CHAPTER 3 - AFFECTED ENVIRONMENT and EFFECTS

3.1 Introduction

This chapter will provide background information for the project area, and address how each alternative will affect certain environmental components such as rangeland vegetation, hydrology, wildlife, fisheries, soils, recreation, and heritage resources. For each component, this analysis identifies direct, indirect, and cumulative effects of past, current and future activities and describes these effects as they relate to the key issues identified in Chapter 1. The issues will be addressed from the perspective of the resource being analyzed. As such, there may be differences of opinion on the value or effect of each action.

3.2 Range Management History and Condition

Sheep grazed the area which is now the San Isabel National Forest in the early 1880's. Forest Service records dating to shortly after establishment of the San Isabel National Forest indicate that domestic livestock grazing has taken place in the analysis area since at least 1913**.** During this time, the Forest Service instituted a system which defined areas to be grazed (e.g. allotments), set the season of use and established the number of livestock to be permitted. Permittees were to place their livestock only in designated areas, but few if any fences existed to ensure livestock grazed only in the area they were permitted. The lack of livestock control also made it difficult to determine if unauthorized livestock in excess of those permitted had been placed on National Forest land and it is highly likely that significant amounts of unauthorized use has occurred. Over time fences were constructed on National Forest and on allotment boundaries to control livestock numbers between allotments, but grazing management within the individual allotments generally consisted of continuous season-long grazing systems for many years.

Records for individual allotments show a dramatic decrease in the number of animal unit months (AUM's) grazed from the early 1900's to the late 1970's due to shorter seasons and reduced numbers imposed by the Forest Service and reductions in overall sheep operations.. In the 1980's total AUM's were slightly increased but were reduced to the current AUM's presently grazed on the allotments. The numbers of AUM's have remained relatively consistent over the last 25 years.

Drought impacts from 1999 to 2002 had significant impacts on grass production and vigor in the analysis area resulting in shortened seasons and reduced numbers of cattle run on allotments. From 2003 to 2005 even though they were good precipitation and forage production years, reduced numbers were still run on allotments in order to allow grasses and other native plants to recover from the drought. In 2006 and 2008 lack of precipitation had effects on lower elevation allotments. Allotments in the project area were grazed at voluntarily reduced stocking levels (partial to full non-use for resource protection) from 1999-2008.

The majority of rangeland analysis and inventories were conducted on the allotments within the project area in 2005 and 2006, with data collected on the remainder of the allotments in 2007. The rangeland analysis and inventory process concentrated on existing vegetation, and how the existing condition and plant communities compared to the desired conditions and plant communities. Comparisons of existing condition and historical condition were also evaluated to

the extent possible where historical Parker Three-step data existed. The effects of the recent drought were factored into the analysis to the extent possible to avoid arriving at erroneous conclusions.

As a result of the suppression of wildfires, canopy cover in forested areas, open parks, and meadows has increased. In the mountain shrub types, dense thick stands of brush are now present. Movement of grazing herbivores through the dense conifer and shrub stands is gradually becoming more difficult and affecting distribution. With the loss of forage production and availability, rangelands on portions of allotments are becoming and have become unusable.

Other past, present and reasonably foreseeable management activities in the project area include timber harvest, prescribe fire, dispersed and developed recreation, motorized and non-motorized travel, and special uses. Recreation developments, including campgrounds, picnic areas, trails, and trailheads are dispersed across the project area. Special use permits for outfitters & guides, mountain biking, ATVs, and special events have been authorized. Most of the area is roaded, ranging from state highways and maintained gravel roads to two-track roads requiring high clearance vehicles.

This revised range allotment management plan project involves 8 individual open allotments on the San Carlos Ranger District. Of the total 84,915 acres within the analysis area, over two thirds (57,728 acres or 68 percent) is considered capable and also suitable for livestock grazing. Capable rangeland is classified as rangeland that is accessible and used by domestic livestock, has inherent forage producing capabilities, and can be grazed on a sustained yield basis without damage under reasonable management. For the purpose of this analysis capable and suitable acreage were treated as the same since differences in acreage totals were negligible. Non-capable rangeland has no current grazing value for domestic livestock and is not being used for grazing because of physical or biological restrictions, or lacks improvements that would allow use. While livestock are authorized within the allotment boundaries encompassing all 84,915 acres within the project area, one-third of the acreage is not grazed by livestock due to steep slopes, rock outcrops, dense forests or other factors and is not considered in stocking rate determinations or management. See Appendix 4 for a more complete discussion of capable and suitable rangeland.

Devils Hole C&H

The Devils Hole Allotment is one of the lower elevation allotments (7,800-9000 ft.) on the San Carlos District. This allotment is located in the southern end of the Wet Mountain Range approximately ten miles north of Gardner Colorado. The Gardner Road (Forest Service Road 634) runs through the middle of the allotment and allows easy access. The allotment includes 13,225 acres of National Forest lands of which 12,695 acres are considered Suitable rangelands (96 percent). The majority of slopes are gentle to rolling throughout the allotment. Forest types include pinyon/juniper, ponderosa pine, and Douglas-fir. Grassland communities are dominated by Arizona fescue and needle and thread grasses. The allotment is permitted for 220 cow/calf pairs from June 1 – September 15. The allotment is currently run by one permittee under a 7-pasture deferred rotational grazing system. See allotment map in Appendix 1 for a list of existing and proposed improvements.

The Devils Hole Allotment was grazed in the spring and fall with the Williams Creek Allotment until 1948. From 1949 to 1963, the allotment was grazed as one unit with 150 cow/calf pairs. An analysis done in 1958 showed the allotment was in an upward trend but many gullies from past heavy grazing use were present. In 1963 the allotment was divided into four pastures with smaller numbers put into

each pastures under a continuous grazing system. In 1966 a six pasture rest-rotation was implemented which improved vegetative conditions. In 1989 the season of use was changed so that more numbers could be run for a shorter season. Tree planting was started on the allotment in 1967 and continued into the 1970's. The Mud Springs Pasture was furrowed and planted with crested wheatgrass as part of erosion control projects in 1973. This is still very apparent but native grass species are becoming fairly well dispersed throughout the pasture.

On the Devils Hole allotment water availability has been the limiting factor in maintaining good distribution of livestock on the allotment. Additional water developments are needed on the allotment to draw grazing use both livestock and wildlife away from riparian bottoms and improve livestock distribution. In the North Wylie and Reed Gulch Pastures, earthen ponds constructed over the past few years have improved cattle distribution as well as providing benefits to wildlife. Several windmill wells have gone dry on the allotment and could be used again if there is a return to near normal precipitation in the future. There are numerous test holes for wells scattered throughout the allotment which have potential to be developed as a water source. Cleaning and lining of existing ponds with bentonite in the North Wylie pasture has helped retain water and therefore has helped with cattle distribution. With implementation of an efficient grazing system and installation of sufficient and reliable water developments, there has been substantial improvement with healing of major gullies that resulted from historical heavy grazing use in the Ute log Pasture.

Photo 3-1; Upper Wylie Pond with bentonite, Devils Hole Allotment

On the Devils Hole Allotment there is an abundance of historical data and photos for comparison of vegetative conditions. These comparisons with current vegetative analysis indicate that overall the allotment is in an upward trend. There are still areas of concern on the allotment. Due to the low elevation and dryer climate the percentage of bare soil in all transect plots was higher and the litter cover was lower than on other allotments because of a lower site potential. This indicates that the risk of resource damage occurring is greater on the Devil's Hole Allotment than on allotments with overall higher site potentials. The Wylie and Reed Gulch drainages are the main areas of concern on the allotment because of water availability and the tendency for cattle to spend more time in these riparian areas during drier years. Both drainages have expansion of willows, sedges, and cottonwoods occurring, indicating that the current overall trend is upward. In the Black Mountain Pasture the cover of blue gramma grass in parks was greatly reduced after recent drought years but with the natural resiliency of this species, coupled with proper management, recovery should be relatively rapid.

The Black Mountain Fuels Project has greatly reduced conifer encroachment on the allotment. Starting in 2004, mechanical treatments have occurred in the Mud Springs and Reed Gulch Pastures and prescribed fire projects have occurred in the North Wyle Gulch, and Blue Springs Pastures. As a result of these treatments forage production has been greatly increased and distribution of grazing use on the allotment has been improved. Hydro-axe mechanical treatments have especially been effective. There are future fuel reduction treatments planned on the allotment.

Historically cattle trespass from adjacent private lands has been a major problem. The District is currently working to resolve issues with unauthorized grazing use from adjacent private lands. .

Noxious weed species found on the allotment are Canada and musk thistle. The District has been treating these noxious weed species annually.

Indian Creek/Lakes C&H

This allotment is located on the north side of Raspberry Mountain approximately seven miles southwest of La Veta, Colorado. The allotment includes 8,476 acres of National Forest lands of which 4,622 acres are considered Suitable rangelands (55 percent). The majority of slopes are steep throughout the allotment with some gentle to rolling slopes present. Forest types include ponderosa pine, lodge pole pine, bristle cone pine, and spruce/fir. Grassland communities are dominated by Arizona and Thurber's fescue. The allotment is permitted for 57 cow/ calf pairs from July 6 – September 5. The allotment is currently run by one permittee under a 5-pasture deferred rotational grazing system. See allotment map in Appendix xxx for as list of existing and proposed improvements.

Before the 1930's heavy grazing use occurred on the Indian Creek Allotment. The allotment was grazed under a continuous grazing system until 1943. In 1944 a deferred grazing system was implemented and the season of use was shortened and permitted numbers were reduced. Range analysis conducted in 1969 indicated the range condition was poor and the season of use was reduced by twenty days. Prior to 1936, the Bonnet Park Unit was under private ownership. During this time farming practices and heavy grazing use occurred on the allotment. The Lakes Allotment which includes the Bonnet Park Pasture was created in 1936. The Cuchara Valley Livestock Association managed the allotment from the 1930's to 1955. In 1970 except for the Bonnet Park Unit, five of the grazing units on the Lakes allotment were closed to livestock grazing. In 1993, the Indian Creek Allotment was combined with the Lakes Allotment.

On the combined allotment there is very little historical data and photos for comparison of vegetative conditions. Range analysis done in 2005 showed that overall upland areas on the allotment have a healthy composition of native grasses with adequate ground cover. One exception is in the Tracy Canyon Pasture where open parks are primarily composed of introduced smooth brome and timothy. Comparison with historical range analysis information in the Bonnet Park upland areas indicated the area has improved considerably from 1964 with less bare ground and greater amounts of litter and since 1970 the native grass composition has become more diverse and vigor has increased. In the Bonnet Park riparian area much progress has been made in recovery of vegetation from historical heavy grazing use but desired conditions which include more willow regeneration especially in northwest end of Bonnet Park have not been met.

There are only a few range improvements on the allotment. The use of natural barriers and salting and riding has been effective in managing grazing use on the Indian Creek/Lakes Allotment. Since 2002, the Grazing Response Index has been used to assess the effects of annual grazing and has greatly helped improve and maintain vegetative conditions on allotment. There are concerns with future access by cattle to Bonnet Park through private land access. The permittee currently has permission to move cattle to Bonnet Park through the Forb's Subdivision. Other access routes through private lands which the permittee has used in the past are no longer available. Without access through the Forb's Subdivision, the permittee would be forced to move cattle to Bonnet Park through the Indian Creek Trail which would be very difficult.

Historically cattle trespass from adjacent private lands has been a problem. The District is currently working to resolve issues with unauthorized grazing use from adjacent private lands to the east of the allotment.

In the past there have been problems with Canada thistle and hounds tongue noxious weed infestations in the Bonnet Park and with Canada thistle infestations in the Tracy Canyon and Frog Pond areas. The District has made significant progress in controlling weed species in these areas.

Loss of capable range areas due to conifer encroachment is a concern on the Indian Creek/ Lakes Allotment. More fuel and conifer reduction projects are needed in the allotment area to restore the area to natural conditions. In 2001 a prescribed burn on the south facing slope of Indian Creek was conducted. There was a prescribed fire carried out in the Indian Creek area in 2009. The District is currently in the process of initiating environmental assessments for additional fuel reduction projects in the allotment area. This will be discussed further in the cumulative effects section.

Newlin C&H

This allotment is located in the northern end of the Wet Mountain Range on Locke Mountain approximately twenty miles south of Canon City, Colorado. The allotment includes 3,933 acres of National Forest lands of which 503 acres are considered Suitable rangelands (13 percent). Slopes are rolling to moderately steep throughout the allotment. Forest types include ponderosa pine, bristle cone pine, and aspen. Grassland communities are dominated by Arizona and Thurber's fescue and Parry's oatgrass. Most of the primary range used for grazing is located in open parks on the top of Locke Park. The majority of the allotment acreage has heavy timber and is too dense and also too steep for livestock grazing use. The allotment was waived back to the Forest Service in 2003 with no preferred applicant and is currently vacant. When the allotment

was in an active status 45 cow/ calf pairs ran from July 1 – September 20. The allotment was run by one permittee under a 3-pasture deferred rotational grazing system. Since then the allotment has not been stocked with livestock for several years; therefore, allotment boundary and interior pasture fences will require heavy maintenance. See allotment map in Appendix 1 for a list of existing and proposed improvements.

The Newlin Allotment is most closely associated with Locke Park. Portions of Locke Park were homesteaded and reverted back to the federal government in 1939. The Locke Park and Oak Creek areas were grazed heavily year around during the first part of the century. Heavy grazing continued until 1952 when the allotment was closed because of resource problems which included sheet erosion. The allotment was re-opened in 1962 with fewer numbers and a four pasture rest-rotation grazing system was implemented utilizing private lands as a fourth pasture under a Term Private Land Permit. This continued until 1994 when the private property was sold and the allotment was run under a three pasture deferred rotation grazing system. In the past timber sales had been very prevalent in the area and signs of these sales are still apparent in the south end of the allotment. Past timber sales on allotment have increased forage production and livestock distribution.

