repeated controlled burning will alter the watershed response to rainfall on both a short-term and long-term basis.

Implementing the prescribed fire program under the riparian and upland objectives could have some short-term negative impacts, but is expected to have long-term positive impacts to watershed function and processes as discussed above. The contributions from each burn unit to overall improvement in watershed function will vary depending on the site potential. Areas with deeper soils and less-steep slopes will have better establishment of grass cover and are likely to contribute substantial benefits to watershed

function; whereas, areas with rocky slopes will see less grass cover established and marginal contributions. Burning steep slopes with fine soils poses the greatest risks of accelerating erosion, but can also benefit greatly from improved grass cover as long as burns are carefully planned on these sites.

The short-term impacts to riparian areas from prescribed fires are expected to be minimal since fire will be limited to upland areas with some small scale riparian burning. Negative impacts to riparian areas are minimized by the use of a specific prescription that controls the intensity of the burn and its spread into riparian vegetative zones and by keeping the burn units small enough to protect streams from the extensive burning of a whole watershed. Since only a portion of the watershed of any single stream will be burned annually, the amount of impact any stream will receive from prescribed burns in any one year is limited. Thus, the burning will be spread out over space and time which buffers the stream channel and water quality from the negative impacts of extensive burning. The management of prescribed burns will emphasize precautions to minimize the chance of fire damaging riparian areas. This will require buffer zones and other mitigation to negative short-term fire effects on riparian and aquatic areas.

With mitigation measures in place, there is still a real, but reduced likelihood of increased sedimentation and instantaneous flood volume that can alter stream channel development following a prescribed burn. Significant negative impacts from these effects would only occur under the following conditions: where a large portion of the burn was severe enough and had enough shrubs to cause the formation of a hydrophobic (water resistant) soil layer and heavy rains on steep slopes occurred prior to the decomposition of the hydrophobic soil layer (approx. 3 months) (Al Medina pers. comm). These conditions are expected to occur only infrequently over the life of the plan.

Cattle Grazing of Soza Mesa is not anticipated to have a negative impact on watershed processes. Proper utilization (40 percent) of perennial grasses

caused no measurable change in runoff or erosion compared to no grazing (Rich and Reynolds 1963). The periodic concentration of livestock numbers in the pastures being utilized, particularly around water sites, would cause localized compaction of soil and trampling of vegetation for short periods of time. The disturbance of these sites would increase the opportunity for erosion and sediment transport offsite. Studies by Dadkhah and Gifford (1980) in the intermountain west show that trampling by livestock causes a decline in infiltration rates, but regardless of trampling, sediment yields remain uniform after grass cover reaches 50 percent.

No significant impacts to watershed functions and processes are expected from implementing management actions under the fish and wildlife, cultural, wilderness, or social environment objectives.

### Impacts to Fish and Wildlife

The attainment of tree density and age structure as stated in the riparian objective is anticipated to have high positive value to the fishery and associated aquatic community. Riparian tree development should promote aquatic habitat diversity in the form of pool, run, and riffle habitat development with varied hydraulic, light, temperature, and thermal conditions. Such diversity is important for maintenance of self-sustaining populations of the existing fish communities. Continued improvement of the riparian plant community may improve aquatic habitat conditions to the point where some drainages could support additional fish species in the future (e.g. Gila chub in Hotsprings Cyn). Higher densities of riparian trees improve shading of the water surface which moderates water temperature extremes for the fish and other aquatic species. For Gila chub, riparian trees provide living root wads and large woody materials that promote the scouring of pools and provide escape cover, essential habitat elements for this species.

In the desert Southwest, it is estimated that nearly 80% of all terrestrial wildlife species use riparian habitats at one or more stages of their lives

(Chaney et al. 1990). These wildlife species require the water, food and cover that a healthy riparian ecosystem offers. Continued exclusion of cattle from the riparian zone would maintain or enhance recovery of riparian resources for wildlife. A dense and structurally diverse riparian area already occurs in some areas and will develop further in others. This high quality riparian habitat provides valuable wildlife habitat and contributes to increased biodiversity.

The acquisition of water rights through the State of Arizona will provide legal protection for fishery and wildlife resources through maintenance of riparian and aquatic habitats resulting in positive long-term benefits to these resources for future generations. The installation of stream gauges will result in positive impacts for fishery and wildlife resources though increased hydrologic information used to understand and manage aquatic and riparian habitat. In some cases the gauges will be used to maintain an instream water rights once they are obtained. Installation of these gauges is anticipated to have minor short-term negative impacts to the immediate area of gage location. Information derived from the development of ecological site guides coupled with stream gage information is anticipated to provide a solid foundation for future management of riparian areas; the impact is expected to be positive for riparian resources and dependent fish and wildlife.

Removal of non-native vegetation is anticipated to promote ecosystem integrity and function which will prevent a sudden alteration of biological interrelationships. Exotic plant species may provide some of the critical elements which wildlife depend upon, but in many cases these plant species are lacking in some characteristic which animals require such as cover, food utilization, and temperature regulation. Exotic vegetation has been shown to have a negative effect on breeding success of avian species (Anderson et al 1977, Carothers 1977). Monitoring is anticipated to identify non-native plant invasion problems before they become difficult to manage. Therefore, removal operations are not anticipated to disturb riparian or other habitats significantly. The subsequent re-establishment of native vegetation,



which is likely to follow exotic species removal, will positively impact native wildlife species using riparian areas by providing additional or higher quality escape, nesting or resting cover within riparian areas.

Implementing off-highway vehicle restrictions in riparian areas will reduce the susceptibility of these areas to erosion and will decrease disturbance to wildlife during all months of the year. This action will have a positive impact on fish and wildlife populations.

The limited scope of recreational activities and development will minimize negative impacts to wildlife populations. The proposed level of recreation use will allow wildlife populations to remain in areas with little chance for displacement by human activity.

The proposed maintenance of roadways and improvements to current roads will have little negative impact on wildlife populations. Construction of waterbars and other structures within roadways will reduce erosive runoff into riparian systems, thus positively affecting wildlife populations. The addition of water bars to the pipeline corridor is likely to have indirect beneficial impacts to fishery resources through reduced sedimentation to Hotsprings Canyon where excessive sedimentation is suspected of limiting pool development which in turn limits Gila chub establishment.

Short-term impacts from prescribed burning may result in some negative impacts to limited reaches of stream from sedimentation and increased floodf lows. The long-term benefits from prescribed burning and the resulting improvement in the watershed condition are anticipated to outweigh the potential risk of short-term injury to aquatic wildlife and fish. This benefit is expected to occur in the form of improved watershed function that, in turn, positively affects stream function through increased stream stability and habitat diversity. Hydrologic processes such as aquifer re-charge, sediment transport, and storm runoff are anticipated to be affected in a manner that improves fish habitat.

The inclusion of small areas of riparian habitat in prescribed burn units for experimental purposes should have no long-term impacts to fish and wildlife. Short-term localized displacements of individuals from burned areas may occur and some less-mobile individuals may not survive. The development of special management guidelines for riparian areas in the operational burn plans will greatly enhance mitigation efforts and decrease impacts on wildlife resources.

Implementation of the prescribed burning program is anticipated to result in an increase in grassland and reduced shrub component on the Muleshoe portion of the CMA. This change would tend to benefit those wildlife species which are better adapted to a grass dominated vegetative state. However, a mosaic of grassland and grass-shrubland would probably result in the overall landscape. This would provide a diversity of habitat types which should still accommodate those species which prefer the cover the shrubs provide.

In general, grasslands that have been invaded by trees and shrubs often have greater wildlife diversity than those without the tree and shrub components. Bird species and population densities tend to be lower in grasslands than other areas (Germano 1983, Carothers and Johnson 1975, Graul 1980, Johnson et al. 1980). However, these areas are of importance to maintaining regional biodiversity by providing habitat for grassland specialists. Grassland are important to a variety of wildlife including graminivorous bird species, golden eagles, Burrowing owls, scaled quail, meadow larks, Cassin's sparrows and pronghorn antelope.

Fire is a natural process within desert grasslands. Wildlife responses to prescribed burning are expected to be positive. The new, nutritious growth which occurs following burns benefits most wildlife species directly or indirectly. For many grassland avian species, fires are required to set back plant succession to earlier ecological stages. In addition, seed production has been noted to be greater on burned sites rather than unburned sites during the first post-fire growing season (Bock et al. 1976). Loggerhead Shrikes use grasslands for hunting small mammals and large invertebrates. Botteri's and Cassin's Sparrows use mature grasslands for

breeding and foraging habitat (D. Krueper pers. obs., Bock et al. 1976). Wintering Baird's Sparrows are found in expansive grasslands which are dependent upon fire to maintain grass cover and reduce shrub growth (J. Whetstone pers. comm.). Slight negative impacts might be expected from loss of shrub species for some avian species which use them for singing perches, (Bock et al. 1976), but overall negative impacts caused by loss of shrubby species would be minimal.