Photo 3-2; Locke Park, Newlin Allotment

There is abundant historical data regarding the condition of vegetation on the allotment. Range analysis conducted on the allotment in 2005, indicates range conditions of uplands are good with a static trend. Ground cover is higher than in the past with litter regenerating each year. Currently

there is a higher forb species composition than desired which could be attributed to recent drought conditions. The overall condition of the allotment is considerably better than in the late 1940s, the 1950s, and the early 1960s. The allotment areas show much improvement from studies done in 1957 and 1961. Comparison of photos points taken of the Locke Park area in 1949, show a remarkable improvement in rangeland condition from1949 to the present day. Overall the condition of vegetation in riparian areas is good on the majority of the allotment. There are two areas of concern on the allotment which are located in riparian areas. In the Lion Canyon area there are effects of trailing by livestock which has resulted in areas of bare ground in Lion Creek near the water development. In Pasture 1 the willow component in Newlin Creek needs improvement. Both of these areas are small and localized in scope and extent. Degener Beards Tongue, a sensitive plant species, occurs mainly in the Pasture 1 area of the allotment and has not been affected by livestock.

The allotment has received only deer and elk grazing use since 2001. In Pasture 4, water developments are needed to help improve cattle distribution and to help draw cattle away from riparian areas. Cattle guards are needed on Forest Service Road 274 where the road intersects the Pasture 1 and 2 division fences and the Pasture 1 and 4 division fences. There have been problems with gates being left open in the past and cattle guards would help to maintain better control of livestock grazing use.

Loss of capable range areas due to conifer encroachment is a concern on the Locke Park area. More fuel and conifer reduction projects are needed in the allotment area. The District is currently in the process of initiating environmental assessments for fuel reduction projects in the allotment area. Prescribed fire and mechanical treatments projects are being proposed and could occur as early as 2009.

Canada thistle is the only noxious weed species found on the allotment. The District has been treating this noxious weed species annually.

Ophir C&H Allotment

This allotment is located east of Deer Peak approximately eight miles west of Beulah, Colorado. The allotment includes 8,793 acres of National Forest lands of which 5,253 acres are considered Suitable rangelands (60 percent). Slopes are rolling to moderately steep throughout the allotment. Forest types include ponderosa pine, aspen, and spruce/ fir. Grassland communities are dominated by Arizona and Thurber's fescue and Parry's oatgrass. The Burris Pasture is permitted for 25 cow/ calf pairs from June 1 – June 30. The Burris Pasture is run under an On-off Term Grazing Permit in which the pasture is grazed with adjacent private lands leased by the permittee to form a logical grazing unit. A total of 250 cow/calf pairs are grazed in this unit. The remainder of the pastures are permitted for 250 cow/calf pairs from July 1 to September 12. This portion of the allotment is currently run by the same permittee who runs on the Burris Pasture under a 5-pasture rest- rotational grazing system. See allotment map in Appendix 1 for as list of existing improvements.

Records show that historically the Ophir Allotment had been grazed together with the Permittee's private lands. Sheep were grazed on the Ophir Allotment until 1929. In 1930 the kind of livestock run on the allotment was changed and 500 cow/calf pairs were run on the allotment from June 1 to October 31. From 1938 to 1963 yearlings were run on the allotment until 1964 when the class of livestock was changed back to cow/calf pairs. In 1965 there was a large reduction in the numbers of

cattle run on the allotment to the 250 cow calf pairs which are the numbers currently run on the allotment.

Photo 3-3; Ophir Allotment

There is very little historical vegetative analysis information on this allotment. Range analysis conducted in 2005 revealed that overall upland parks are in good condition and contain an excellent cover of native grasses and litter with minimal bare ground. Documentation of comparison of photos taken in the Mountain Meadow area in 1945 and again in 1949 show that in 1949 the trend was still down. Range analysis conducted in 2005 showed the cover of native grasses has greatly improved and bare ground had been reduced indicating a positive trend. However, the area still needs further improvement to reach desired conditions. Little Froze Creek is in much better condition compared to the bare banks and little vegetation observed in the 1949 historic photos. Willows are beginning to establish in the lower end of the meadow and with proper management this is expected to continue. In the Ophir Creek riparian area alders are coming back and several age classes of willows are present with good regeneration occurring. The Elmer Canyon, Middle Creek, and Snyder Draw riparian areas are still recovering from historic heavy grazing use. Overall, riparian trends are upward but more willow regeneration is needed in these areas in order to allow different age classes of willows to become established.

Over the years the Permittee's use of owned and leased adjacent private lands has provided for a great deal of flexibility in management of the allotment. The current rest –rotation grazing system

and the use of the Burris Pasture with private lands has helped to maintain and improve resource conditions. During drought years the allotment has received total rest, which has allowed for rapid recovery of vegetation from drought conditions. The permittee has also reduced the time spent in pastures after drought years on the Ophir Allotment in order to allow for recovery. Since the Ophir Pasture consists of steep slopes and the majority of the suitable range is located in riparian areas, the pasture has been used as a riparian pasture. This has helped maintain and improve riparian vegetation and reduce livestock/recreation conflicts. In 2007 private lands in the Government Trap Pasture were fenced off from the allotment. This fencing could affect cattle distribution in the pasture. Logging roads in the northern part of the Deer Peak Pasture have improved cattle distribution.

Canada and musk thistle and yellow toadflax noxious weed species are found on the allotment. The District has been treating these noxious weed species annually.

Pantleon C&H

This allotment is located in the southern end of the Sangre de Cristo Mountains between Medano and Mosca Pass, approximately fifteen miles west of Gardner, Colorado. The majority of the allotment area is located in the Sangre de Cristo Wilderness. The allotment includes 3,644 acres of National Forest lands of which 1,037 acres are considered Suitable rangelands (28 percent). The majority of slopes are steep throughout the allotment with some gentle to rolling slopes present Slopes are gentle to rolling with the majority of slopes being steep throughout the allotment. Forest types include ponderosa pine, bristle cone pine, and spruce/fir. Grassland communities are dominated by Arizona fescue and needle and-thread. The allotment is permitted for 35 cow/ calf pairs from July 1 – September 10. The allotment is currently run by one permittee under a 3-pasture deferred rotational grazing system. See allotment map in Appendix 1 for as list of existing and proposed improvements.

The Pantleon Allotment was originally part of the Mosca C&H Allotment. In the 1920s, 135 cow calf pairs were run on the allotment area with a June 1 to October 31 grazing season. Because of resource concerns in 1936 the numbers and season were reduced again. In 1951 the numbers were reduced again to 12 cow/calf pairs with a June 16 to September season of use. The Mosca Allotment was closed in 1975 and the current Pantleon Allotment area was established with the current season and numbers. Because of drought conditions and non-use taken by the permittee the allotment has only been stocked three times since 2002.

There is very little historical vegetative analysis information on the allotment. Documentation found in the folders stated that in 1957 the allotment was in poor condition and overstocked. Inspections done on the allotment in 1974 stated vegetation and soil stability were in good condition. In 2005 the Pantleon Allotment was still in the process of recovering from several years of drought conditions. Range analysis conducted in 2005 revealed that overall uplands are in good condition with a good composition of native grass species and litter cover. In North Pantleon Creek, the area is still recovering from the effects of the use of a continuous grazing system. The cover of riparian herbaceous and woody vegetation is improving but there are still only a few age classes of willows and alders present in the riparian area.

Historically the allotment has been run under a continuous grazing system. In 2002, a three pasture deferred rotation grazing system was implemented on the allotment utilizing salting, riding, and natural barriers to control grazing use since there are no interior pasture fences on the allotment. This grazing system has not been successful because of problems with controlling cattle in pastures

and the small size of pasture areas. Use of the Pantleon allotment as a separate pasture run in combination with the Permittee's private land is an option that has been considered. There are concerns with future access by cattle to the Pantleon allotment. The permittee currently has permission to move cattle to the allotment through one landowner's adjacent private lands. Other access routes through private lands which the permittee has used in the past are no longer available. Without the current access the permittee would not be able to move cattle to the allotment. A new tank is needed to be installed in an upland area for the existing spring development in North Pantleon Creek. The springs located at the head of North Pantleon Creek and in the western portion of the Middle Tank Pasture need to be fenced off in order to protect them from trampling damage.

Photo 3-4; Stock water tank in Pantleon Allotment

Historically cattle trespass from adjacent private lands has been a problem. The District is currently working to resolve issues with unauthorized grazing use from adjacent private lands surrounding the allotment.

Noxious weed species found on the allotment are Canada thistle which is found mainly in riparian areas of the allotment. The District has been treating these noxious weed species annually.

West Peak Allotment

This allotment is located west of the Spanish Peaks approximately twelve miles south of La Veta, Colorado. The allotment includes 11,741 acres of National Forest lands of which 7,157 acres are considered capable and suitable rangelands (61 percent). Slopes are rolling to moderately steep throughout the allotment. Forest types include ponderosa pine, aspen, bristlecone pine, and spruce/ fir. Grassland communities are dominated by Arizona and Thurber's fescue and Parry's oatgrass. The West Peak Allotment is divided into two separate herd areas which are grazed by different permittees. These areas are lower White Creek and the remaining areas on the West Peak Allotment. The West Peak portion of the allotment is run under an On-off Term Grazing Permit which is grazed with the Permittee's owned and leased private lands to form a logical grazing unit. Ninety percent of the capable range in the unit is located on private lands. The West Peak portion of the allotment is permitted for an average of 27 cow/ calf pairs from June 15 – October 15 based on the estimated grazing of the National Forest lands capacity. A total of 400 cow/calf pairs are grazed on the combined Forest and private lands. The West Peak portion of the allotment is currently run by one permittee under a 5-pasture deferred rotation grazing system. The lower White Creek portion of the allotment is permitted for 17 yearling cattle from July 1-September 15. This portion of the allotment is run as a separate pasture under a deferred rotation grazing system with the Permittee's adjacent private land. See allotment map in Appendix 1 for as list of existing improvements.

The West Peak Allotment was historically used as part of the Lakes Allotment. In 1936, 176 cow calf pairs were run on the allotment area with a June 1 to October 6 grazing season. By the early 1950s the season was shortened and almost half of the numbers had been reduced because of resource concerns. In 1956, the West Peak Allotment area was separated from the Lakes Allotment. Range allotment plans in 1959 and 1970 stated that range conditions on the allotment were good to fair and in upward trend. In 1976 the numbers were further reduced to 37 cow/calf pairs and 17 yearling cattle and the time on the allotment was shortened to a July 1 to September 30 season of use. Starting in 1976, the lower White Creek area was grazed as a separate grazing unit with a different herd and permittee and an On-off Term Grazing permit was issued to the other permittee for use of the remaining portion of the West Peak Allotment.

On the allotment there is very little historical data and photos for comparison of vegetative conditions. Overall vegetative conditions on the majority of areas on the allotment are good. Range analysis done on National Forest lands in 2005 revealed excellent biodiversity in upland areas. Upland areas have a good composition of native grasses with high plant vigor. In these areas there is minimal bare ground with excellent litter cover and plant diversity. Overall conditions of riparian areas on the allotment are good with the exception of the riparian area in upper White Creek. This area is in the West Peak portion of the allotment. The majority of the stream reach is located on private lands but there are small portions of the reach located on National Forest lands. In this area there is no continuous woody vegetation, limited willow regeneration, and stream bank damage occurring. The riparian area in the lower White Creek portion of the allotment is in good condition. In this area there is a good variety of age classes of woody vegetation present with excellent willow regeneration occurring. Additional monitoring sites are needed in the southern end of the lower White Creek Unit to evaluate grazing impacts.

There are limited range improvements on the West Peak Allotment. The majority of private lands which border the allotment are unfenced. Livestock grazing use on the West Peak portion of the

allotment is controlled by salting and riding. The majority of the grazing capacity is located on private lands in the Cuchara Pass Unit which includes the White Creek area. Because of steep topography and severe weather conditions which occur frequently on the allotment, it has been difficult to implement the grazing rotation properly. This has resulted in the White Creek area not receiving the needed proper rest. There are potential water sources on the Permittee's private land which could be developed to help draw cattle away from riparian areas. The Wade Creek Unit which includes the Cordova Pass area has limited capable range. Plains rough fescue, a sensitive plant species, is found in the Cordova Pass and Donald Park areas. These areas have received light grazing use from cattle in the past. Conifer encroachment in Donald Park is a concern.

Prior to 2002 a continuous grazing system had been used in the lower White Creek area. In 2002, a three pasture deferred rotation grazing system was implemented utilizing salting, riding, and electric fencing to control grazing use. This grazing system was not successful because of problems with controlling cattle and the small size of grazing units. In 2006, the entire lower White Creek area was used as a separate pasture under a deferred rotation grazing system with the Permittee's adjacent fenced private lands. This grazing system has been very successful and has provided the needed flexibility to manage this riparian pasture properly.

Canada thistle and hound's tongue infestations are present in the lower White Creek area. Canada thistle infestations are found in the breeched beaver dams. Aggressive treatment in these areas has controlled the spread of the Canada thistle and has greatly reduced heavy infestations which existed in the past. Hound's tongue infestations are found in uplands in the northern portion of upper White Creek. These infestations are being treated annually.

Williams Creek/Greenhorn Allotments

The allotments are located between Deer Peak and Greenhorn Mountains approximately ten miles north of Gardner Colorado. The allotments include 35,103 acres of National Forest lands of which 26,461 acres are considered capable rangelands (75percent). Slopes are rolling to moderately steep throughout the allotment. Forest types include pinyon/juniper, ponderosa pine, aspen, and spruce/fir. Grassland communities are dominated by Arizona and Thurber's fescue and Parry's oatgrass. The Williams Creek allotment is permitted for 735 cow/ calf pairs from June 16 – October 30. Six horses are permitted on the allotment for livestock management during the grazing season. The Greenhorn Allotment is permitted for 392 cow/ calf pairs from June 16 – October 7. The allotments are currently managed together with one herd and permittee under a 13-pasture deferred rotational grazing system. See allotment map in Appendix xxx for as list of existing and proposed improvements.

According to historical records in 1913, 2,200 cow/calf pairs grazed on the Williams Creek Allotment. In 1928 the numbers of cattle were increased and 2,450 cow/calf pairs were run on the allotment from June 25 to October 5. By the late 1940s, because of resource concerns the season of use was shortened and the numbers of cattle run on the allotment were dramatically reduced by seventy- five percent. From the 1950's to the 1970's the numbers of cattle and season of use remained fairly constant. During this time 671 cow/calf pairs were run on the allotment from June 16 to October 5. Logging activities in the 1960's and 1970's increased forage production and improved cattle distribution. In 1980 an environmental assessment was done which evaluated range conditions on the allotment. This environmental assessment indicated rangelands on the allotment were in an upward trend. As a result of this environmental assessment, there was a decision which

increased cattle numbers on the allotment to 1182 cow/calf pairs with a June 16 to October 13 season of use. The increase in numbers was the result of consolidating 5,000 acres of private, state, and Bureau of Land Management lands with the current grazing allotment to form an eight pasture rest rotation grazing system. In 1983 this land was taken out of the grazing rotation and the numbers were reduced to the 735 cow/calf pairs with the current permitted season of use. The last time the allotment has been fully stocked with the 735 cow/calf pairs was in 2000. Over the last eight years the allotment has only been stocked with only forty-four percent of the permitted numbers as a result of dealing with drought conditions on the allotment and the Permittee's ranch.

Prior to 1930 there was heavy grazing by sheep on the Greenhorn Allotment. In the 1930's the kind of livestock was changed from sheep to yearling cattle. During this time, 515 head of yearling cattle were run on the allotment from June 1 to October 15. By the mid 1950s cattle numbers had been reduced to less than half of the numbers run in the 1930's because of resource concerns. Over the next 25 years cattle numbers and the season of use remained basically the same. During this time an average of 242 yearlings were run with a typical season of June 16 to September 30. In 1978 the Maes Creek fire occurred on the allotment and burned 2200 acres. In 1982 and 1983 a range analysis was conducted on the allotment. This analysis revealed the allotment was in fair to good condition with an upward trend. In1985 an environmental assessment was conducted on the allotment and a decision was made allowing for stocking levels to be increased based on stocking capacity data from the 1982/83analysis. Cattle numbers on the allotment were increased from 500 yearlings in 1984 to 800 yearlings in 1987. In 1993 another environmental assessment was conducted which updated the allotment management plan and removed areas of the allotment in the Greenhorn Wilderness. These areas were removed because they contained steep slopes producing minimal forage which made it difficult to properly manage cattle. In 1996 the numbers were reduced to the current 392 cow calf pairs and the June 16 to October 7 season of use was established. Since 1999, the total permitted numbers have not been stocked on the allotment. During this time the allotment has had total rest for two years and received only partial use as a result of drought conditions on the allotment and the Permittee's ranch. Since 2003, the Greenhorn Allotment has been run together with Williams Creek Allotment with a single herd. Since 2003, less than 45 percent of the permitted AUM's (Animal Unit Months) have been used on either the Williams Creek or Greenhorn Allotments.

Overall, the majority of upland areas in the Williams Creek Allotment have excellent ground cover with very little erosion concerns. There is a significant amount of historical data recorded for the Williams Creek allotment to determine overall trend. Evaluation of range analysis data collected in 2005 and 2006 indicated that the majority of upland areas on the allotment are either in a stable upward trend. The historical transect located near the junction of the Greenhorn Road and Meadow Divide Roads has changed little since studies were conducted in 1956 and 1963 because of proper management of livestock grazing use. . The park located at the head waters of St. Charles Creek where the historical transect is located has improved remarkably since the 1963 study. The forage density and composition has increased while the amount of bare ground has decreased dramatically. The Deer Lick exclosure is an excellent source for determining trend because of its extensive data and photos dating back to 1939. There was not a significant difference between the inside and outside of the exclosure except for which grass species was dominant. Inside the exclosure Parry's oat grass was dominant and outside the exclosure Arizona fescue was the most common graminoid. In the historical photos it appears that the site outside the exclosure has improved since the 1930s and 40s. In the Custer Pasture there are open parks that are not utilized by cattle and are accumulating too much litter and are becoming stagnant. This is reducing the vigor of grasses especially of Parry's oatgrass and Thurber's fescue. Establishing watering locations near these parks will increase the utilization to acceptable levels, and therefore the vigor of these plants to improve the overall health of

the area. An area of concern is an upland area located north of the Pole Creek Trailhead in the Custer Pasture where historically cattle have concentrated. The area is in the process of recovering from this heavy use however the cover of native grasses needs to be increased and the amount of bare ground needs to be reduced further to reach desired conditions

Most of the areas of concern on the Williams Creek and Greenhorn Allotments are in mesic meadow/ riparian areas. These high elevation areas are wet throughout the summer making them more susceptible to compaction damage. These areas are recovering from historical heavy grazing use which resulted in headcuts, pedestaling, stream bank damage, and poor willow regeneration and composition. The areas of concern are located in: North Bear Creek, St. Charles Creek, Amethyst Creek, Beaver Creek, Cisneros Creek, Greenhorn Creek and a small riparian area located north of the Pole Creek Trailhead in the Custer Pasture. The Beaver, Amethyst, Cisneros, and Greenhorn Creek riparian areas have received substantial rest from cattle grazing use during the last eight years which has allowed for these areas to recover at a rate which is desirable. The rate of recovery is not as rapid as desired in the North Bear and St. Charles Creeks and in the small riparian area north of the Pole Creek Trailhead.

Photo 3-5; Blue Lakes meadow, Greenhorn Allotment

The Greenhorn Monitoring Project was started in 2000. The United States Forest Service contracted out work for the project to Mergan Ecological Delineations, Inc. The project area was located in the Williams Creek and Greenhorn Allotments. The objective of the project was to develop a long term

monitoring plan for wetland plant communities and to determine the rate vegetative changes may occur in the study area and what changes may be observed with changes in management. Eighty-two long term monitoring plots were established in 2001 and 2003 and thirty photo points were established in 2005. The monitoring plots were sampled from 2001 to 2008. The photo points were also retaken in 2008. A final report will be submitted to the Forest Service in 2010 summarizing the findings of the study. Information from the study as well as use of the monitoring plots and photo points to evaluate livestock grazing impacts will be useful.

The majority of the historic data for the Greenhorn Allotment was taken in the Greenhorn Wilderness area. This area was removed from the allotment in 1993. On the current Greenhorn Allotment vegetation in pastures is highly similar to each other. Range analysis conducted during the 2006 grazing season indicated that uplands had a good composition of forbs and native grasses.

Running the Williams Creek and Greenhorn Allotment with one herd has provided for more flexibility in management and has helped to improve resource conditions. However, more flexibility is needed in management of grazing use to reach desired conditions in an acceptable time frame. Since there is only one lower elevation pasture it has been difficult to defer grazing of higher elevation mesic meadow riparian areas during later times in the grazing season when areas are not as wet and there are less impacts. Added flexibility is also needed to give more options to graze the Back and Froze Pastures during times when Plains Larkspur is not as prevalent.

Use of electric fence has helped to control livestock grazing use and allow riparian areas of concern to recover. Many fences are in need of reconstruction and are not always located in proper locations to efficiently control grazing use. Some of the pastures are too large and encompass different vegetation types at different elevations, slopes and aspects which have made it difficult to properly manage vegetation and get proper distribution of livestock grazing use. Some current fencing locations have created problems which have resulted in cattle congregating in riparian areas of concern. Because of this, these areas not recovering as rapidly as desired. Additional water sources are needed in the St. Charles and Greenhorn Allotment Pastures in order to help draw cattle out of riparian areas. The use of the Beaver Creek Pasture as a riparian pasture in the rotation has worked in the rotation and has helped the riparian areas recover from historical heavy grazing use.

There are concerns when cattle are moved from the St. Charles Pasture to southern pastures. Cattle must be moved using the Greenhorn Road because of the steep topography and thick dense timber in the area. When cattle are moved on the road during times of heavy motor vehicle use there are safety concerns as well as difficulties in moving cattle. Another route is needed in this area in order to move cattle safely and more efficiently. Access from the Permittee's ranch to higher elevation pastures on the allotment is time consuming because of long traveling distances on rough roads. There have been problems in the past with camping trailers and equipment used by riders and fencing crews being vandalized. There is a need for a cow camp facility to provide for safe parking of camping trailers and to provide for adequate lodging of fencing crews and riders. A cow camp facility is also needed to provide for a safe place to store tack, equipment, and salt as well as to provide an area where horses used for management of cattle on the allotment could be kept. Such a facility would greatly improve the ability of the permittee to provide timely and cost effective management.

In June 2007 there was a wind event which blew down approximately 1000 acres of mixed conifer in the Williams Creek and Greenhorn Allotment areas. This event has impacted all activities including livestock grazing. The blow-down severely damaged sections of pasture fences on the Williams

Creek allotment. There are still large trees on sections of pasture fences which need to be removed. This has made fence maintenance difficult and has caused problems with proper implementation of the grazing rotation. Future management actions could involve the salvage of affected trees to reduce proliferations of spruce beetles and would remove blow down from existing fence locations.

The Meadow Divide Timber sale is located in the East Williams and Deer Lick Pasture areas. The timber sale is still active and has harvested standing green trees along with salvage blow down. The timber sale has reduced conifer encroachment in parks as well, thereby increasing forage production and improving cattle distribution. Future management actions may occur on suitable timber lands in the Williams Creek and Greenhorn Allotment areas that may be determined through the environmental assessment process. Hydro-axe treatments in the West Plantation Pasture have reduced conifer encroachment and have greatly increased forage production in the pasture.

Canada thistle and musk thistle are the only two noxious weed species found on the allotments. Isolated infestations of Canada thistle are found along the Greenhorn Road. Small infestations of musk thistle are found in the southwestern portion of the Deer Lick Pasture near the Meadow Divide Road. The District has been treating these noxious weed species annually.

Photo 3-6; Canada Thistle

3.2 Rangeland Resources Effects

Alterative A. - No Action –No Livestock Grazing

Direct and Indirect Effects

Under Alternative A there would be no permitted cattle grazing allowed on National Forest lands in the San Carlos Project Area (SCPA). Conflicts between livestock and other users would not occur.

Discontinuing cattle grazing would allow for faster recovery in areas of concern primarily in riparian areas and some upland areas than under the action alternatives across the project area. Riparian health is one of our key issues. The removal of cattle grazing would allow riparian/mesic meadow areas that are meeting or adequately moving toward desired condition to improve in ecological condition. Riparian species would likely increase in cover and frequency. Stream banks that are damaged by livestock impacts would stabilize, unless also impacted by other factors, as riparian graminoids and willows establish on previously unvegetated and unstable sites. This trend would probably continue through the mid- to late-seral stage. However, this trend would not continue to be stable throughout time due to the dynamic nature of stream systems. Natural hydrologic processes (including presence of beaver) can produce dramatic changes in short amounts of time.

Benefits to wildlife species from water developments would not be provided. Distribution of elk and other wildlife species would become more concentrated in some areas because of reduced water availability. Concentrations of elk watering from springs which were previously protected by fencing could be negatively affected.

The overall effect of no livestock grazing on rangeland condition could be beneficial the first few to several years and potentially neutral to negative thereafter. Indirectly, those areas in poor to fair condition would experience increases in litter accumulation and decreases in bare ground. Over time the lack of significant disturbance would result in matting and accumulation of dead plant material that would insulate the ground, provide some water-holding capacity, and decrease surface soil movement and erosion. However, grasses evolved with the periodic removal of vegetative material through fire, insects, or ungulates. In the absence of grazing or other disturbance such as fire, plants continue to accumulate litter (dead grass blades left at the end of the growing season). After years of litter accumulation, plants go into a “self-imposed stress” whereby the detritus (previous years’ growth) chokes out new shoots competing for light (Knapp and Seastedt, 1986). The vigor of the entire plant is compromised and rangelands become less productive and healthy, providing less desirable habitat for a variety of plant and animal species. Under Alternative A we would take away our ability to use livestock as a vegetation management tool to prevent this from occurring and to maintain a mix of seral stages across the landscape. Many invertebrate and wildlife species depend upon productive grasslands in a mosaic of seral stages, especially for late fall, winter, and spring range.

In addition to loss of plant vigor and decrease in rangeland health, the accumulation of litter would allow fine fuels to build up which could result in an increase in the susceptibility to fire and rate of spread.

Under this alternative all term grazing permits would be cancelled as provided for by current direction (FSH R2 ID 2209.13). Discontinuing cattle grazing could negatively impact stability of

ranches run by permittees. This could result in permittees having to sell ranches to developers resulting in loss of open space. There would no longer be combined management of private and Forest Service lands which could result in less flexibility to manage grazing use on private lands by the permittee. Conflicts between livestock and other uses on the National Forest would not occur but conflicts on private land would intensify.