Large mammals will benefit from the increased herbaceous forage available after the fire. Small mammals, *herps* and many species of grassland birds will also benefit from periodic fires in the uplands, as it will provide dense grass cover for feeding and nesting activities. Amole which supplies forage for javelina will be reduced by prescribed burning. This is not anticipated to reduce javelina populations since much amole is anticipated to remain in areas less susceptible to burning and javelina have flexible dietary habits. Bighorn sheep may benefit from prescribed burns through enhanced visibility, reduced predation, and increased forage availability (Peek et al 1979, Graf 1980, Risenhoover and Bailey 1980, Martin 1983 in Bighorn sheep hab. eval. 1995); this is especially true for the Wildcat Hills which have become heavily invaded by brush. There is a potential that some desert tortoise will be out of their burrows during prescribed fire activities which will expose them to the risk of burning. However, in those areas known to have desert tortoise, precautions to avoid injury to desert tortoise will be included in individual burn plans which will help minimize negative impacts to this species.

Lesser long-nosed bat and Mexican long-tongued bat are summer residents of the area feeding primarily on nectar of saguaro and agave blossoms. The prescribed fires will have little impact on survivorship of *Agave palmeri* and therefore little impact on foraging habitat for the lesser long-nosed bat and Mexican long-tongued bat. On the Canelo Hills TNC Preserve in similar habitat prescribed fire resulted in only 3.9% mortality of agave (D. Gori, 1995. pers. comm.). Since most stands of agave occur on rocky soils where fuels are light it is likely that few agave will be severely scorched by the proposed prescribed fire.

Limiting livestock use to the Pride Basin Area will benefit wildlife species by allowing more forage to become available for herbivores. On the Muleshoe Allotment, forage which would have been consumed by livestock, would be made available to wildlife species, such as white-tailed deer and mule deer. In addition, direct physical destruction of avian nests due to cattle use would be eliminated until grazing resumed (Tibbetts et al. 1994). Maintenance of livestock and wildlife waters will benefit wildlife populations, especially those now dependent upon availability of developed waters for their continued survival. Implementation of a rest/rotational grazing system within the Soza Mesa Uplands will benefit wildlife species in a variety of ways. With rest, the current grasslands will be able to produce more forage for mule deer and other herbivores. Increased cover will also result in higher numbers of nesting and wintering birds.

The assessment of habitat for and the initiation of actions to expand or develop additional populations of fish and wildlife species in danger of extinction and struggling game species will have a positive impact on fish and wildlife.

Implementation of these management actions will allow for fish and wildlife populations to be re-established into historic habitat or will augment a species' population. Some of the species presently identified for action will have increased security against extinction should new populations or range extensions succeed. Augmentation of existing populations or establishment of new populations of game species will expand hunting opportunities and/or help prevent local extirpation of less stable populations. Many of these species represent elements of the ecosystem that are under-represented or missing.

The inventory and control of foreign fish and amphibian species introduced (i.e. non-native species) to the area will have a large positive impact to the native fish community through increased security from foreign diseases carried by or displacement by aggressive, competitors and predators.

Management actions undertaken for cultural resource management will have little or no impact to **wildlife** populations on the Muleshoe CMA. Minimal disturbance to wildlife populations will occur if an excavation or a lengthy inventory were conducted in a limited area during the breeding season of a sensitive species, such as a bird-of-prey, but potential impacts could be easily mitigated if deemed to be detrimental to the animal.

Wildlife populations would not be adversely impacted by the described Wilderness Management Objective actions. Providing informational kiosks **will** educate the public as to the sensitivity of wildlife populations and their habitats. Conducting annual big game surveys in wilderness will benefit wildlife populations by providing information needed to manage them. Providing for maintenance of wildlife water developments will ensure permanent water for wildlife at the two locations in wilderness.

Management actions within the Social Environment Objective will not adversely affect fish and wildlife populations. The dispersed and low impact nature of the recreational activity will result in little negative impacts or risk to the fish habitat or fish populations. The risk of the unauthorized stocking of non-native fishes is low since most of the streams and springs are too small to support most game fishes. The limitation on bank disturbance will help define an upper limit to recreation should it expand in the future to levels that begin to impact aquatic habitat. Implementing road closures will help minimize disturbance to wildlife in sensitive areas currently being accessed. Entry to the pipeline road utilizing a walk-through gate will lessen pressure from illegal entry of off-highway vehicles and thus benefit sensitive wildlife species such as Common Black-Hawk and Western Yellow-billed Cuckoo. Maintenance of the Jackson Cabin Road to 4X4 standards minimizes the number of visitors to the more remote areas of the Muleshoe resulting in lesser disturbance of wildlife and higher quality wildlife viewing and hunting opportunities. Pullouts will be placed where erosion will be minimized and will least impact sensitive wildlife species, especially Desert Bighorn Sheep, raptors and other state or Federal listed species. Interpretive brochures will educate the public to ethical outdoor

behavior and responsible wildlife viewing opportunities. Improved interpretive materials that include information about wildlife including T&E fishes will improve under-standing and appreciation of these resources resulting in a positive impact.

## **Impacts to Special Designation Areas**

### **Hot Springs Area of Critical Environmental Concern**

The Hotsprings ACEC will benefit from prescribed fire and grazing management actions. As stated above, these actions will maintain or improve watershed and **riparian** function which benefits the **riparian** values for which it was designated. Impacts associated with the pipeline right-of-way will be reduced by excluding most vehicle traffic and placing water bars in areas vulnerable to erosion.

### **Wilderness**

Improving vegetative cover, structure and species diversity within riparian areas in wilderness will benefit wilderness values through restoration of natural ecosystem processes.

Restricting prescribed fires in wilderness to those occurring from natural ignition will help to preserve wilderness values, particularly naturalness. This approach is more compatible with wilderness than management ignited prescribed fires. Prescribed fire management activities, even with natural ignition, will have short-term negative impacts on wilderness values, particularly solitude. Emphasizing minimum tool and appropriate responses will help to minimize the short-term impacts. Allowing small areas of riparian to burn experimentally will improve knowledge about the role of fire in riparian areas. This knowledge will help managers decide on the best ways to restore or maintain natural ecosystem processes in wilderness.

The lands on the Muleshoe have not been grazed since wilderness designation in 1990. The proposed action would eliminate livestock grazing on approximately 3800 of the 6600 acres of Public **Land** in the Redfield Wilderness Area. This would equate to a reduction in grazing preference on the public lands in the wilderness from 752 **AUMs** to

350 AUMs. The proposed livestock grazing during the winter dormant period on the Pride Basin allotment should provide adequate rest to maintain the desired plant communities. Reductions in the amount of cattle which could be authorized in the wilderness will benefit solitude and naturalness values. The public lands in the Soza Wash allotment receive only very light grazing use because of the rough topography. It is expected that this level of grazing will not adversely affect the vegetation communities or wilderness values.

The presence of approximately 4.50 miles of existing fence will have an unnatural visual effect but will control livestock use of the wilderness which is positive. The impacts from the construction of 1/2 mile of new pasture fence within the wilderness area will be minimized by the use of minimal tools to construct and maintain the fencing and by the special design features such as green fence posts to blend in with vegetation and rustic designed gates. Overall, there will be 1.75 miles less fence in the wilderness from these actions which is a positive benefit on wilderness values.

The redevelopment of the two wells along the Jackson Cabin road would have little impact on the wilderness values since it will be designed to minimize the visual impact of these wells on the naturalness of the wilderness. The increase in wildlife resulting from the availability of reliable water would be a positive impact.

The presence of livestock, particularly along the Jackson Cabin Road, would adversely affect some people's wilderness experience. The redevelopment and use of the Sycamore and Swamp Springs Canyon wells would result in trailing of livestock between waters and concentrations of animals around the waters. Much of this impact would be visible from the Jackson Cabin road. However, the proposed livestock grazing would occur in the winter when visitor use is lowest. This will result in a small negative impact to wilderness values.

Positive impacts to wilderness would result from implementing the Fish and Wildlife Population Objective actions, the Cultural Resource Management Objective actions. An increase in populations of rare species and game animals would add to the wilderness experiences available

to visitors. Preservation and interpretive efforts would help maintain important wilderness values.

All of the actions proposed under wilderness management are designed to protect wilderness values and to inform the public about those values. These actions, taken together, would have both a short-term and a long-term beneficial impact on wilderness.