Most rangeland structural improvements currently in existence on the allotments would be removed as time and budgets allow. Subsequent decisions would need to be made regarding retention of any range improvements (such as water developments) for other resource needs and funding would need to be secured for maintaining them. Except for Forest Service boundary fences, interior pasture fences and allotment boundary fences in the project area would be removed as time and budgets allow. Springs and earthen ponds would no longer be maintained by the permittees. The Forest Service would need to assume maintenance of the developments for wildlife benefit to retain the water rights or they would be removed.

On-off term grazing permits would be cancelled. This would result in the permittee having to fence off private lands or find other means of ensuring that the livestock do not move onto National Forest lands which were previously grazed efficiently together as a natural grazing unit with National Forest Service lands. Fencing of the private lands or other tools will be needed to prevent unauthorized grazing use from occurring on National Forest lands. Construction and maintenance of fences would be the most feasible tool but would also be expensive and not practical in some locations because of topography.

Treatment and inventory of noxious weeds would continue in the project area according to the PSICC Noxious Weed Action Plan but there would be less Forest Service presence to detect and treat noxious weeds due to the absence of the permit administrator on the land.

Alternative B: No Change –Livestock Grazing with Current Management

Direct and Indirect Effects

Alternative B: No Change-Livestock Grazing with Current Management.

Direct and Indirect Effects

Alternative B would maintain the current management of livestock grazing on National Forest Service lands in the planning area. Livestock grazing would continue to be permitted under current management to Forest Plan Standards and Guidelines, and the Watershed Conservation Practices Handbook (FSH 2509.25). In general, the effect of continuing current management would be to perpetuate the existing conditions previously described for the pastures of each allotment. Levels of use in terms of timing, intensity, and duration/frequency by livestock would remain the same. Under this Alternative, if monitoring shows that Forest Plan or WCPH desired conditions are not being met or satisfactory progress is not occurring toward meeting the desired conditions, and all administrative actions have been exhausted, then the Forest Service has limited flexibility to make changes without completing a new NEPA analysis. Conducting new NEPA analysis each time a change is needed takes considerable time and expense. This

inefficiency often leads to management on the ground being several steps behind due to the dynamic nature of environmental systems, leading to a failure to achieve desired results.

Maintenance of range improvements would continue to be required. No new range structural improvements would be constructed without completing new NEPA analysis. Many of the range improvements were constructed years ago; their location or design often is not consistent with current management direction or does not meet the needs to mitigate current livestock conflicts with other resource uses or environmental challenges. For example, on the Williams Creek and Greenhorn Allotments, the current fence locations in pastures are not adequate. Additional fencing is also needed in order to divide larger pastures into to smaller areas so they can be grazed more efficiently. The relocation and additional fencing would allow for grazing of riparian areas for a shorter period of time and faster recovery of riparian /mesic meadow areas of concern. Any new fencing would require additional NEPA analysis and decision. Existing structural improvements would continue to be maintained and amortized improvements could be reconstructed in place under the current term grazing permits.

Surveys for noxious weeds would continue to be done and treatments would continue to be managed according to the PSICC Noxious Weed Action Plan.

Alternative C: Livestock Grazing Using Adaptive Management

Direct and Indirect Effects

Alternative C would allow for the continuation of livestock grazing in the analysis area but would change the management over time , as need is demonstrated through monitoring to move the existing conditions to the desired conditions using management tools and adaptive principals. Adaptive management allows us to implement changes and new technology efficiently when needed. This ties directly to our second key issue – Management Flexibility. This gives managers the ability to keep up with environmental changes and ultimately allows for better control over the timing, intensity, duration and frequency of grazing. This should increase residual vegetation in areas where it is presently less than desired, reduce the amount of bare ground in areas where it is currently too prevalent, and increase the vigor of individual plants through better distribution of livestock across allotments. Increasing litter where it is currently less than desired ensures that plenty of material is available for trapping sediment in runoff and overland flow events. Additionally, this material insulates plant crowns and over-wintering buds, protects and covers soil, holds moisture in the ground and allows the plant to continue photosynthesis for carbohydrate production and storage. Greater carbohydrate storage results in more roots being produced by each plant. This increases the erosion defensibility and moisture-holding capacity of soils. It also provides a buffer to plants in times of stress such as drought. Less bare ground means more plants holding the soil in place while lessening the likelihood of invasion by noxious weeds. This alternative would also respond to those areas where additional utilization could be beneficial, thereby improving resource conditions on those sites.

Alternative C would establish “benchmarks” and “key areas” for monitoring purposes for each of the allotments.

- ***Benchmarks –*** *Benchmarks are reference points that are sensitive to management changes. These are the small areas where long-term trend studies are installed and maintained so that the manager can assess the resource impacts from management.*

- ***Key Area*** *- That portion of a pasture or grazing unit which is selected as a monitoring point because of its location, use, or grazing value. In this analysis, key areas monitor short-term implementation of management actions and design criteria.*

Monitoring benchmarks and key areas provides insurance to all other areas of the pasture. If a permittee does a good job of pasture management, the effect is better livestock distribution and use across a pasture. Promoting better distribution means that previously under-grazed areas will have a better chance of being grazed within allowable use criteria (stimulating growth), and that individual grazed plants will be grazed fewer times during the growing season providing an opportunity for more vigorous plant growth or re-growth. Achieving more even pasture use may mean that livestock may stay longer in a particular pasture as opposed to moving quickly through pastures if cattle are allowed to congregate, especially in key areas. This system encourages responsible management as it rewards the permittee for good management and penalizes poor performance.

The Grazing Response Index (GRI) can be used as an indicator of the effects of the current season's grazing activity and is used to assist in making decisions to resolve problems and adjust management in a way that will move the resource toward desired conditions. The GRI addresses three areas of grazing management: 1) **frequency** – number of times a plant is defoliated during the grazing period; 2) **intensity** – amount of leaf material removed during the grazing period; and 3) **opportunity** – amount of time plants have to grow prior to grazing or regrow after grazing. Opportunity is the one factor most highly related to long-term health and vigor of the vegetation. A series of neutral or positive GRI scores over time would be expected to promote a healthy range condition; a continuing series of neutral GRI scores over time would most likely maintain the current range condition. A continuing series of negative GRI scores would most likely be related to a decline in rangeland condition. Future information collected can be compared to baseline data or desired condition data to see how close we are to achieving management goals. This determination will allow the Forest Service and permittee to work cooperatively towards a neutral or positive rating, which will maintain and increase plant vigor and health.

Alternative C has identified additional structural range improvements to be installed or constructed as part of initial management actions. Since many of the existing range improvements were constructed many years ago, their location and design are not necessarily consistent with current management direction. In situations with spring developments, some stock tanks were placed in riparian areas. Upon reconstruction, stock tanks will most often be placed completely outside of areas with potential for riparian vegetation. In situations where water sources are not being adequately protected, exclosures may be constructed or enlarged to encompass the area of potential impact. Where water is the limiting factor for cattle distribution additional water developments may also be constructed outside of riparian zones. Much cleaner water would be provided to both cattle and wildlife.

There are situations where allotment fences will need to be reconstructed or removed and constructed in new locations. Minor additional soil disturbance may occur during the installation of some of these improvements. Some trees may need to be removed to provide a clearing for installation and maintenance of some fences. Additional fencing could be a barrier (temporary or permanent) to some

wildlife species movement if not installed to minimize or prevent this although design criteria will be implemented to ensure that this is minimized or eliminated. . Permittees will be required to invest in some of the cost of new and/or reconstructed range improvements (Coop/Cost Share), and to rehabilitate some sites where improvements (i.e. ponds, tanks) are moved to different locations.

Under this alternative, new allotment management plans would contain objectives derived from the NEPA analysis and decision that are designed to meet desired conditions for soil and vegetation. The condition and trend of the soil and vegetation will likely improve since allowable use levels are set to provide for maintenance or improvement of each specific plant community type and condition. Improved livestock grazing management and adaptive stocking rates should allow soil and vegetation to reach desired conditions on most areas within the allotments within 10-15 years. The more productive range sites may recover more rapidly, especially those associated with plant communities in early-intermediate seral stages dominated by native species. Early seral plant communities associated with less resilient shallow and/or rocky soils, especially those dominated by introduced species, may require more than 15 years to reach mid to late seral vegetative condition. Areas in early and early-intermediate seral stages will move toward late seral vegetative conditions as a result of improved management practices within their site potential. Changes in management practices will improve grazing efficiency and reduce adverse effects on soil and upland vegetation within the allotments.

Risk of noxious weed invasion would be decreased in the long-term under this alternative. The proposed action alternative prescribes livestock management and limits utilization, which would lessen the chance of creation of sites available for weed invasion. As range conditions improve and less soil disturbance occurs, there will be less bare soil to invite noxious weed invasion. Noxious weeds surveys and treatment would continue. Permit administration would also continue to accomplish noxious weed surveys and treatments at the same time.

This alternative gives the Forest Service and the permittee more flexibility to choose the best way to consistently meet the allowable use standards and move toward desired future conditions of the rangelands and riparian areas on the allotments and to respond to changed new conditions or new information.

Permitting livestock grazing on the National Forest will help perpetuate the continuation of local ranching operations, which will help delay or prevent them from being subdivided. Demonstrating proper grazing management on adjacent National Forest lands may help reduce resource problems on private lands where subdivisions have already occurred.

Overall, the direct and indirect effects of implementing the proposed alternative of livestock grazing using adaptive management would be positive in achieving or moving toward desired conditions for rangeland and riparian vegetation, which addresses our first key issue.

> "Riparian degradation is often associated with the presence of livestock, which sometimes leads to the misconception that livestock must be removed from these areas. Poor management issues such as overgrazing, continuous grazing, poor water access, poor water crossings, overstocking of pastures and placement of streamside feedlots are the real issues. All of these poor management practices can lead to unhealthy riparian areas. Therefore a grazing management plan that incorporates range management principles and BMPs should be prepared and followed. The basic principles of range management are: 1) balance animal

> demand with available forage supply, 2) distribute livestock evenly, 3) avoid grazing during vulnerable periods, and 4) provide ample rest after grazing (Fitch et al. 2003). Water sources are an important variable in how these principles are applied. Properly managed grazing systems that follow these basic principles can actually promote improved riparian health through stimulating plant growth, removing excess litter and accelerating nutrient cycling (LaForge 2004)." McIver, 2004)

Adaptive management alternative C gives the Forest Service and permittee the flexibility to design a dynamic management plan that allows us to apply these four basic principles of range management to the allotments by choosing techniques from a management toolbox until desired conditions are achieved.

Implementation of initial management actions will provide a good start towards achieving desired conditions on allotments in the SCPA. Specific adaptive management actions have been developed for areas of concern which were identified by the Interdisciplinary Team in the SCPA. Specific adaptive management actions have also been developed to deal with drought or other significant situations on allotments. Proper implementation of these specific adaptive management actions based on careful evaluation of monitoring feedback will assure that desired conditions are eventually reached. The following discusses specifically how the adaptive management alternative will be used on allotments to reach desired conditions.

Devils Hole Allotment – Water availability is the limiting factor for proper livestock grazing management on the allotment. Additional earthen ponds and well developments will greatly improve cattle distribution across the allotment. This will allow for better use of hydro-axe project areas in the Reed Gulch and Mud Springs Pastures which have had a significant increase in forage production. Additional water developments, relocating of tanks out of riparian areas, and implementing specific adaptive management measures when needed for the South Wylie and Reed Gulch areas will help insure willow and cottonwood regeneration will continue and also allow for conditions necessary for the establishment of willows and cottonwoods in North Wylie Gulch. By improving livestock distribution, the cover of native grass species would be increased and bare ground would be reduced in the Blue Springs, Black Mountain, and North Wylie Gulch Pastures. Flexibility in the grazing season would allow for crested wheat grass areas in the Mud Spring pasture to be grazed early in the season in order to improve the cover of Arizona Fescue, Mountain Muley, and June grass species. The management actions initially implemented in this alternative along with implementing proposed adaptive management actions when needed will maintain the allotment in an upward trend and reach desired conditions.

Indian Creek/Lakes Allotment

The adaptive management alternative will improve on current management which has already maintained an excellent overall vigor, vegetative composition, and litter cover on the allotment. The adaptive management alternative will allow for flexibility in the timing, intensity, and duration of grazing which will provide options to reduce the cover of introduced smooth brome and timothy in the Tracy Canyon Pasture and allow native grass species to become established. Flexibility in the grazing season will allow more opportunities for the Indian Creek Trailhead area to be grazed during different times in order to avoid livestock/ recreational use conflicts during the 4th of July period. Grazing this area other than during the 4th of July period will allow for better distribution when cattle are in the Indian Creek Pasture.

In the Bonnet Park Pasture developing a water source in the uplands on the north end of the park will reduce time cattle spend in riparian areas. Flexibility in the season of use will allow for the pasture to be grazed early in the season when forage preferences of cattle do not favor willows. By initially implementing these management actions in the Bonnet Park Pasture and if needed other adaptive management options like reducing the time cattle spend in the pasture and possible fencing of riparian areas, more willow regeneration on the north end of the pasture and maintenance of the cover of sedges and rushes in riparian areas will occur.

Newlin Allotment

From 1961 to 2001 when the allotment was stocked, management has allowed for healthy riparian and upland vegetation to occur on the majority of the allotment. Under this alternative when the allotment is re-stocked, there will be additional improvement over management because of implementation of initial management actions. Construction of additional earthen ponds in Pastures 1 and 2 will assist in improving distribution of cattle across the pastures. Installing of cattle guards between pastures on Forest Service Road 274 will help insure that an efficient grazing rotation is implemented. Constructing fence to exclude cattle out of the Lion Canyon area will allow for the willow component to improve and decrease the amount of bare ground.