The actions to implement the social environment objective would benefit wilderness recreation experiences. The acquisition of legal passage over roads which access the wilderness would have the beneficial effect of providing visitors a long-term guarantee of use. Maintaining the wilderness access roads to a 4-wheel drive standard would have a slightly negative impact by eliminating a small portion of the visiting public without proper vehicles from having the ability to approach this particular wilderness by road. However, the experiences of other visitors would be of higher quality. The quality of wildlife viewing and hunting opportunities would remain high and those desiring solitude would continue to have opportunities to experience it. Actions to provide maps detailing roads and parking areas, overnight use areas, and information on uses and restrictions would benefit wilderness by reducing inadvertent wilderness intrusions and violations. The availability of literature and placing of signs emphasizing low impact camping techniques in riparian areas would have a positive effect in maintaining wilderness values.

### **Impacts to Cultural Resources and Native American Concerns**

A majority of the cultural sites documented in the CMA are located in or close to riparian areas. Cultural resources located in the CMA's riparian areas would generally benefit, or would not be significantly impacted, under the proposed riparian actions.

Continued elimination of livestock from riparian areas would benefit the CMA's cultural resources by allowing increased growth of vegetation cover, which would help reduce erosion of historic and archaeological sites and protect them from being trampled by livestock. It would also protect Native American Traditional Use Plants from being eaten

or trampled by livestock. Prohibition of recreational activities that cause heavy stream bank impacts would reduce trampling of cultural sites by humans, and would also eliminate other activities which promote compaction and erosion of sites. Prohibiting the commercial collection of riparian plants would prevent over collection of Native American Traditional Use plants by the general public. Prohibiting firewood cutting in riparian areas would reduce displacement of surface artifacts and compaction of subsurface materials. There would be minor impacts from collection of dead and down firewood which can provide some protection to sites against erosion and exposure to natural elements. If specified mitigation measures are followed, prescribed fires and road maintenance activities will have minimal impacts on cultural resources.

Achieving the upland objective would result in improved vegetation cover. Increased vegetation cover would help protect cultural sites by reducing wind and water erosion.

Prescribed fires in the upland areas of the CMA would probably result in negligible impacts to most cultural resources. Based on existing inventory data, relatively few cultural sites are believed to be located in the CMA's upland areas. Therefore, it is believed that prescribed burns would impact few, if any, cultural sites in the uplands. In addition, these areas are arid and have fairly low fuel loads. Fires in such areas tend to burn rapidly, and develop low intensity heat. With the exception of historic structures, such fires would probably cause minimal surface disturbance to cultural resources located in the uplands.

Reduction of the Muleshoe Allotment to the Pride Basin Area would protect a major number of the CMA's cultural resources. Disturbance caused by livestock at the Pride Cabin Homestead Site (which may be eligible for National register of Historic places designation), and one near-by prehistoric site, would be prevented by fencing the sites.

The proposed actions for Soza Mesa would benefit the cultural resources in the Soza Mesa Allotment. The results of inventories indicate that site

densities are low in this allotment and that fences, cattle guards, wells, tanks, and pipelines could easily be planned and located so as to avoid impacts to cultural resources.

The proposed fish and wildlife management actions are not expected to impact cultural resources.

Accomplishing the cultural resource management actions would be beneficial to cultural resources as our knowledge about them would increase contributing to improved management. Cultural resources would also be protected and preserved. Interpreting cultural resources for the public would allow for better understanding and appreciation of these resources.

Cultural resources in the wilderness area could benefit under from the wilderness management actions. Ensuring zero vehicle use, and limiting group size, would lower the number of people who visit the cultural resource sites, resulting in fewer visitor impacts and also reduce vandalism and site looting. An interpretive kiosk at the beginning of the Jackson Cabin Road would provide an opportunity to present information to the public about cultural resources in the wilderness area, and contribute to imbuing visitors with a preservation ethic.

The proposed management actions for the Social Environment could both benefit or negatively impact cultural resources. Implementing and enforcing road closures would make it more difficult for people to reach some cultural sites, which would result in less vandalism, artifact collecting and looting, as well as lower degrees of normal visitor impacts. Maintaining the Jackson Cabin and Soza Mesa roads to a 4-wheel standard, would restrict the number of people who visit the CMA's sites, resulting in fewer opportunities for vandalization, surface collecting and looting. These restrictions would also help to minimize collection of Traditional Use Plants by non-Native Americans.

### **Impacts to Livestock Grazing and Rangelands**

The proposed modification of the Muleshoe allotment boundary was the result of livestock

suitability (slope and distance to water) and compatibility (limitations on livestock to meet the various objectives for the area) analyses. As a result livestock grazing would be limited to the Pride Basin and would reduce the allotment from 26,360 acres to 4,127. The preference would be reduced from 3204 AUMs (267 Cattle from yearlong at 100% public land use) to 346 AUMs (86 Cattle from 10/1 to 3/31 at 67% public land use).

The proposed grazing programs would provide substantial rest periods and grazing deferments, to improve plant vigor, herbage production, and slowly over time, change the species composition to more desirable perennial grass species (Martin 1978). The time required and the amount of change expected will vary from site to site on the ranch depending on the site potential of the particular range site.

Range condition should improve over the long-term. This is a result of an expected improvement in plant density and vigor, hence potential production, as has been indicated in **studies** on the Santa Rita Experimental Station south of Tucson. The principles of grazing systems that include periodic rest phases to benefit the forage plants have been substantiated on the Santa Rita Experimental Range as well as by numerous range scientists (Hormay, A.L., Merrill, L.B., Schmutz, E.M., Martin, S.C., Sampson, A.W., et al).

The proposed rotational livestock grazing strategy on Soza Mesa and the change from **yearlong** to seasonal use during the non-growing season in Pride Basin, will provide the opportunity for the stabilization and improvement of the present upland plant communities.

No impacts are anticipated from implementing Fish and Wildlife Population Objective actions, Cultural Resource Management Objective actions, or Social Environment Objective actions.

Increased public awareness of rangelands, their ecology, and multiple uses could have a positive effect by developing an interest in protecting these resources for future generations. Also information obtained from the prescribed burning program and

the effects to rangelands would increase our ability to better manage these resources.

## Impacts to Recreation

Efforts to improve vegetative cover and diversity of habitats along riparian corridors would have a positive effect on recreational experiences available to visitors, particularly wildlife enthusiasts. The attainment of riparian objectives is expected to increase populations of wildlife and plants, including rare species, which many recreationists seek to view.

Including **riparian** areas within target areas for prescribed burning could temporarily impact small portions of **riparian** areas which might be burned experimentally. This would have a short-term negative impact on recreational use of these areas. Long-term benefits would be positive, however, due to decreased understory cover allowing for less demanding hiking, and to an expected increase in numbers and diversity of plants and wildlife.

Designation of Bass Canyon as a day-use area would displace some traditional overnight users who would probably look at alternative sites, cease to camp overnight or pack in for overnight camping. Possible impacts vary depending on the public's response. Overnight campers may experience a negative impact, but opportunities for day users and backpackers would be of high quality.

Treating blocks of upland areas with prescribed burning would temporarily suspend the affected area for recreation use. The short-term effect of the burning program would be slightly negative for recreationists. Long-term benefits of the bum plan would be positive, however, due to decreased shrub cover allowing for less demanding hiking, and to an expected increase in numbers and diversity of plants and wildlife.

The proposed livestock grazing on the Pride Cabin allotment and the Soza Mesa allotment may have some adverse and positive impacts to people's recreational experience. The presence of livestock and their physical impacts may be annoying to

some people, although others may enjoy seeing livestock. The existence of fences will require use of several gates. Fences and gates associated with the livestock operations will create an inconvenience to hikers resulting in a slightly negative impact.

Implementing actions to achieve the fish and wildlife population objective, would have a long-term beneficial impact on recreation by providing visitors more opportunities for wildlife viewing and hunting due to increased populations of native species, particularly game species.

Positive impacts to recreation would result from implementing the Cultural Resource Management Objective actions. Preservation of sites and interpretation efforts would help maintain important recreation related experiences available to visitors. Implementing actions to achieve the wilderness objective including signing the wilderness boundary, develop parking areas and provide informational brochures and maps would have a positive impact on recreation. Without these actions inadvertent wilderness intrusions would result in negative experiences for some recreationists and enforcement problems for the agency.

Implementing actions to achieve the social environment objective such as increasing public information available to visitors would have a positive impact on recreation. Informational signs, brochures and maps would increase the public's comfort level when visiting the area. The availability of parking would discourage off-road intrusions and diminish standard enforcement problems. Maintenance of hunting opportunities on public lands and improving those opportunities on private lands would have a positive impact on recreation related hunting. With more land available for hunter dispersal, less congestion would occur and the recreation experience would be enhanced for most visitors. Maintaining main access roads to a 4-wheel drive standard would have a slightly negative impact by eliminating a small portion of the visiting public without proper vehicles from having the ability to access a portion of the area by road.