Implementing initial management actions and having the flexibility to adapt to changes will help to maintain and improve upland and riparian areas on the allotment. The composition of native grasses, residual vegetation, and the vigor of plants would be maintained and the apparent upward trend of vegetation on the allotment will continue. This alternative will also allow for riparian areas to improve so that mid-seal or higher conditions on the allotment would be achieved. Since the allotment has not been stocked for several years, it is important that grazing use especially be evaluated carefully during the first few years of grazing to determine if adaptive management actions will need to be applied.

Ophir Allotment

Current management has already made significant progress in improving areas which have had resource problems from historical grazing use on the allotment. Along with the currently successful rest-rotation grazing system and management options provided with the use of the permittees adjacent private lands, the adaptive management alternative will provide flexibility in the timing, intensity, and frequency of grazing use. This will allow for continued improvement in areas of concern, as well as maintaining excellent vegetative conditions in the majority of upland and riparian areas. This flexibility will allow for an increase in the rate of establishment of native grass species and reduction of undesirable forbs in the Mountain Meadows and Government Trap areas by limiting the number of days in pastures and providing for more frequent rest of the pastures. Limiting days in pastures or rest is especially important during drier years when grazing effects on grasses are potentially greater.

In the Deer Peak and Government Trap pastures where historically heavy browsing of willows has occurred, establishment and regeneration of different age classes of willows will continue to improve but at a faster rate than under the current management alternative because of flexibility in the timing

and duration of grazing use. Avoidance of grazing use during the fall months will be able to occur more frequently and allow for pastures to be grazed early in the grazing season when willows are less palatable and livestock prefer the more palatable grasses. This will minimize utilization of willows and allow for increased regeneration. There will also be more flexibility to use these pastures for fewer days which will help in willow establishment.

Proper monitoring and implementation of adaptive management options if necessary will, allow the apparent upward trend in upland and riparian areas on the allotment to continue until desired conditions are achieved.

Pantleon Allotment

Historically a continuous grazing system had been used on the allotment which resulted in a reduction in the willow component in North Pantleon Creek. In the last seven years, a three pasture deferred grazing system has been used. This was not successful because of the small size of the allotment and cattle could not be controlled properly with natural barriers and salting and riding. This resulted in proper rest or deferment not being given to uplands and riparian areas during the grazing season. By implementing the adaptive management alternative, a more efficient grazing system used in conjunction with the permittees private land and the Pantleon Allotment will provide the needed flexibility to control frequency, intensity, and timing and allow opportunity for growth of forage plants in order to meet physiological needs of forage species. By meeting physiological needs of the main forage species on the allotment, (Arizona fescue and needle – and – thread), the cover and vigor of these upland grasses will be maintained.

In management of riparian areas, the adaptive management alternative provides important advantages compared to present management. These advantages will help achieve desired conditions in the North Pantleon Creek riparian areas at a faster rate. Under this alternative the existing tank which is located in the North Pantleon Creek riparian area will be moved to an upland area which will help to lessen the amount of time cattle spend in the riparian area. Limiting the total use on the allotment to thirty days or less and having the flexibility to graze the allotment before July 1, will provide for improved willow regeneration in order to establish a diversity of willow age classes. Implementation of an efficient grazing system will allow riparian areas to be grazed at different times every year. Limiting fall grazing on the allotment will help willow and alder species in the North Pantleon Creek riparian area to become established. Fencing will be constructed around spring sources which will protect vegetation and the ground around the spring from grazing impacts under this alternative.

Under this alternative initial management actions and the implementation of an efficient grazing system combined with use of adaptive management options if necessary, will allow for good vegetative conditions in uplands to continue. This will also allow for improvement of riparian vegetation in the North Pantleon Creek riparian area until desired conditions are achieved.

West Peak Allotment

Only ten percent of capable National Forest grazing lands on the West Allotment are part of natural grazing unit with the permittees leased and private lands under an On-Off Term Grazing Permit. Under present management grazing of National Forest lands on the West Peak Allotment with leased/private lands has maintained good composition and high vigor of native grass species. The

adaptive management alternative will allow for added flexibility in the season of use as well as providing for the installation of range improvements if needed in order to maintain good vegetative conditions in uplands.

The upper White Creek area is comprised mostly of private lands and there are small sections of the stream reach that are on the National Forest. Historically cattle have overused this riparian area. Because of this there is no continuous woody species community, limited willow regeneration, and poor cover of aquatic species. Under present management this area has improved but not at the desired rate. It is more difficult to implement management actions on this allotment compared to other allotments because of private lands ownership. The adaptive management alternative will help achieve desired conditions in the upper White Creek riparian area at a faster rate than under present management. Under this alternative the Forest Service will work with the permittee to locate potential water developments on private lands outside of the riparian area. This will lessen the amount of time cattle spend in the riparian area. Limiting the total use in Cuchara Pass Unit to thirty days or less and having the flexibility to graze this unit early in the grazing season will provide for improved willow regeneration in order to establish a diversity of willow age classes and improve cover of other aquatic species in upper White Creek. The adaptive management alternative will allow flexibility for riparian areas to be grazed at different times ever year. Limiting fall grazing in the Cucharas Pasture Unit will allow willow species in the upper White Creek to riparian area to become established.

White Creek Allotment

Current management has allowed for healthy upland and riparian conditions to occur on the allotment by utilizing the permittees adjacent private lands in an efficient grazing rotation. The adaptive management alternative will provide for even more flexibility in the timing, intensity, and frequency of grazing use. In addition the implementation of proposed adaptive management actions when needed will provide for the cover of native grasses, diverse age classes of woody vegetation, and willow regeneration to be maintained on the White Creek Allotment.

Williams Creek/Greenhorn Allotment

Under the present management alternative much improvement in resource conditions has been made. Current management has maintained the majority of upland areas on the allotments in a static or upward trend. However, historically there have been distribution problems in certain areas of the allotment which had resulted in undesirable resource conditions. These areas, which include some riparian areas, have improved under current management. Under the adaptive management alternative there will be substantial improvement over present management because of implementation of initial management actions. The adaptive management alternative will allow for desired conditions to occur at a faster rate.

Under the adaptive management alternative with the implementation of a more efficient grazing system and use of adaptive management actions when necessary, the cover and vigor or upland grasses will continue to be improved and maintained. Under the adaptive management alternative, fencing the northern and southern pastures of the allotment with permanent fence as well as using a combination of permanent and electric fence to establish new pastures will allow

for much better control of grazing use and allow for a more efficient seventeen pasture rest-rotation grazing system to be implemented. This grazing system will allow for more flexibility in timing, intensity, and frequency of grazing use than the present management alternative. Two new lower elevation grazing pastures would be created. In addition the grazing capacity of these pastures would be increased by adding 1,335 acres of the permittees private land to the pasture grazing area. Three lower elevation pastures would allow for higher wetter elevation pastures to be grazed later in the grazing season when conditions are drier. The new grazing system would allow pastures especially those with large amounts of mesic meadow riparian areas to be rested more frequently. Careful monitoring and evaluation of new pasture electric pasture division fences will be needed to determine if these fences are in the proper location and not creating any new resource problems before permanent fence is constructed.

Because of the large size of the allotment areas, the development of a cow camp facility in the East Williams Pasture will allow for more efficient management of grazing use. Proper implementation of a seventeen pasture intensive management grazing system will require construction of several miles of new fence, installation of electric fence and water developments, and maintenance of existing improvements. More frequent moving of cattle will be required than under present management because more pastures will be used in the rotation. Access from the Permittee's ranch to high elevation pastures on the allotment is time consuming because of traveling distances on rough roads. Under present management camping trailers have been used by fencing crews and riders to stay in but and have not been adequate to address needs. In the past camping trailers have been vandalized. Secured storage facilities are needed on the allotment to store salt, tack, and equipment safely. The cow camp facility will provide a cabin for lodging of fencing crews and riders. The cow camp facility will provide an area to park camping trailers during times when more fencing personnel and riders are needed. The cow camp facility will provide for safe storage of tack, equipment, and salt.

Even though the Horse Pasture is a small area (17.8 acres), grazing use would be managed similar to larger pastures on the allotment. Implementation of a three pasture deferred rotation grazing system will help maintain the current cover and vigor of vegetation in pasture. Because the Horse Pasture is an area of concern, specific adaptive management actions have been developed for this area. Monitoring of grazing use in the Horse Pasture is critical in order to determine when the necessary adaptive management actions will need to be implemented. If adaptive management actions are implemented when needed healthy vegetative conditions will be maintained in the pasture. This is important because impacts from grazing use in the Horse Pasture will occur faster than in larger pastures.

Under the proposed action the St. Charles Pasture boundary would be modified to include riparian areas on North Bear Creek and St. Charles Creek that are not at desired conditions due to historical grazing use. The St. Charles Pasture would be grazed as a riparian pasture which would provide better control of grazing use in order to achieve riparian area objectives. Fencing all of the St. Charles and North Bear Creek riparian areas together in the St. Charles Pasture would allow maximum flexibility in timing, frequency, and intensity of grazing use to reach desired conditions and allow for desired conditions to be reached at a faster rate than under present management. A more efficient grazing system will provide for the pasture to be grazed

at different times of the year. Limiting the use of this pasture in the fall will help willow species to become established. This alternative provides for the development and relocation of water sources in upland areas which will help grazing distribution and lessen the time cattle spend in riparian areas. Under this alternative a six inch residual stubble height criteria will be used for riparian herbaceous vegetation in the St. Charles Pasture to reduce the risk of browsing on willows and limit trampling impacts in riparian areas.

Because the St. Charles and North Bear Creek are areas of concern on the allotment, specific adaptive management actions have been developed which will help reach desired conditions. Monitoring of grazing use in these areas will be critical in order to determine if or when the necessary adaptive management actions will need to be implemented. Implementation of initial management actions in these areas along with use of adaptive management actions when needed will allow for healthy riparian vegetation conditions and healing of stream banks to continue until willow components are in an upper mid seral stage.

New fencing under this alternative will form the Greenhorn, Millset, and Snowslide pastures. Under this alternative the current allotment boundary will be modified in order to fence the Blue Lakes area out of the allotment. Fencing out of the Blue Lakes area will eliminate livestock /recreational conflicts and improve cattle distribution. Forming of new pastures will allow for areas to be grazed more efficiently than under present management. This grazing system will allow for greater flexibility in the timing, intensity and frequency of grazing use. Since the majority of the capable areas in the pastures are located in higher elevation riparian/mesic meadow areas which are sensitive to grazing impacts, appropriate responsiveness to management will be provided under this alternative. This alternative will allow for pastures areas to be grazed later in the grazing season when impacts on these high elevation riparian areas can be minimized.

With a more efficient grazing system being implemented under this alternative there will be more opportunities to provide total rest in these pastures or reduce the number of days cattle use these pastures than in the past. This will help to maintain stream banks and allow for a healthy regenerating willow component. Under this alternative initial management actions will provide for the development of four additional water sources in upland areas which will improve grazing distribution and lessen the time cattle spend in riparian areas. Under this alternative a six inch residual stubble height utilization criteria will be used for riparian herbaceous vegetation in pastures. This utilization criterion will help to reduce the risk of browsing on willows and limit trampling impacts in riparian areas.

Under this alternative implementation of initial management actions in the Greenhorn, Millset, and Snowslide Pastures will allow for continued maintenance and improvement of riparian vegetation and stream bank healing to occur, especially in the Cisneros and Greenhorn Creek areas. Application of specific adaptive management actions developed for these pastures when needed will allow for desired conditions to be achieved at a faster rate than under the present management alternative.

This alternative will allow for forming of the Cisneros Pasture area. Under the adaptive management alternative the Cisneros Pasture will include upland areas and a small riparian area north of the Pole Creek Trailhead which has been recovering from historical heavy grazing use.

The adaptive management alternative will allow these areas to recover at a faster rate than under present management. Forming of the Cisneros Pasture will allow these areas to be grazed more efficiently than under the present management by allowing for more flexibility in management to reach desired conditions. This alternative will provide for the construction of a stock driveway which would improve distribution of grazing use. The stock driveway would allow for easier movement of livestock to upland areas in the northeast portion of the Cisneros Pasture and would lessen the time cattle spend in the Pole Creek upland and riparian areas of concern.

Since the Pole Creek upland and riparian areas are already improving under present management, the adaptive management alternative will continue to provide for reduction in bare ground and improvement in cover and vigor of native herbaceous species as well as restoration of the riparian area vegetation to a mid-seral stage but at a faster rate than under present management. Specific adaptive management actions developed for this alternative especially those actions which deal with grazing impacts from new fence locations will help to achieve desired conditions.

The Beaver Creek Pasture is another area of concern on the Williams Creek/Greenhorn Allotment. Under the adaptive and present management alternatives, the Beaver Creek Pasture would be grazed as a riparian pasture and would only be grazed only during drier years. Under the adaptive management alternative there would be more flexibility and responsiveness to management of grazing use so continued improvement of vegetation in the Amethyst and Beaver Creek riparian areas would occur at a faster rate than with present management. In addition adaptive management actions which have been developed specifically for the Beaver Creek Pasture will provide for desired conditions to be achieved at a faster rate than under present management.

Cumulative Effects Common to All Allotments

Population growth in and around the project area has led to greater numbers of forest users. Unauthorized OHV and motorcycle use negatively impacts environmental conditions in some riparian areas. Social trails and semi-permanent camping areas are developing along some creeks as well. These actions may have an overall negative effect on the integrity of rangeland and riparian ecosystems by trampling/weakening the vegetation, compacting the soil and creating ruts and bare ground across portions of upland, transition and riparian zones. Recreation activities also impact management by interfering with livestock distribution, breaching fences, and so forth.