## **B. IMPACTS OF THE NO ACTION ALTERNATIVE**

### **Impacts to Air Quality**

Air quality will not be impacted under current management except in the case of a large wildfire which escaped immediate suppression. In this instance, air quality would be negatively impacted during the wildfire but should recover shortly afterward.

### **Impacts to Watershed Function and Processes**

Improvement of vegetative cover and diversity of habitats along riparian corridors would continue slowly under the no action alternative. Positive effects on riparian functions are expected to occur gradually. Without significant improvement in upland infiltration and recharge rates, riparian areas are expected to remain in their present condition, or could be frequently set back, depending on climatic variation. Under current management, some localized down-cutting and other forms of accelerated erosion may continue, or may heal slowly. Baseflows and peak flows are expected to remain about the same, or either increase or decrease only slightly. The long-term effect would be positive, if the area does not receive increased pressure from recreational or other uses.

By continuing "full suppression" of all fires within the riparian areas, fuels will continue to build to unnatural levels. Such loading could result in catastrophic fires of unnaturally high intensities, which could have highly negative impacts on the riparian ecosystem and its fluvial functions. Heavy loads of suspended sediments and high turbidity of streamflow may result from intense large burn areas. Such fires are not within prescription, but may occur from natural starts and could become large due to remoteness of area and response times for fire personnel. Long-term benefits for all watershed functions within the riparian areas and other water courses is expected to be positive. Long-term benefits would be positive due to gradually increased infiltration rates expected from continued improvement of ground-cover from prolonged continued total rest from cattle grazing.

Only slight and gradual improvement is expected in areas where topsoils remain compacted. On rocky slopes less improvement is expected.

No significant impacts to watersheds would result from continuing with current management of fish and wildlife populations. Long-term benefits might be expected if the area remains in low recreation use. Current impacts from hunting and wildlife viewing are not posing any significant threat to these watersheds.

No impacts are expected to watershed condition from implementing the Cultural Resource Management Objective actions. Preservation and interpretive efforts would help maintain important watershed education values.

Current wilderness management is designed to protect wilderness values, and to a great degree this is already protecting watershed values.

The continued use of unimproved roads could have long-term negative impacts to drainages below roads if runoff is increased by the roads, especially if road systems are not properly drained. However, because present road conditions probably deter usage of the area by most vehicle types, no significant impacts are expected, because only marginal increases in road usage are foreseen.

Periodic maintenance of the wilderness access roads to a 4-wheel drive standard would have a positive impact by eliminating a small portion of the visiting public without proper vehicles from having the ability to approach this particular wilderness by road, and thus would reduce associated impacts in inaccessible areas.

### **Impacts to Fish and Wildlife**

Full suppression of wildfires may allow for excessive fuel build-up in riparian areas which, if ignited, could seriously damage mature riparian forest habitats. This would result in decreased habitat for wildlife species, especially for the riparian obligate species within the planning area.

Continuation of full suppression of all fires on BLM administered lands would promote the maintenance of brush invaded grasslands.

Restoration of more open grasslands would be unlikely under this alternative. Periodic wildfires are generally not frequent enough or large enough to set back ecological stages and select against excessive brush and fuel buildup. This would negatively affect those wildlife species who prefer open grassland habitats. Historic habitat for bighorn sheep in the Wildcat Hills has become heavily invaded by brush and is infrequently used by bighorn sheep. This habitat would not be restored under this alternative which would be a negative impact on bighorn sheep.

Continued suspension of livestock use within riparian areas would have beneficial effects for aquatic habitat, fish and wildlife species which would be the similar to those under the preferred alternative where livestock are eliminated from the riparian areas. Riparian vegetation development will continue with improvements in cover, structural diversity and species composition. However, this improvement will proceed at a slower pace due to the condition of the upland vegetation. The riparian vegetation may be impacted more often by major floods under this alternative and may recover more slowly to the desired conditions.

The continued suspension of livestock grazing would have a large positive impact. There would be little risk of cattle reducing riparian vegetation or reducing watershed cover. Cattle over-grazing in the past has reduced grass cover and promoted shrub invasion on uplands. This reduces the watershed yield to ground water sources that ultimately discharge into streams. It may have increased runoff, and thus, peak discharge from storm events due to reduced interception and infiltration rates associated with decreased vegetative ground cover.

The pipeline right-of-way is a potential source of excessive runoff and sediment. A negative impact to fish does occur from an unmitigated road surface that is bare and unstable. Desert streams are subject to high peak flows and sediment naturally. Such areas exacerbate the effects of



flood flows that erase habitat features and sedimentation of important habitat features such as pools.

Continuation of fish and wildlife surveys will allow management to determine population change through time as a result of the no action alternative. Some case-by-case species reintroduction and augmentation work would continue to provide a positive impact to wildlife.

There are no impacts to fish and wildlife from current management of cultural resources or wilderness under this alternative.

Current recreation management has little impact upon wildlife populations. Few improvements or developments are currently in existence along the Jackson Cabin Road. This discourages the public from concentrating heavy use in selected access areas or developed places. The quality of the 4x4 Jackson Cabin Road currently limits the number of visitors accessing the backcountry portions of the CMA. Wildlife populations are expected to experience very few impacts as a result of the continuation of current management actions.

### **Impacts to Special Designation Areas**

#### **Hot Springs Area of Critical Environmental Concern**

The impacts on the Hot Springs ACEC from current management are similar to those from the proposed action alternative. ACEC values would be protected, but would be enhanced at a slower rate than through the proposed alternative.

#### **Wilderness**

Current management has resulted in healthy riparian areas which contribute to wilderness values. The condition of upland areas within the wilderness is improving slowly under current management. However, with continued suppression of fire, watershed and grassland condition may not improve much further due to shrub invasion. Under current conditions fire is not able to play a natural role in maintenance of the ecosystem which is a negative impact to

wilderness. Limited cattle grazing on the Soza Wash Allotment (120 acres, 5 cattle year-long) does not impact wilderness values significantly.

Current management of fish and wildlife populations under decisions in the Safford RMP to maintain and enhance priority species and their habitats would enhance wilderness values and thus have a beneficial effect.

Cultural properties are managed to protect, preserve and interpret the resource. No current active management of cultural resources is underway, but district, state and national policy for the protection of wilderness values, including cultural resource values, would benefit wilderness. The current passive management of Redfield Canyon wilderness has provided adequate protection of wilderness values. Due to the remoteness and ruggedness of the area, few significant wilderness violations occur. Visitation is expected to increase, however, as the public becomes aware of the area's outstanding wilderness qualities. Lack of active management within the near future to authorize boundary and **trail** signs, information kiosks **and other** needed facilities would be detrimental in the near future.

Current passive management of the social environment within the Muleshoe area has provided adequate protection of the values available to visitors. Visitation is expected to increase as the public becomes more aware of the area's outstanding qualities. Lack of active management to authorize construction of parking areas, installation of directional signs, publication of informational brochures and maps, and monitoring and maintenance personnel would be detrimental in the near future.

#### **Impacts to Cultural Resources and Native American Concerns**

Gradual increase of **riparian** vegetation would promote stabilization of stream terraces where cultural sites are located and also contribute protection from wind erosion.

Fire suppression might initially benefit cultural sites, however long-term build-up of heavy fuel

loads could promote intense, possibly destructive fires which might damage or destroy the integrity of cultural sites.

Lack of actively managed recreation would probably result in continuing artifact collection from sites and also vandalism to some **historic** structures.

Suspension of livestock indefinitely would probably benefit cultural resources by eliminating risk from trampling of sites.

Fish and wildlife management actions under this alternative will not affect cultural resources.

Under current management, the CMA's cultural resources are only being managed for protection, and no formal interpretive or educational programs focusing on the cultural resources are in place. Under this alternative, little new knowledge would be acquired about the cultural resources. Sites may be lost to erosion or vandalism without any knowledge of their existence. The public would not have opportunities to learn about the cultural resources. Lack of signs, brochures and other educational materials may contribute to diminishing public understanding and appreciation of the CMA's cultural resources and contribute to vandalism and site looting.

### **Impacts to Livestock Grazing and Rangelands**

Continuing the current suspension of livestock grazing on the Muleshoe allotment would have the same beneficial impacts for **riparian** resources as the proposed action in the short-term. Livestock grazing would not be resumed until upland and **riparian** vegetative conditions had improved. Without an active prescribed burning program upland conditions would improve more slowly, and livestock grazing would be resumed later than under the proposed action.

Under the current management, livestock grazing would continue in suspended nonuse indefinitely, however, the grazing preference on the Public Lands would remain at 267 cattle yearlong (3204 AUMs), rather than 86 cattle during the non-growing season (346 AUMs) with the potential of grazing all of the 26,360 acres in the allotment at

some future date.

No impacts are expected from current fish and wildlife management, cultural resource management, wilderness management, or social environment management.

### **Impacts to Recreation**

Continuing current management of riparian areas, upland areas, and fish and wildlife populations would have a slightly negative impact on recreation in the short-term. Lack of active management to improve wildlife habitat and increase species diversity and populations, a plus for wildlife enthusiasts, hunters and general recreationists, would delay achievement of these objectives.

Cultural properties are managed to protect, preserve and interpret the resource. Lack of active management to interpret the resource would have a negative impact on a portion of the visiting public interested in the cultural properties and history of the area.

Lack of boundary signs, **parking** areas, informational literature and maps related to wilderness is detrimental to wilderness recreation. Without these actions increasing inadvertent wilderness intrusions are expected to result in negative experiences for some recreationists and enforcement problems for the agency.

The current, mostly passive, management of the social environment has a slightly negative impact on recreation in the area. Lack of informational signs, brochures and maps, parking and turn-around spaces relate directly to inadvertent off-road intrusions and standards enforcement problems. Lack of hunting opportunities on some portions of the Muleshoe impacts recreation negatively. Maintaining main access roads to a 4-wheel drive standard is a slightly negative impact on recreation by eliminating a small portion of the visiting public without proper vehicles from having the ability to access a portion of the area by road.

### **C. CUMULATIVE IMPACTS**

All four of Federally listed fish species identified in this plan have historic distributions in the San Pedro River Drainage. The recovery plans for the spikedace and loach minnow specifically mention Redfield Canyon as a potential reintroduction site. Because many of these fishes became rare before thorough surveys were conducted, their historic presence for many locations, especially less noteworthy streams, is unknown. However, their known presence in larger or more prominent waters in a drainage indicate that re-establishment anywhere in the drainage where natural dispersal occurred is likely to play a natural and largely benign role in the existing ecosystem.

The expansion of existing or introduction of new populations of Federally listed wildlife or those species likely to become listed has the potential to have a large positive impact. By implementing recovery actions through this plan, the security of these endangered species will increase while expenses and delays associated with compliance with the ESA may be reduced.

The San Pedro watershed of which the Muleshoe CMA is a small but significant part has been severely disrupted by past practices including farming, unscreened water diversions that strand fish on fields, water development, introduction of non-native fishes, pollution, watershed degradation, road building, wood cutting, mining, and livestock grazing. These activities have left the aquatic habitat for fish in a degraded state (high negative impact). Past and present removal of water which reduces or eliminates surface flows in the San Pedro River constitutes one of the largest adverse impact to fish habitats. The historic practice of stocking non-native fishes represents another negative impact to the native fish community. These impacts have left a legacy of changes that encumbers the potential for improved management to restore the integrity of the ecosystems in the San Pedro proper. This makes management of the tributary streams such as those on the Muleshoe paramount in protecting the remaining native fish fauna in the basin.

The Muleshoe CMA when added to other relatively undisturbed portions of stream and watershed in the basin, plays a significant role in maintaining habitat for native fishes, a group that is rapidly

declining towards extinction; only 2 of 30 native freshwater fish species remain unlisted by State or Federal wildlife agencies. The San Pedro River once supported 13 native fishes, but now only supports 3 (Gila chub, longfin dace, desert sucker). Aravaipa Creek, its major tributary supports 5 additional species (sonora sucker, speckled dace, spikedace, loach minnow, roundtail chub). The rest of the fish fauna has been extirpated from the basin (razorback sucker, Colorado squawfish, flannelmouth sucker, Gila topminnow, desert pupfish). This management plan is anticipated to have a large positive effect on the remaining aquatic ecosystem in the basin.

There are indirect effects to adjacent lands and the San Pedro river watershed which ultimately feeds the Gila and then Colorado River Watersheds. Because the watershed condition is anticipated to be stable or improving with time, flood intensity from heavy rainfall events is anticipated to be reduced through the watershed processes of interception and retention of water, flood flows are expected to be retained and released more slowly allowing for decreased damage and increased groundwater recharge, base stream flow is anticipated to be more permanent in drought and to generally increase relative to historic levels. All of these positive effects are anticipated to increase water resource values of the San Pedro River downstream of the CMA.

#### D. MITIGATION

1. Prescribed burn areas will be inventoried for cultural resources, as required under **BLM Instruction Memorandum No. AZ-90-52; Requirements for Cultural Inventory of Prescribed Burn Areas. Areas surrounding cultural resources will be black-lined so as to prevent them from being burned.**
2. All prescribed burns conducted in the uplands would conform to Instruction Memorandum No. AZ-90-52. Areas around significant stands of traditional use plants would be black-lined so that they would not be destroyed during a prescribed burn.

3. Road maintenance will be planned so as to avoid cultural sites. If a site cannot be avoided, the required Section 106 Consultations with the Arizona State Preservation Officer will take place and the appropriate course of mitigation will be pursued.
4. To minimize damage to fish populations and habitats and water quality, prescribed fires will be planned to ensure:
  - a. 300 + foot riparian buffer strips
  - b. buffer strips along non-riparian headwater drainages which can contribute large amounts of sediment and ash to streams
  - c. burns will be avoided on slopes >30%
  - d. install waterbars and seed where needed to reduce post-fire erosion
  - e. allow <20% (<10% severely) of riparian area to burn from unanticipated fire encroachment
  - f. burn when riparian area is moist and protect canyons from rolling embers
  - g. if practical, pre-moisten areas at risk with sprinklers, areal water drops or other methods
5. Areas with sensitive wildlife or plant species (such as saguaro stands and desert tortoise areas) will be avoided during prescribed fire to the extent practicable.

## **V. CONSULTATION AND COORDINATION**

Information about consultation, coordination, and public involvement can be found in Appendix B of the proposed Muleshoe Ecosystem Management Plan.

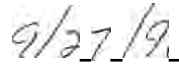
## **FINDING OF NO SIGNIFICANT IMPACT**

### **Finding of No Significant Impact:**

Based on the analysis of potential environmental impacts contained in the Muleshoe Ecosystem Plan Environmental Assessment, I have determined that impacts are not expected to be significant and an environmental impact statement is not required.



**Tucson Field Manager**



**Date**



# GLOSSARY

**ACCELERATED EROSION:** Soil loss above natural levels resulting directly from human activities. Due to the slow rate of soil formation, accelerated erosion can lead to a permanent reduction in plant productivity.

**ACTIVE PREFERENCE:** The difference between grazing preference and suspended preference.

**ACTIVE USE:** Authorized livestock use for the current billing year.

**ACTIVITY PLAN:** A detailed and specific plan for managing a single resource program or plan element undertaken as needed to implement the more general resource management plan decisions. An activity plan is prepared for specific areas to reach specific resource management objectives within stated time-frames.

**ALLOTMENT:** An area of land where one or more individuals graze their livestock. An allotment generally consists of federal rangelands, but may include intermingled parcels of private, state, or federal lands. BLM and the Forest Service stipulate the number of livestock and season of use for each allotment.

**ALLOTMENT MANAGEMENT PLAN (AMP):** A livestock grazing management plan dealing with a specific unit of rangeland and based on multiple use resource management objectives. The AMP considers livestock grazing in relation to other uses of rangelands and in relation to renewable resources--watershed, vegetation, and wildlife. An AMP establishes the seasons of use, the number of livestock to be permitted on rangelands, and the rangeland improvements needed.

**ALLUVIAL:** Pertaining to material that is carried and deposited by running water.

**ALLUVIUM:** Any sediment deposited by flowing water, as in a river bed, floodplain, or delta.

**ANIMAL UNIT:** A unit of measure for rangeland livestock equivalent to one mature cow or five sheep or five goats, all over 6 months of age. An animal unit is based on average daily forage consumption of 26 pounds of dry matter per day.

**ANIMAL UNIT MONTH (AUM):** The amount of forage needed to sustain one cow, five sheep, or five goats for a month. A full AUM's fee is charged for each month of grazing by adult animals if the grazing animal (1) is weaned, (2) is 6 months old or older when entering public land, or (3) will become 12 months old during the period of use. For fee purposes, an AUM is the amount of forage used by five weaned or adult sheep or goats or one cow, bull, steer, heifer, horse, or mule. The term AUM is commonly used in three ways: (1) stocking rate as in X acres per AUM, (b) forage allocation as in X AUMs in allotment A, and (3) utilization as in X AUMs consumed from Unit a.

**ANNUAL PLANT:** A plant that completes its life cycle and dies in 1 year or less.

**AQUATIC HABITATS:** Habitats confined to streams, rivers, springs, lakes, ponds, reservoirs, and other water bodies.

**AQUATIC RESOURCES:** Plants and animals that live within or are entirely dependent upon water to live; living resources of aquatic habitats (fish, invertebrates, amphibians); aquatic species.