Past timber management practices in some areas have had a positive effect on promoting herbaceous conditions through increased understory vegetation production and stimulation of a variety of herbaceous species primarily in the uplands. Possible future timber sales in some of the allotments could increase areas of grass production and improve rangeland health by opening up the overstory and invigorating grass production. Increased ground cover protects soil resources from erosion and high temperatures. Increased herbaceous vegetation has a positive effect on riparian and water conditions creating favorable habitats for all types of terrestrial and aquatic life.

The exclusion of fire (both wild and prescribed) has a measurable effect on rangeland extent quality and health. In the last sixty years upland areas in the SCPA Project Area have been reduced due to conifer encroachment. Many of the rangeland communities are adapted to fire. In the absence of fire, many areas not accessible to livestock grazing have had long intervals of no disturbance to rejuvenate plant growth. This has resulted in reduced health and vigor in vegetation.

Past fuel reduction projects (hydro-axe and prescribed fire) and timber management practices in the project area have reduced conifer encroachment. These projects have had positive effects in upland areas by increasing forage production and improving herbaceous cover in these areas.

Increases in elk population numbers have a significant effect on herbaceous vegetation. The dietary overlap between elk and livestock is similar. Grazing management of forage by the Forest Service takes wildlife grazing use into consideration. Management of elk numbers is under the control of the Colorado Division of Wildlife.

Cumulative Effects - Alternative A: No Action - No Livestock Grazing

Under this alternative, the absence of livestock grazing would no longer contribute to any cumulative effects within the project area. As riparian areas improve, the cumulative effects of other activities may have less of an impact on streams and watershed health.

The elimination of permitted grazing may have some unintended cumulative effects if recreation increases due to the removal of livestock. An increase in OHV and ATV use, especially in and around riparian areas would negatively impact associated vegetation and soils which in turn contribute directly to the health of riparian and water resources. As plants and soils are lost, stream incision and water table depression could result.

Cumulative Effects - Alternative B: No Change - Livestock Grazing with Current Management

Livestock grazing under this alternative would continue and, along with other uses, could potentially increase any adverse cumulative effects already occurring. Improper livestock grazing along certain riparian areas reduce the riparian vegetation and decrease the plants ability to hold the soil as the stream widens. This effect can be compounded by roads adjacent to the riparian areas, OHV use in riparian areas, and recreational camping in those same riparian areas. Concentrated use by elk can have some of the same effects.

As recreation and private land development continues to increase, so will the associated impacts to watershed health and water quality. Population growth in and around the project area will result in a greater number of forest users. Unauthorized OHV and motorcycle use already impact many of the riparian areas. In addition to livestock grazing, these actions may have an overall negative effect on the integrity of rangeland and riparian ecosystems by weakening the vegetation and creating ruts and unvegetated scars across portions of the riparian zone.

Timber and fuel reduction projects are planned for the watersheds within the SCPA. Usually, these projects have a short-term negative impact to watershed health; they do provide for long-term benefits to the watershed when implemented properly. Such practices have been shown to improve herbaceous conditions by increasing understory vegetation production and stimulating a variety of herbaceous species. Increased herbaceous vegetation has a positive effect on riparian and water

conditions creating favorable habitats for all types of terrestrial and aquatic life. This increased ground cover also protects soil resources from erosion and high temperatures.

Allotment conditions contribute to overall watershed health. Where no improvements are made, watershed conditions would not improve. Riparian areas that are degraded by grazing may be more susceptible to damage from natural events and anthropogenic influences. As a result, cumulative impacts from other sources may be magnified.

Cumulative Effects - Alternative C: Livestock Grazing Using Adaptive Management

When implemented properly, the proposed adaptive grazing management strategies could help to maintain or improve riparian and stream habitat and upland conditions resulting in overall positive cumulative effects across the project area. Aquatic resources and water quality could also improve. Streams may be healthier and might be able to better withstand the effects from other activities in the watershed.

Current and future fuels management projects will reduce the risk of catastrophic fires and thus reduce the potential for catastrophic sediment delivery over the long-term. Past and on-going restoration efforts within the burn areas, such as closing roads, mulching, and seeding should also reduce erosion and sediment. These efforts combined with managing livestock grazing to improve riparian and stream habitat conditions under the proposed action would have cumulative benefits to the affected aquatic ecosystems within the SCPA of the Arkansas, Huerfano, and Purgatory River basins.

Photo 3-7; Range Staff inspecting the Custer Pasture, Williams Creek Allotment.

3.3 Hydrology

Affected Environment

Williams Creek C&H

The Williams Creek allotment is comprised of 17 pastures totaling approximately 35,300 acres (55.2 square miles). Essentially, this allotment includes 12 pastures which were part of the previous Williams Creek allotment and 5 pastures which were part of the previous Greenhorn Allotment. This allotment is tributary to the following 5th-level watersheds:

- 2.7% tributary to the headwaters of Grape Creek,
- 19.6% tributary to the headwaters of the St. Charles River,
- 72.0% tributary to the Upper Huerfano River, and
- 5.7% tributary to Greenhorn Creek.

For the purpose of this analysis, this allotment will be described by the twelve pastures that comprise the core of the original Williams Creek allotment, and by the five pastures that comprise the Greenhorn portion of the now combined Williams Creek allotment. The 12 pastures are as follow: Back Pasture, Bear Creek, Beaver Creek, Cisneros, Custer, Deer Lick, East Williams, Froze Creek, Horse Ranch, Pole Creek, St. Charles and West Plantation. The five pastures of the Greenhorn portion are: Greenhorn, Lower Turkey Creek, Millset, Snowslide, and Upper Turkey Creek.

While this allotment covers a large land area, the riparian corridors, grasslands and shrublands, collectively referred to as 'open parks' on the original Williams Creek portion of the allotment occupy nearly 9,900 acres. These open parks are the primary areas grazed by livestock, and 82% of the open parks are accessible to livestock. In round figures, 39% of this area is riparian, 50% is grassland, and 11% is shrubland. Open parks on the Greenhorn portion of the allotment occupy nearly 3,200 acres; 2800 of these acres are accessible by cattle. In round figures, 58% of this area is riparian, 32% is grassland, and 10% is shrubland.

Ophir C&H

The Ophir allotment is comprised of 4 pastures totaling approximately 8,800 acres (13.8 square miles). This allotment is tributary to the following 5th-level watersheds:

- 16% tributary to the Hardscrabble Creek,
- 2% tributary to the headwaters of Grape Creek, and
- 82% tributary to the headwaters of the St. Charles.

The four pastures are Burris, Deer Peak, Government Trap and Ophir.

Approximately nine percent (820 acres) of the allotment are open parks, and just over six percent (550 acres) of the allotment is accessible to livestock. These open parks are the primary areas grazed by livestock. In round figures, 49% of this area is riparian, and 51% is grassland.

Devils Hole C&H

The Devils Hole allotment is comprised of 7 pastures totaling approximately 13,200 acres (20.7 square miles). This allotment is tributary to the following 5th-level watersheds:

- 96% tributary to the Upper Huerfano River, and
- 4% tributary to the Huerfano River.

The seven pastures are Black Mountain, Blue Springs, Mud Springs, North and South Wylie, Reed Gulch and Ute Log.

Approximately 53% (7,000 acres) of the allotment are open parks, and 48% (6,300 acres) of the allotment is accessible to livestock. These open parks are the primary areas grazed by livestock. In round figures, seven percent of this area is riparian, 90% is grassland, and three percent is shrubland.

Newlin C&H

The Newlin allotment is comprised basically of 3 pastures totaling approximately 3,900 acres (6.1 square miles). This allotment is tributary to the following 5th-level watersheds:

- 61% tributary to the Hardscrabble Creek, and
- 39% tributary to the Arkansas River-Canon City.

The three pastures are Pasture 1, Pasture 2 and Pasture 4. Nearly 90% of pastures 2 and 4 are tributary to Newlin Creek, a municipal watershed within the Hardscrabble Creek 5th-level watershed.

Approximately 23% (900 acres) of the allotment is open parks, and nearly 15% (570 acres) of the allotment is accessible to livestock. These open parks are the primary areas grazed by livestock. In round figures, 38% of this area is riparian, 56% is grassland, and six percent is shrubland.

Pantleon C&H

The Pantleon allotment is comprised of 3 pastures totaling approximately 3,600 acres (5.7 square miles). This allotment is entirely tributary to the Huerfano River headwaters 5th-level watershed. The three pastures are North End, Middle Tank, and South End.

Approximately 17% (620 acres) of the allotment is open parks, and 12% (450 acres) of the allotment is accessible to livestock. These open parks are the primary areas grazed by livestock. In round figures, 34% of this area is riparian, 49% is grassland, and 17% is shrubland.

Indian Creek C&H

The Indian Creek allotment is comprised of 4 pastures totaling approximately 7,700 acres (12.1 square miles). This allotment is entirely tributary to the Upper Cucharas River 5th-level watershed. The four pastures are Frog Pond, Indian Creek, Sawmill and Tracy.

Twenty-six percent (1,980 acres) of the allotment is open parks, yet only seven percent (540 acres) of the allotment is accessible to livestock. These open parks are the primary areas grazed by livestock. In round figures, 38% of this area is riparian, 28% is grassland, and 34% is shrubland.

Lakes C&H

The Lakes allotment is comprised of 1 pasture totaling approximately 760 acres (1.2 square miles), and this allotment is managed together with the Indian Creek C&H allotment. This

allotment is entirely tributary to the Upper Cucharas River 5th-level watershed. The lone pasture is Bonnet Park.

Just over nine percent (70 acres) of the allotment is open parks, yet only six percent (45 acres) of the allotment is accessible to livestock. These open parks are the primary areas grazed by livestock. In round figures, 78% of this area is riparian, and 22% is grassland.

West Peak C&H

The West Peak allotment is comprised of 5 pastures totaling approximately 9,700 acres (15.1 square miles); a 117 acre parcel was added to Donald Park. This small Donald Park addition was not analyzed. This allotment is 98% tributary to the Upper Cucharas River 5th-level watershed. The five pastures are Bohman, Cuchara Pass, Donald Park, Special Use and White Creek.

Nine percent (840 acres) of the allotment is open parks, yet only four percent (430 acres) of the allotment is accessible to livestock. These open parks are the primary areas grazed by livestock. In round figures, 54% of this area is riparian, 34% is grassland, and 12% is shrubland.

White Creek C&H

The White Cree allotment is comprised of 1 pasture totaling approximately 1960 acres (3.1 square miles). This allotment is entirely tributary to the Upper Cucharas River 5th-level watershed. The lone pasture is White Creek.

Nineteen percent (370 acres) of the allotment is open parks, yet only six percent (120 acres) of the allotment is accessible to livestock. These open parks are the primary areas grazed by livestock. In round figures, 44% of this area is riparian, 8% is grassland, and 48% is shrubland.

Existing Condition

By analyzing the soil surveys, the project area falls into the following climatic zones: subalpine, montane, lower montane, and semi-arid. Table 3-1 summarizes the elevation range, mean annual air and soil temperatures, the number of frost-free days and the monthly occurrence of those frost-free days for each climatic zone.

Table 3-1. Climatic Information, Part 1.

Climatic Zone	Elevation (ft. above MSL)	Air Mean Annual Temp (° F)	Soil Mean Annual Temp (° F)	Frost Free Days (Count)	Frost Free Days (Months)
Subalpine	9,000 to 11,800	34 to 40	32 to 38	30 to 50	July to August
Montane	6,500 to 10,500	36 to 44	34 to 42	50 to 70	Mid-June to mid August
Lower Montane	6,000 to 9,500	40 to 48	38 to 46	70 to 90	Mid-June to mid September
Semi-arid	6,000 to 9,000	48 to 52	46 to 50	90 to 110	Mid-May to mid September

Table 3-2 summarizes mean annual precipitation and snowfall amounts, the dominant rainfall months, and when snowfall begins and ends for different facing slope aspects. Information for these two tables was compiled from the Wet Mountain and Spanish Peaks Area Soil Survey.

Table 3-2. Climatic Information, Part 2.

Climatic Zone	Mean Annual Precipitation (inches)	Mean Annual Snowfall (inches)	Dominant Months of Rainfall	Snowmelt Begins/Ends	Aspect for Snowmelt
Subalpine	25 to 40	300 to 400	June to August	June – July May - June	North Planar, South
Montane	20 to 30	200 to 300	June - September	June – July May – June April - June	North Planar South
Lower Montane	16 to 25	100 to 200	May - September	May – June April – May Mar. - May	North Planar South
Semi-arid	12 to 16	50 to 100	April – October	Mar. – April Feb. – April Jan. – Mar.	North Planar South

A further review of climatic data from nearby stations generally support the information provided in these two tables. The average minimum temperature remains above freezing in the months of June, July, August and September. Spring rains occur in the months of April and May. Rainfall drops in the month of June at all nearby stations; the wettest months at each of these stations occur in July and August. Historically at Gardner, less than one-inch each month on average occurred in September and October. Approximately one-inch each month on average occurred in September and October at the Westcliffe station; and approximately one and one-half inch each month on average occurred in September and October at the Rye station.