**AQUIFER:** A water-bearing bed or layer of permeable rock, sand, or gravel capable of yielding large amounts of water.

**AREA OF CRITICAL ENVIRONMENTAL CONCERN (ACEC):** An area within public lands where special management attention is required (1) to protect and prevent irreparable damage to fish and wildlife; important historic, cultural, or scenic values; or other natural systems or processes or (2) to protect life and safety from natural hazards.

**ARID REGION:** A region where precipitation is insufficient to support any but drought-adapted vegetation.

**ASPECT: (1)** The visual first impression of vegetation at a particular time or as seen from a specific point. **(2)** The predominant direction of slope of the land.

**AUTHORIZED OFFICER:** Any person authorized by the Secretary of the Interior to administer BLM's rangeland management program.

**AVAILABLE FORAGE:** Forage that can be grazed and still allow sustained forage production on rangeland. Available forage may or may not be authorized for grazing.

**AVIFAUNA:** All the birds of a specific region or time division.

**BASAL COVER (AREA):** The area of ground surface covered by the stem or stems of a rangeland plant, usually measured 1 inch above the soil, in contrast to the full spread of the foliage.

**BASE PROPERTY:**

**BLM:** Lands or water sources on a ranch that are owned by or under long-term control of the operator.

**Forest Service:** Lands and improvements owned and used by a permittee for a farm or ranch and designated by the permittee to qualify for a term grazing permit.

**BIODIVERSITY:** See BIOLOGICAL DIVERSITY.

**BIOLOGICAL DIVERSITY (BIODIVERSITY):** The full range of variability within and among living organisms and the ecological complexes in which they occur. Biological diversity encompasses ecosystem or community diversity, species diversity, and genetic diversity.

**BIOMASS:** The total amount of living material, plants and animals, above and below the soil surface in a biotic community.

**BIOTA:** The animal and plant life of a particular region considered as a total ecological entity.

**BIOTIC Communities:** The assemblage of native and exotic plants and animals associated with a particular site or landscape, including microorganisms, fungi, algae, vascular and herbaceous plants, invertebrates, and vertebrates. These assemblages and their biotic and abiotic relationships serve landscape and watershed functions by promoting soil properties supporting water infiltration and storage, energy and nutrient fixation, recycling and transfer, species survival, and sustainable population dynamics.

**CARRYING CAPACITY:** The maximum stocking rate possible without damaging vegetation or related resources. Carrying capacity may vary from year to year on the same area due to fluctuating forage production.

**CERTIFICATE:** A document containing a certified statement, especially as to the truth of something.



**CATEGORY 1 SPECIES:** Species for which the Fish and Wildlife Service has enough information on biological vulnerability and threats to Support their listing as endangered or threatened species.

**CATEGORY 2 SPECIES:** Species for which the Fish and Wildlife Service has information suggesting the possible appropriateness for listing as endangered or threatened.

**COMMUNITY:** An assemblage of plant and animal populations in a common spatial arrangement.

**COMMUNITY OF INTEREST:** All parties concerned with the management and function of a geographical unit of land. The tie between community of interest, watershed management, and ecosystem management is important. Watersheds are the basic functional units of land that tie together the interests of a variety of participants, including ranchers, farmers, agencies, and town and city representatives. Other participants concerned with the relationships of individual watersheds to broader ecological functions should participate as members of the community of interest to influence management decisions relative to these broader perspectives.

**COOL-SEASON SPECIES:** Plants whose major growth occurs during the late fall, winter, and early spring.

**COOPERATIVE MANAGEMENT AGREEMENT:** A document that describes agreements made between BLM and the public on adjustments in grazing use. This document also defines the specific adjustments and the schedule of adjustments (usually over a 5-year period).

**COORDINATED RESOURCE MANAGEMENT PLAN:** A plan for managing one or more grazing allotments that involves all affected resources, such as vegetation, wildlife, soil, and water.

**COVER:** Plants or objects used by wild animals for nesting, rearing of young, escape from predators, or protection from harmful environmental conditions.

**CULTURAL PROPERTY:** The definite location of a past human activity, occupation, or use identifiable through field inventory, historic documentation, or oral evidence. Cultural properties include prehistoric and historic archaeological remains, or architectural sites, structures, objects, or places with important public and scientific uses.

**CULTURAL RESOURCES:** The fragile and nonrenewable remains of human activity found in historic districts, sites, buildings, and artifacts that are important in past and present human events.

**DEFOLIATION:** The removal of plant leaves, by grazing or browsing, chemical action, or natural phenomena such as hail, fire, or frost.

**DESIRED FUTURE CONDITION:** The future condition of rangeland resources on a landscape scale that meet management objectives. Desired future condition is based on ecological (such as desired plant community) social, and economic considerations during the land and resource management planning process. Desired future condition is usually expressed as ecological status or management status of vegetation (species composition, habitat diversity, age and size classes of species) and desired soil qualities (conditions of soil cover, erosion, compaction, loss of soil productivity)

**DESIRED PLANT COMMUNITY (DPC):** The plant community that has been determined through a land use or management plan to best meet the plan's objectives for a Site. A real, documented plant community that embodies the resource attributes needed for the present or potential use of an area, the desired plant community is consistent with the Site's capability to produce the required resource attributes through natural succession, management intervention, or a combination of both.

**DEVELOPED RECREATION SITES:** Recreation sites that have facilities, structures, or developments such as drinking water, bathrooms, picnic tables, and developed campsites.

**DIRECT:** To be related exactly and without interruption to or from other sources.

**DISCHARGE:** The rate of flow or volume of water flowing in a stream at a give place or within a given period of time.

**DRAINAGE:** A water source, such as a stream.

**ECOLOGICAL CONDITION (OR HEALTH):** See ECOLOGICAL STATUS.

**ECOLOGICAL SITE:** A distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce a characteristic natural plant community.

**ECOLOGICAL SITE CAPABILITY:** The highest ecological status an ecological site can attain given political, social, or economical constraints.

**ECOLOGICAL STATUS:** The present state of vegetation and soil protection of an ecological site in relation to the potential natural community for the site. Vegetation status is the expression of the relative degree to which the kind, proportions, and amounts of plants in a community resemble that of the potential natural community.

**ECOLOGICAL SUCCESSION:** An ecosystem's gradual evolution to a stable state. If, through the ability of its populations and elements, an ecosystem can absorb changes, it tends to persist and become stable through time.

**ECOSYSTEM:** A complete interacting system of organisms considered together with their environment.

**ECOSYSTEM MANAGEMENT:** (A) The skillful use of ecological, economic, social, and managerial principles in managing ecosystems to produce, restore, or sustain ecosystem integrity and desired conditions, uses, products, values, and services over the long-term. (B) A process of land and resource management that emphasizes the care and stewardship of an area to ensure that human activities will be carried out to protect natural processes, natural biodiversity, and ecological integrity.

**EFFECTIVENESS:** The ability to work towards achieving resource goals and objectives.

**EFFICIENCY:** The proportion of funding spent on program administration relative to funding spent on implementation.

**ENDANGERED SPECIES:** Any animal or plant species in danger of extinction throughout all or a significant portion of its range as designated by the U.S. Fish and Wildlife Service under provisions of the Endangered Species Act.

**ENVIRONMENTAL ASSESSMENT (EA):** A concise public document for which a federal agency is responsible. An EA serves (1) to briefly provide enough evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact; and to aid an agency as compliance with the National Environmental Policy Act when no EIS is needed; and (2) to facilitate preparation of an EIS when one is needed. See ENVIRONMENTAL Impact STATEMENT.

**ENVIRONMENTAL CONSEQUENCES:** A situation that naturally or logically follows as a result of an action. Commonly used in environmental impact statements for discussions about how the human environment, which includes the natural and physical environment and the relationship of people with that environment, is influenced by the government as actions.

**ENVIRONMENTAL IMPACT STATEMENT (EIS):** An analytical document that portrays potential impacts on the human environment of a particular course of action and its possible alternatives. Required by the National Environmental Policy Act (NEPA), an EIS is prepared for use by decision makers to weigh the environmental consequences of a potential decision.

**EROSION:** The wearing away of land by water, wind, gravitation other geologic agents. Natural erosion is a geologic process that occurs under natural conditions of climate and vegetation.

**EXOTIC SPECIES:** A species that is not native to the area where it is found.

**EXOTIC VEGETATION:** Plants that are not native to the region in which they are found.

**FEDERAL LAND POLICY AND MANAGEMENT ACT OF 1976 (FLPMA):** The act that (1) sets out for the Bureau of Land Management standards for managing the public lands, including land use planning, sales, withdrawals, acquisitions, and exchanges; (2) authorizes the setting up of local advisory councils representing major citizens groups interested in land use planning and management; (3) established criteria for review of proposed wilderness area; and (4) provides guidelines for other aspects of public land management such as grazing.

**FISHERY:** Habitat that supports some in the propagation and maintenance of fish.

**FLEXIBILITY:** A characteristic of a grazing management plan that allows it to accommodate changing conditions.

**FORAGE:** All browse and herbaceous growth available and acceptable to grazing animals or that may be harvested for feeding purposes. Forage includes pasture, rangelands, and crop aftermath. Whereas, feed includes forage, hay, and grains.

**FORB:** A herbaceous plant that is not a grass, sedge, or rush.

**FOREST Plan:** See NATIONAL FOREST LAND AND RESOURCE Management PLAN.

**GOAL:** The desired state or condition that a resource management policy or program is designated to achieve. Narrower and more specific than objectives, goals are usually not measurable and may not have specific dates by which they must be reached. Objectives are developed by first understanding one's goals.

**GRASSLANDS:** Lands on which the vegetation is dominated by grasses, grasslike plants, or forbs. Nonforest land is classed as grassland if herbaceous vegetation constitutes at least 80 percent of the canopy cover, excluding tress. Lands that are not now grasslands but were originally or could become grasslands through natural succession may be classified as potential natural grasslands.

**GRAZING:** Consumption of native forage from rangelands or pastures by livestock or wildlife.

**GRAZING ALLOTMENT:** An area where one or more livestock operators graze their livestock. An allotment generally consists of federal land but may include parcels of private or state-owned land.

**GRAZING PERMIT/LICENSE/LEASE:** Official written permission to graze a specific number, kind, and class of livestock for a specified time period on a defined rangeland.

**GRAZING PREFERENCE:** The status of qualified grazing permittees acquired by grant, prior use, or purchase, that entitles them to special consideration over applicants who have not acquired preferences.

**GRAZING REST:** Deferral of grazing on an area.

**GRAZING SEASON:** On federal lands, an established period for which grazing permits are issued.

**GRAZING SYSTEM:** Systematic sequence of grazing use and nonuse of an allotment to meet multiple use goals by improving the quality and amount of vegetation.

**GROUND COVER:** The percentage of material, other than bare ground, covering the land surface. Ground cover may include live and standing vegetation, litter, gravel, cobble, stones, boulders, and bedrock.

**GROWING SEASON:** Generally, the period of the year during which the temperature of vegetation remains high enough to allow plant growth. The most common measure of this period is the number of days between the last frost in the spring and the first frost in the fall.

**HABITAT:** The natural abode of a plant or animal, including all biotic, climatic, and soil factors affecting life.

**HERBACEOUS:** Vegetation growth with little or no woody component. Nonwoody vegetation, such as graminoids and forbs.

**HERBIVORES:** Animals that subsist mainly or entirely on plants or plant materials.

**IMPACTS:** The effect of one thing upon another. Impacts may be beneficial or adverse. See ENVIRONMENTAL CONSEQUENCES.

**INFILTRATION:** The downward entry of water into the soil or other material.

**INTERDISCIPLINARY TEAM:** A team of varied land use and resource specialists formed to provide a coordinated, integrated information base for overall land use planning and management.

**KEY SPECIES:** (1) Species that, because of their importance, must be considered in a management program; or (2) forage species whose use shows the degree of use of associated species.

**LAND USE PLAN:** Any document developed to define the kinds of use, goals and objectives, management practices and activities that will be allowed to occur on an individual or group of parcels of land.

**LEASE:** See GRAZING LEASE.

**LESSEE:** One who has specified rights or privileges under a lease. The terms written in the lease define the actual length of time and seasons a lease is good for.

**LITTER:** The uppermost layer of organic debris on the soil surface, essentially the freshly fallen or slightly decomposed vegetal material.

**LIVESTOCK:** Domestic animals, including beef cattle, sheep, goats, and horses kept or produced on farms or ranches.

**MAJOR LAND RESOURCE AREA:** Geographically associated land resource units with particular patterns of soils, climate, vegetation types, water resources, and land uses.

**MOTORIZED USE:** Recreation use in which driving is the main activity and an end unto itself. Examples include scenic drives in the family car or operating off-highway vehicles for fun.

**MULTIPLE USE:** A combination of balanced and diverse resource uses that considers long-term needs for renewable and nonrenewable resources, including recreation, rangeland, timber, minerals, watershed, and wildlife, along with scenic, scientific, and cultural values.

**NATIONAL FOREST SYSTEM:** A system of federally managed forest, rangelands, and related lands consisting of the national forests, the national grasslands; land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act; and other lands, waters, or interests therein that are administered by the Forest Service or designated for administration through the Forest Service as part of the system.

**NATIONAL WILD AND SCENIC RIVERS SYSTEM:** A system of nationally designated rivers and their immediate environments that have outstanding scenic, recreational, geologic, fish and wildlife, historic, cultural, and other similar values and are preserved in a free-flowing condition. The System consists of three types of streams: (1) Recreation--rivers or sections of rivers readily accessible by road or railroad that may have some development along their shorelines and may have undergone some impoundment or diversion in the past, (2) scenic--rivers or sections of rivers free of impoundments with shorelines or watershed still largely undeveloped but accessible in places by roads, and (3) Wild--rivers or sections of rivers free of impoundments and generally inaccessible except by trails with watersheds or shorelines essentially primitive and waters unpolluted.

**NATIVE SPECIES (FISH):** Any species that naturally occurred within a given body of water.

**NEOTROPICAL Migratory BIRDS:** Birds that breed in the United States and Canada and later migrate south to Central and South America, Mexico, and the Caribbean islands. These birds include almost half of the bird species that breed in the United States and Canada.

**NEPA ANALYSIS:** Analysis conducted during the preparation of documents required under the National Environmental Policy Act, particularly environmental assessments and environmental impact statements.

**NONPOINT-SOURCE POLLUTION:** Water pollution whose sources cannot be pinpointed but that can be best controlled by proper soil, water, and land management practices.

**NONUSE:** (1) absence of grazing use on current year's forage production. (2) lack of exercise, temporarily, of a grazing privilege on grazing lands. (3) an authorization to refrain, temporarily, from placing livestock on public rangelands without loss of preference for future conditions.

**OBJECTIVE:** The planned results to be achieved within a stated time period. Objectives are subordinate to goals, more narrow in scope, and shorter in range. Objectives must specify time periods for completion, and products or achievements that are measurable.

**OFF-HIGHWAY VEHICLE:** Any vehicle that is not permitted on a highway. Including dune buggies, four-wheelers, and dirt bikes, these vehicles are often driven for recreational purposes.

**OPERATOR:** One who is in the business of buying, raising, and selling livestock.

**OVERSTORY:** The upper canopy or canopies of plants, usually referring to trees, shrubs, and vines.

**PALATABILITY:** The relish with which a particular plant species or part is consumed by an animal.

**PASTURE:** (1) Land that is separated from other areas by a fence or natural barriers. (2) The act of letting livestock graze land for forage.

**PERENNIAL STREAM:** A stream that flows throughout the year for many years.

**PERMEABILITY, SOIL:** The ease with which gases, liquids (water), or plant roots penetrate or pass through a bulk mass of soil or a layer of soil. Since different soil horizons vary in permeability, the particular horizon under question should be designated.

**PERMIT:** See GRAZING PERMIT.

**PERMITTEE:** One who holds a permit to graze livestock on state, federal, or certain privately-owned lands.

**PERENNIAL PLANT:** A plant that has a life cycle of 3 or more years.

**PLANT SUCCESSION:** See ECOLOGICAL SUCCESSION.

**POTENTIAL NATURAL COMMUNITIES (PNC):** The stable biotic community that would become established on an ecological site if all successional stages were completed without human interference under present environmental conditions.

**PRESCRIBED BURN:** A controlled fire used to meet such management goals as reducing shrub and tree invasion or changing species composition toward a more desirable forage.

**PRIVILEGE:** The benefit or advantage enjoyed by a person or company beyond the common advantage of other citizens to graze livestock on federal lands. Privilege may be created by permit, license, lease, or agreement.

**PROGRAM:** The disciplines in the field of land use planning that are organized within the BLM and Forest Service to contribute to the management of public land. These disciplines include economics, rangeland, wildlife biology, botany, ecology, realty, law, and communication.

**PROPERLY FUNCTIONING CONDITION:** Riparian-wetland areas are functioning properly when adequate vegetation, ~~landform~~, or large woody debris is present to dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid floodplain development; improve floodwater retention and groundwater recharge; develop root masses that stabilize streambanks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity. The functioning condition of riparian-wetland areas is influenced by geomorphic features, soil, water, and vegetation. Uplands function properly when the existing vegetation and ground cover maintain soil conditions capable of sustaining natural biotic communities. The functioning condition of uplands is influenced by geographic features, soil, water, and vegetation. Also see NONFUNCTIONING CONDITION and FUNCTIONING AT RISK.