Using nearby stream gages on the Huerfano River (Huerfano River at Manzanares Crossing near Red Wing, Colorado) and the Cucharas River near the Boyd Ranch, the rising limb of the hydrograph begins in the middle of April, peaks in early June, and recedes to baseflow conditions generally by mid-October. The stream gage on the Huerfano River was active for the water years 1923 through 1982; this gage was activated again in water year 1995, and from water year 1997 to the present. While data since the 1995 water year hasn't been analyzed, the earlier data was. Droughts occurred in the following years: 1950-1956, 1962-1964, and from 1974-1976. This gage along with other drought information can be used to help monitor hydrologic conditions on these allotments. There is a desire to construct a gauging station above Lake Isabel on the St. Charles River. If such a gage is installed, it too could be used to also monitor hydrologic conditions.

As previously mentioned, soil surveys were used to identify the climatic zones for the project area. These surveys were also used to identify the ecological land units, soil composition, depth to water table, permeability, and runoff potential; they also provide other relevant information on soil properties and qualities. Complete soils information can be obtained from the Wet

Mountains and Spanish Peaks Area Soil Survey; this survey covers all the allotments except for Pantleon. See the Sangre de Cristo Mountain Area Soil Survey for soils information on the Pantleon allotment. Also, see the Soils Report for additional soils information.

Williams Creek

Of the accessible acreage on the original Williams Creek portion of the allotment, 40% occurs in the subalpine, 39% occurs in the montane, 18% occurs in the lower montane and two percent occurs in the semi-arid climatic zones. The Beaver Creek, Cisneros, Custer, Froze Creek, and St. Charles pastures occur mostly in the subalpine climatic zone; Beaver Creek and St. Charles are entirely within the subalpine climatic zone. Back, Deer Lick and East Williams occur mostly in the montane climatic zone. Nearly equal amounts of the Bear and Pole Creek pastures occur in the subalpine and montane climatic zones, and nearly equal amounts of the Horse Ranch pasture occur in the montane and lower montane climatic zones. Eighty-eight percent of the West Plantation pasture occurs in the lower montane zone with the balance occurring in the semi-arid climatic zone.

Of the accessible acreage on the Greenhorn portion of the allotment, 84% occurs in the subalpine, 6% occurs in the montane, 4% occurs in the lower montane and 6% occurs in the semi-arid climatic zone. The Greenhorn, Millset, Snowslide and Upper Turkey Creek pastures occur mostly in the subalpine climatic zone; Millset and Snowslide are entirely within the subalpine climatic zone. Thirty-nine percent of the Lower Turkey Creek pasture is within the lower-montane zone and 55% of this pasture occurs in the semi-arid climatic zone.

The accessible open park within the subalpine zone is mostly underlain by soil map units 100F, 610G and 701M. Parent material of 100F is comprised of alluvium and slope wash; this soil map unit is wet and it supports riparian communities. Parent material of 701M is comprised of colluvium and residuum; this soil unit is drier and supports the subalpine fir and Engelmann spruce ecological unit. Parent material of 610G is comprised of glacial till and fluvial valley fill; this soil unit is also drier and it too supports the subalpine fir and Engelmann spruce ecological unit.

A large percentage of the open park within the subalpine zone is mesic meadows, riparian shrub complex and upland grasses associated with riparian; this holds true on the Greenhorn pastures yet alpine shrub complex appears due to the increase in elevation. These areas tend to be wet, year-round based on field observations. These riparian communities, as previously stated are underlain by soil map unit 100F (71% of accessible pasture in subalpine). As these soils are subject to compaction and rutting in wet areas, not surprisingly soil disturbance was observed in many places in these riparian, subalpine pastures. The interdisciplinary team (IDT) identified the following special areas of concern:

- Beaver Creek Pasture
- St. Charles Pasture
- Horse Pasture (cow camp) within East Williams Pasture
- Cisneros Pasture near Pole Creek Trailhead
- Millset, Greenhorn, Snowslide Pastures

Soil disturbance was also noted at two locations in N. Fork Bear Creek on soil map unit 701M.

Photo 3-8; Amethyst Creek, Beaver Creek pasture, Williams Creek Allotment.

Within the Beaver Creek pasture, the majority of livestock impacts to date occur on the South Fork and main stem of Amethyst Creek (above Marion Lake); approximately 30% of the stream reach (1400 of 4800 feet) and 30 acres of mesic meadow have been negatively impacted. This area is recovering nicely as the pasture hasn't been used over the last few years. One watershed improvement project was done on the South Fork of Amethyst Creek; and other improvement projects on this reach could be done, if needed. Evidence of pedestalled plants and hummocky ground occurs on 15 acres of mesic meadow between the Beaver Creek and Amethyst Creek drainages. No adverse cattle effects presently exist on Beaver Creek and only one small disturbance was noted on North Fork Amethyst Creek. A recent two-track scar was created (because of saturated soils) along Beaver Creek within the pasture, yet this was not livestock related.

North Fork Bear Creek and St. Charles Creek drain significant portions of the St. Charles pasture. The headwaters of St. Charles Creek also drain the easternmost portion of the East Williams Creek pasture. Within the East Williams Creek pasture approximately 30% of the stream reach (1000 of 3500 feet) and 25 acres of mesic meadow have been negatively impacted. Approximately 40% of St. Charles Creek (2350 of 5600 feet) and 50 acres of mesic meadow within the St. Charles pasture have been negatively impacted. Approximately 80% of N. Fork

Bear Creek (5760 of 7200 feet) and 50 acres of mesic meadow within the St. Charles pasture have been negatively impacted.

The proposed horse pasture (cow camp) has not been negatively impacted to date. The mesic meadow associated with this pasture was the reason the ID team identified it as an area of concern.

Approximately 30 acres in the vicinity of the Pole Creek trailhead have been negatively impacted from livestock. Twenty of these acres exist in the Cisneros pasture, and ten acres exist in the Snowslide pasture. These acres are tributary to the South Fork St. Charles Creek.

As previously mentioned the Millset, Greenhorn and Snowslide pastures were also identified as special areas of concern due to their mesic conditions. Within the Snowslide pasture, approximately 30% of the West Fork Cisneros Creek (1200 of 4200 feet) and 40 acres of mesic meadow on the west side of the creek have been negatively impacted. Approximately 20% of North Fork Greenhorn Creek (900 of 4500 feet) and 25 acres of mesic meadow within the Millset pasture have been negatively impacted. Less than 5 acres have been negatively impacted within the Greenhorn pasture which is likely related to the amount of use it has received in the past.

The accessible open park within the montane zone is mostly underlain by soil map units 101F, 702M and 703M. Parent material of the 101F is comprised of alluvium; as expected this soil map unit is also wet and it supports riparian communities. Parent material of 702M is comprised of colluvium and residuum; this soil unit is drier and supports the Thurber fescue and Parry oatgrass ecological unit. Parent material of 703M is same as 702 but includes some slope wash; this soil unit is also drier and it supports the aspen and subalpine fir ecological unit.

Soil disturbance was noted at a few locations underlain by soil map unit 702M. One location is of a headcut in the Custer pasture near the Pole Creek Trailhead. The others were in the East Williams pasture and are cattle trail and cattle trail/road related.

The mesic meadows, riparian shrub complex, and upland grasses associated with riparian account for the majority of the riparian vegetation in the montane climatic zone, too. Aspen riparian stringers are also significant in this climatic zone. Limited hydrology surveys were conducted in these riparian communities.

The accessible open park within the lower montane zone is mostly underlain by soil map units 102F, 520M, 715M and 716M. Parent material of the 102F is comprised of slope wash and alluvium. This map unit is obviously drier than 100F and 101F, yet can be wet in places; this soil map unit supports the blue gramma and needlegrass ecological unit. Parent material of 520M is comprised of slope wash and residuum; this soil unit is drier and also supports the blue gramma and needlegrass ecological unit. Parent material of units 715M and 716M is comprised of residuum, and they both are also drier and support the pinyon pine, ponderosa pine and Gambel oak ecological unit.

When moving down in elevation (hotter and drier), roughly one-third of the riparian community is comprised of mesic meadows, riparian shrub complex and upland grasses associated with riparian. Aspen riparian stringers are still important; cottonwood stringers also appear and are important, as well. No hydrology surveys were conducted in this climatic zone.

The accessible open park within the semi-arid zone is predominantly underlain by soil map unit 524M. Parent material of 524M is comprised of slope wash and residuum; this soil map unit is dry and it supports the pinyon pine and blue gramma ecological unit.

Riparian shrub complex, cottonwood, aspen and evergreen riparian stringers dominate in this climatic zone. No hydrology surveys were conducted in this climatic zone.

Ophir C&H

Of the accessible acreage on the Ophir allotment, 33% occurs in the subalpine, and 67% occurs in the montane climatic zone. The Burris, Deer Peak and Government Trap pastures occur mostly in the montane climatic zone; Burris and Government Trap are entirely within the montane climatic zone. The Ophir pasture occurs mostly in the subalpine climatic zone.

The accessible open park within the subalpine zone is mostly underlain by soil map units 100F and 701M. Parent material of 100F is comprised of alluvium and slope wash; this soil map unit is wet and it supports riparian communities. Parent material of 701M is comprised of colluvium and residuum; this soil unit is drier and supports the subalpine fir and Engelmann spruce ecological unit.

Approximately 63 acres of riparian vegetation underlain by 100F occurs in the Ophir pasture. Fifty-three percent of this vegetation is comprised of mesic meadow and riparian shrub complex. The Ophir-Gardner road occupies much of this riparian corridor.

The accessible open park within the montane zone is mostly underlain by soil map units 101F, 702M and 703M. Parent material of the 101F is comprised of alluvium; as expected this soil map unit is also wet and it supports riparian communities. Parent material of 702M is comprised of colluvium and residuum; this soil unit is drier and supports the Thurber fescue and Parry oatgrass ecological unit. Parent material of 703M is same as 702 but includes some slope wash; this soil unit is also drier and it supports the aspen and subalpine fir ecological unit.

Riparian vegetation (197 acres) underlain by 101F is present in each pasture; the majority occurs in the Deer Peak pasture. Thirty-five percent of this acreage is mountain grassland, 45% is mesic meadow, riparian shrub complex and upland grasses associated with riparian, and 20% is aspen and evergreen stringers. With the high water table associated with soil map unit 101F, soil disturbance was observed at the following range photo points: OCDP-P2, OCDP-P3, and OCDP-P5; a small headcut on the side drainage and a road-stream crossing disturbance in Mountain Meadow (overall 5 of 35 acres within meadow negatively impacted) were also observed within this soil unit. Per notes from range file, Little Froze Creek (flows through Mountain Meadow) is in much better condition when compared to historic photos. Young willows are beginning to establish on the lower end of the meadow. Mountain Meadow was identified as a special area of

concern by the IDT. A stream/riparian survey was conducted on Little Froze Creek by the hydrologist.

Devils Hole C&H

Of the accessible acreage on the Devils Hole allotment, 95% occurs in the lower montane and 5% occurs in the semi-arid climatic zone. With the exception of the South Wylie pasture, all pastures are predominantly in the lower montane climatic zone. Black Mountain, Mud Springs and Ute Log are entirely within the lower montane climatic zone. Fifty-three percent of the South Wylie pasture is in the lower montane while the balance of the pasture is in the semi-arid climatic zone.

The accessible open park within the lower montane zone is mostly underlain by soil map units 102F, 520M, and 521M. Parent material of the 102F is comprised of slope wash and alluvium. This map unit is obviously drier than 100F and 101F, yet can be wet in places and it does support riparian communities. This soil map unit supports the blue gramma and needlegrass ecological unit. Parent material of 520M is comprised of slope wash and residuum; this soil unit is drier and also supports the blue gramma and needlegrass ecological unit. Parent material of 521M is comprised of slope wash and valley till, and this map unit is also drier and supports the ponderosa pine ecological unit.

As one would expect in this climatic zone, the riparian occurs as narrow stringers along the predominantly intermittent and ephemeral channels. Nearly 20% of the open park is underlain by soil map unit 102F. Of this acreage, 86% is mountain grassland, 3% is mountain shrubland, one percent is aspen/evergreen stringers, two percent is cottonwood, and eight percent is mesic meadow, riparian shrub complex and upland grasses associated with riparian. Eighty-five percent of this acreage occurs in the Mud Springs, North and South Wylie and Reed Gulch pastures.

Because of the limited availability of water, many of the water developments occur in or near these narrow, riparian corridors. Forty-three water developments occur within the allotment; thirty-one occur in the Mud Springs, North and South Wylie and Reed Gulch pastures. The range summary for this allotment provides a good description of these developments and their condition. As cattle tend to congregate in North and South Wylie Gulch and Reed Gulch pastures, they were identified as areas of concern by the IDT. No stream/riparian surveys were conducted by the hydrologist.

The accessible open park within the semi-arid zone is predominantly underlain by soil map unit 524M. Parent material of 524M is comprised of slope wash and residuum; this soil map unit is dry and it supports the pinyon pine and blue gramma ecological unit.

Newlin C&H

Of the accessible acreage on the Newlin allotment, 100% occurs in the montane climatic zone. The accessible open park within the montane zone is mostly underlain by soil map units 101F, 702M and 710M. Parent material of the 101F is comprised of alluvium; as expected this soil map unit is also wet and it supports riparian communities. Parent material of 702M is comprised of colluvium and residuum; this soil unit is drier and supports the Thurber fescue and Parry

oatgrass ecological unit. Parent material of 710M is slope wash and residuum; this soil unit is also drier and it supports the white fir and Douglas fir ecological unit.

Thirty-eight percent of the accessible acreage is underlain by soil map unit 101F, thus riparian in nature. Eighty-two acres are comprised of mesic meadow, riparian shrub complex and upland grasses associated with riparian; the other 62% is comprised of aspen and evergreen stringers.