**PUBLIC LANDS:** As defined in Public Law 94-79, public lands are any land and interest in land outside of Alaska owned by the United States and administered by the Secretary of the Interior through BLM. In common usage, public lands may refer to all federal land no matter what agency has responsibility for its management.

**PUBLIC PARTICIPATION:** A procedure allowing citizens as individuals or interest groups to review proposed government procedures or information and offer suggestions, comments, and criticism, and help identify the issues and concerns associated with federal land management.

**RANGE OR RANGELAND:** Rangelands, forests and woodlands, and riparian zones that support an understory or periodic cover of herbaceous or shrubby vegetation amenable to rangeland management principles or practices.

**RANGE CONDITION:** The current productivity of a rangeland relative to what it could naturally produce.

**RANGE EXTENSION:** Establishment of a species population into areas previously unoccupied, but which now support habitats suitable to maintain that species.

**RANGELAND:** A kind of land on which the native vegetation, climax or natural potential consists predominately of grasses, grasslike plants, **forbs**, or shrubs. Rangeland includes lands revegetated naturally or artificially to provide a plant cover that is managed like native vegetation. Rangelands may consist of natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes, and wet meadows.

**RAPTORS:** Birds of prey.

**RECORD OF DECISION:** A document signed by a responsible official recording a decisions that was preceded by the preparation of an environmental impact statement.

**RE-ESTABLISH:** The establishment of a population of a species in a basin where it historically occurred but no longer occurs there naturally.

**RESOURCE MANAGEMENT PLAN (RMP):** A BLM planning document, prepared in accordance with Section 202 of the Federal Land Policy and Management Act, that presents systematic guidelines for making resource management decisions for a resource area. Based on an analysis of an area's resources, its existing management, and its capability for alternative uses, **RMPs** are issue oriented and developed by an interdisciplinary team with public participation.

**REST:** See GRAZING REST.

**RIPARIAN:** Pertaining to or situated on or along the bank of a stream or other body of water.

**RIPARIAN ECOSYSTEM:** A transition between an aquatic ecosystem and an adjacent terrestrial ecosystem identified by soil characteristics or distinctive vegetation communities that require free or unbound water. **Riparian** ecosystems often occupy distinctive landscapes, such as floodplains or alluvial **benches**.

**RUNOFF:** The portion of the precipitation of a drainage area that flows from the area.

**SEDIMENTARY ROCK:** Rock formed from sediments or from transported fragments deposited in water.

**SEDIMENT YIELD:** The amount of sediment removed from a watershed over a specified period, usually expressed as tons, acre-feet, or cubic yards of sediment per unit of drainage area per year.

**SENSITIVE SPECIES:** All species that are under status review, have small or declining populations, or live in unique habitats. May also be any species needing special management. Sensitive species include threatened, endangered, and proposed species as classified by the Fish and Wildlife Service. In the Forest Service, sensitive species are designated by regional foresters.

**SERAL:** Pertaining to the successional stages of biotic communities.

**SERAL (SUCCESSIONAL) COMMUNITY:** One of a **series** of biotic communities that follow one another in time on any given ecological site.

**SOIL HORIZON:** A layer of soil or soil material roughly parallel to the land surface and differing from adjacent, genetically related layers in physical, chemical, and biological properties or characteristics, such as color, structure, texture, consistence, degree of acidity or alkalinity, and kinds and numbers of organisms present.

**SOIL MOISTURE:** The water content stored in a soil.

**SOIL PROFILE:** A vertical section of the soil from the surface through all its horizons.

**SPECIAL STATUS SPECIES:** Plant or animal species listed as threatened, endangered, candidate, or sensitive by federal or state governments. See also SENSITIVE SPECIES, KEYSTONE SPECIES, and KEY SPECIES.

**STOCKING:** The act of placing livestock on rangeland.

**STOCKING RATE:** The number of specific kinds and classes of animals grazing or using a unit of land for a specified time. Not the same as carrying capacity.

**STREAM ENERGY:** The potential of flowing water, at a given time and place, to detach and transport solid particles.

**STRUCTURAL DIVERSITY:** The diversity of the composition, abundance, spacing, and other attributes of plants in a community.

**SUCCESSION:** See ECOLOGICAL SUCCESSION.

**SUITABILITY:** The adaptability of a particular plant or animal species to a given ecological site.

**SUITABILITY CRITERIA:** In protecting a site from resource damage, the standards for judging whether a rangeland should be accessible to a specific kind of animal.

**SUITABLE RANGE:** Rangeland that is accessible to a specific kind of animal and that can be grazed on a sustained yield basis without damage to the resource.

**SUPPLEMENT:** The augmentation of additional individuals to an existing population.

**SUSPENDED NONUSE:** Forage from BLM-administered land that at one time could be grazed by livestock, but was later suspended from grazing because an evaluation showed that the rangeland could not support that level of grazing. Although suspended forage cannot be used, it remains as part of the total number of animal unit months of forage on grazing permits.

**SUSTAINED YIELD:** The continuation of a healthy desired plant community.

**TAKE:** As defined by the Endangered Species Act, "to harass, harm, pursue, hunt, shoot, wound, kill, capture, or collect, or attempt to engage in any such conduct."



**TAYLOR GRAZING ACT OF 1934 (TGA):** The Act of June 28, 1934, providing for the regulation of grazing on the public lands (excluding Alaska) to improve rangeland conditions and stabilize the western livestock industry. The law permitted 80 million acres to be placed into grazing district to be administered by the Department of the Interior as Division of Grazing (later renamed the Grazing Service) . The General Land Office was responsible for administering grazing on public lands outside the districts. TGA conferred broad powers on the Secretary of the Interior to do all things needed for the preservation and use of the unreserved public lands of the United States.

**THREATENED SPECIES:** Any plant or animal species likely to become endangered within the foreseeable future throughout all or a part of its range as designated by the U.S. Fish and Wildlife Service under the Endangered Species Act. See ENDANGERED SPECIES.

**TRAILING:** (1) Controlled directional movement of livestock. (2) Natural trailing is the habit of livestock or wildlife repeatedly treading in the same line or path.

**UNDERSTORY:** Plants growing beneath the canopy of other plants, usually grasses, forbs, and low shrubs.

**UNSUITABLE RANGE:** Rangeland that is not accessible to a specific kind of animal and that cannot be grazed on a sustained yield basis without damaging the resource.

**UPLAND GAME:** A term used in wildlife management to refer to hunted animals that are neither big game nor waterfowl. Upland game includes such birds as grouse, turkey, pheasant, quail, and dove, and such mammals as rabbit and squirrel.

**UPLANDS:** Land at a higher elevations than the alluvial plain or low stream terrace; all lands outside the riparian-wetland and aquatic zones.

**UTILIZATION:** The proportion of a year's forage production that is consumed or destroyed by grazing animals.

**VEGETATION:** Plants in general, or the sum total of the plant life above and below the soil surface in an area.

**VIGOR:** The capacity for natural growth and survival of plants and animals.

**WARM SEASON SPECIES:** Plants whose major growth occurs during the spring, summer, or fall, and are usually dormant in winter. See COOL-SEASON SPECIES.

**WATER QUALITY STANDARDS:** Standards for water quality established under Section 303 of the Clean Water Act. The water **quality** standards program is covered by an implementing regulation in 40 CFR 131. A water quality standard is a rule or law consisting of three elements: (1) the designated use (or uses) to be made of the water body or segment; (2) the water quality criteria needed to protect that use (or uses); and (3) an antidegradation policy. Standards are to protect the public health or welfare, improve water quality, and serve the purpose of the Clean Water Act. Criteria are usually established thresholds that when violated are intended to reveal harm to beneficial uses of water.

**WATERSHED:** The total area above a given point on a waterway that contributes runoff water to the streamflow at that point.

**WETLANDS:** Permanently wet or intermittently water-covered areas, such as swamps, marshes, bogs, muskegs, potholes, swales, and glades.

**WILDERNESS AREA:** An area designated by Congress where the earth and its community of life are untrammelled by humans, where people are visitors who do not remain. An area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, that is protected and managed to preserve its natural conditions and that (1) generally appears to have been affected primarily by the forces of nature, with human imprints substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5,000 acres of land or is large enough to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

**WOODY:** Consisting of wood such as trees or bushes.

**YEAR-LONG GRAZING:** Continuous grazing for a calendar year

**ACCELERATED EROSION:** Soil loss above natural levels resulting directly from human activities. Due to the slow rate of soil formation, accelerated erosion can lead to a permanent reduction in plant productivity.

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