When compared to historical photos, the overall condition of the allotment is considerably better than in the 1940's through 1960's. Historically, the allotment had problems with sheet erosion, yet native vegetation has made a good comeback, and good ground cover exists over much of the allotment. A few small headcuts are being monitored by the range staff (NCU1-P2). A review of photos from NCU2-P1 show recovery of disturbed side slopes with some bare ground still evident. Wild ungulate related impacts (bank trampling and browsed willows) were observed in the E-type channel in the bottom of Newlin Creek during the IDT visit. The allotment has been vacant since 2002.

Five ponds currently provide water on the allotment. Two ponds each exist in Pastures 2 and 4, and one pond exists in pasture 1. The spring development/tank at the end of the road in Pasture 2 and in Lion Canyon was not functioning; they are not in the improvement database.

<u>Pantleon C&H</u>
Of the accessible acreage on the Pantleon allotment, 100% occurs in the montane climatic zone The accessible open park within the montane zone is mostly underlain by soil map units 440M, 630M, 815G and 825G. Parent material of the 440M is comprised of alluvium and colluvium; this soil map unit is wet and it supports riparian communities. Parent material of 630M is comprised of colluvium; this soil unit is drier and supports the white fir/Douglas fir/common juniper ecological unit. Parent material of 815G is glacial moraine; this soil unit is also drier and it supports the Parry Oatgrass ecological unit. Parent material of 825G is also glacial moraine; this soil unit is also drier and it supports the white fir ecological unit.

Aspen stringers account for over 90% of the riparian vegetation in this allotment, all of this is accessible to livestock. Most of the aspen stringers are underlain by soil map units 440M (North End Pasture only) and 630M (all pastures); the former has a high erosion hazard and the later a moderate erosion hazard. Again, riparian acreage accounts for 34% of the open parks. The Parry Oatgrass ecological unit accounts for 55% of the open parks; this unit occurs in the Middle Tank and South End Pastures.

Past use on the allotment was season-long and continuous. This resulted in overgrazing, and it created some resource concerns (gullying and limited riparian) on the North Fork of Pantleon Creek. A large headcut still exists on a southerly exposed drainage to this creek; this was likely the result of combined effects of an unimproved, two-track road and grazing. The range staff has seen this area improve over the last five years. A range, cross-section composition monitoring point, PLSE-X1 exists on this creek. This area in the South End Pasture was identified as a special area of concern by the IDT.

Indian Creek C&H

Of the accessible acreage on the Indian Creek allotment, 27% occurs in the subalpine, 23% occurs in the montane, and 50% occurs in the lower montane climatic zone. The Frog Pond pasture is 69% subalpine with the balance equally divided between the montane and lower montane climatic zones. The Indian Creek pasture is nearly equally divided between the subalpine and lower montane climatic zones. Twenty-eight percent of the Sawmill pasture is in the subalpine, and 64% of this pasture is in the montane climatic zone. The Tracy pasture is almost entirely in the lower montane climatic zone.

The accessible open park within the subalpine zone is mostly underlain by soil map units 510M and 610G. Parent material of 510M is comprised of residuum and slope wash; this soil unit is drier and supports the subalpine fir and Engelmann spruce ecological unit. Parent material of 610G is comprised of glacial till and fluvial valley fill; this soil unit is also drier and it too supports the subalpine fir and Engelmann spruce ecological unit.

Photo 3-9; Frog Pond pasture, Indian Creek Allotment

The accessible open park within the montane zone is mostly underlain by soil map units 101F, 516M and 702M. Parent material of the 101F is comprised of alluvium; as expected this soil map unit is also wet and it supports riparian communities. Parent material of 516M is comprised of slope wash and residuum; this soil unit is also drier and it supports the white fir and Douglas

fir ecological unit. Parent material of 702M is comprised of colluvium and residuum; this soil unit is drier and supports the Thurber fescue and Parry oatgrass ecological unit.

The accessible open park within the lower montane zone is mostly underlain by soil map units 102F, 103F, 505M, 506M and 529M. Parent material of the 102F is comprised of slope wash and alluvium. This map unit is obviously drier than 100F and 101F, yet can be wet in places; this soil map unit supports the blue gramma and needlegrass ecological unit. Parent material of the 103F is comprised of alluvium; as expected this soil map unit is wet and it supports riparian communities. Parent material of 505M is comprised of slope wash and residuum; this soil unit is drier and it supports the Gambel oak and snowberry ecological unit. Parent material of 506M is also comprised of slope wash and residuum; this soil unit is drier and it supports the ponderosa pine and Gambel oak ecological unit. Parent material of 529M is comprised of residuum and colluvium, and this map unit is also drier and it too supports the ponderosa pine and Gambel oak ecological unit.

The majority of the riparian acreage on this allotment is comprised of aspen and evergreen stringers. Site visits by the hydrologist to this allotment were limited to IDT visits. The range staff is monitoring a few small headcuts, one in the Sawmill pasture and one in the Tracy Canyon pasture.

Lakes C&H

Of the accessible acreage on the Lakes allotment, 98% occurs in the montane climatic zone. The accessible open park within the montane zone is mostly underlain by soil map units 101F, and 516M. Parent material of the 101F is comprised of alluvium; as expected this soil map unit is wet and it supports riparian communities (80% of the accessible acreage). Parent material of 516M is comprised of slope wash and residuum; this soil unit is drier and it supports the white fir and Douglas fir ecological unit. A closer look at Bonnet Park reveals that 25 acres of the riparian vegetation is mesic meadow and upland grassland associated with riparian, and 10 acres are aspen. Ten acres of grassland occur in the adjacent uplands. Hounds tongue and Canada thistle are present in the park, yet they are being treated. Bonnet Park was identified as a special area of concern by the IDT.

West Peak C&H

Of the accessible acreage on the West Peak allotment, 72% occurs in the subalpine, and 28% occurs in the montane climatic zone. Donald Park and the Special Use unit are entirely subalpine pastures. The Bohman and White Creek units are each 70% subalpine and 30% montane. The Cuchara unit is entirely in the montane climatic zone.

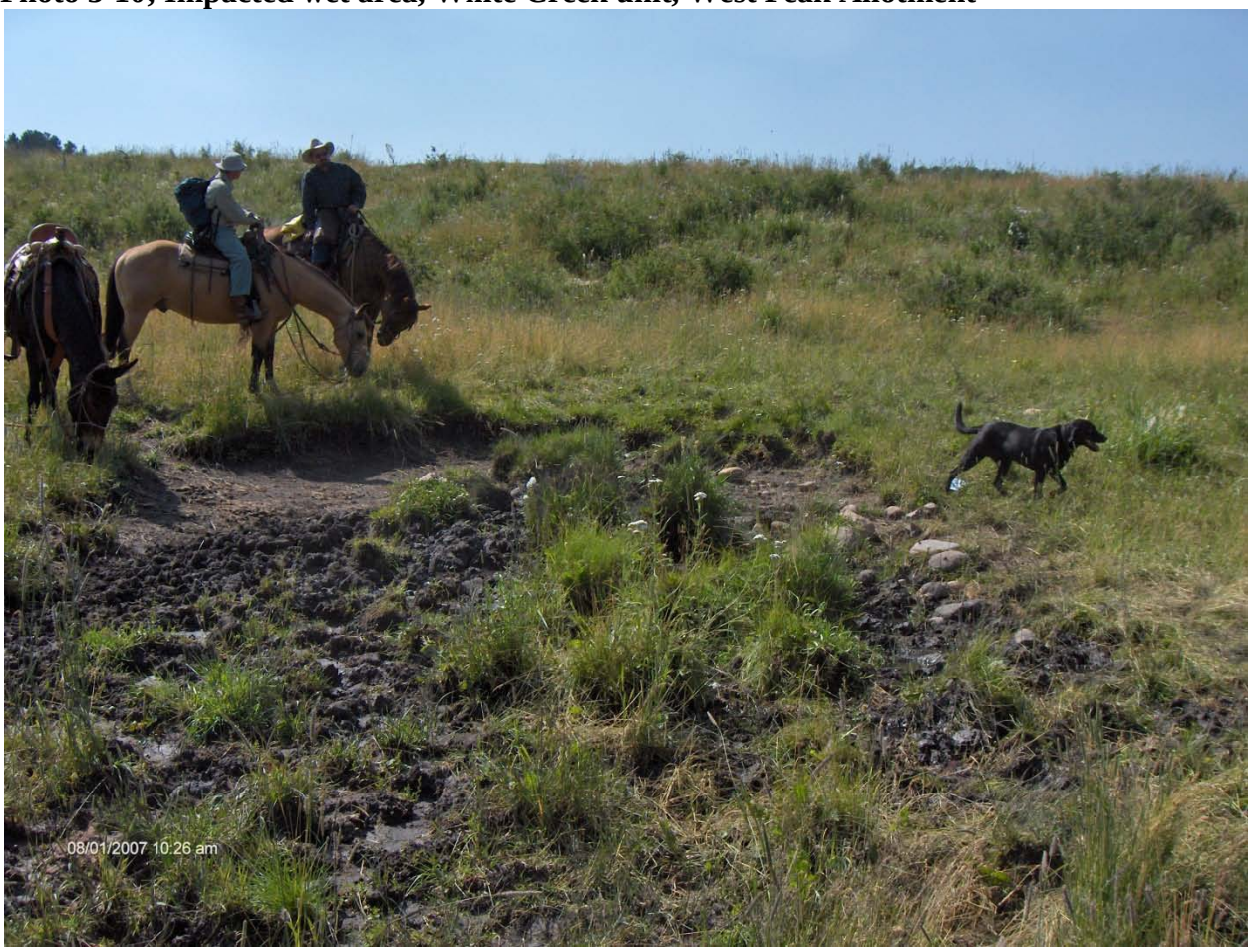
The accessible open park within the subalpine zone is mostly underlain by soil map units 510M and 610G. Parent material of 510M is comprised of residuum and slope wash; this soil unit is drier and supports the subalpine fir and Engelmann spruce ecological unit. Parent material of 610G is comprised of glacial till and fluvial valley fill; this soil unit is also drier and it too supports the subalpine fir and Engelmann spruce ecological unit.

The accessible open park within the montane zone is mostly underlain by soil map units 101F, and 514M. Parent material of the 101F is comprised of alluvium; as expected this soil map unit

is wet and it supports riparian communities. Parent material of 514M is comprised of slope wash and residuum; this soil unit is also drier and it supports the Thurber fescue ecological unit.

The Cuchara Pass Unit and the White Creek Unit within the White Creek drainage were identified as an area of concern by the IDT. Distribution problems have resulted in overgrazing in these two pastures; much of the allotment is on private land. Thus there is a need to work closely with the permittee to improve the rangeland and riparian condition on their private land. Much of this private land is upgradient of the National Forest System lands, so there is an opportunity and desire to work closely with the permittee to improve their lands.

Photo 3-10; Impacted wet area, White Creek unit, West Peak Allotment



White Creek C&H

Of the accessible acreage on the White Creek allotment, 76% occurs in the montane, and 24% occurs in the lower montane climatic zone. The accessible open park within the montane zone is underlain by soil map unit 101F. Parent material of the 101F is comprised of alluvium; as expected this soil map unit is wet and it supports riparian communities. The accessible open park within the lower montane zone is underlain by soil map unit 505M. Parent material of 505M is comprised of slope wash and residuum; this soil unit is drier and it supports the Gambel oak and snowberry ecological unit.

A site visit by the IDT on August 28, 2007 revealed this riparian pasture to be in good condition. Alders, narrowleaf cottonwoods and willows and other mesic vegetation were all present. There were various age classes of willows present. White Creek is a C-type channel and the point bars were stable with good vegetation present. Canada thistle and hound's tongue are present, yet they are being treated.

Desired Condition

The main objective is to maintain the uplands and the riparian and stream corridors at desired condition. The following bullets summarize some of the related guidance discussed in the Forest Land & Resource Management Plan, the Watershed Conservation Practices (WCPs), and other key, hydrologic concepts:

- Maintain all riparian ecosystems in at least an upper mid-seral stage based upon the R2 Riparian Ecosystem Rating System (PSICC LRMP, III-50). Provide healthy, self-perpetuating plant communities, meet water quality standards, provide habitats for viable populations of wildlife and fish, and provide stable stream channels and still water-body shorelines (PSICC LRMP, III-203).
- Achieve desired condition of riparian areas by following the standards set forth in the Watershed Conservation Practices (WCP) Handbook, FSH 2509.25. Section 12 deals specifically with Riparian Areas. Management measure (3) of this section states, "In the water influence zone (WIZ) next to perennial and intermittent streams, lakes, and wetlands, allow only those actions that maintain or improve long-term stream health and riparian ecosystem condition." Adherence to the design criteria within this standard will help to sustain riparian areas at or move them toward their desired conditions.
- To provide healthy uplands and riparian communities and stable stream systems in order to sustain the flow of high quality water to the forest boundary under current climatic conditions.
- To ensure that grazing does not negatively alter the hydrologic processes in the uplands and along the riparian corridors, and to maintain the pattern, profile and dimensions of the stream network.
- To protect the hydrologic integrity and functionality of all riparian communities, particularly the subalpine, mesic vegetative community types by reducing livestock use in these areas, and by improving distribution onto and increasing the utilization of the mountain grasslands.
- To ensure that current water sources are adequately watering the livestock in a manner that is protecting those sources and the watershed. Where this is not occurring use tools available under current management or adaptive management to provide sufficient water in a manner that protects these resources. Develop springs in a manner that provides for their long-term sustainability.

There is an immediate need to address the special areas of concern (except the proposed horse pasture) identified by the ID team. For those portions of the pastures not at desired conditions, tools available under current or adaptive (proposed action) management will be selected and implemented to improve the less than desired resource conditions.

Watershed Improvement Projects

Watershed improvement projects could be implemented within the project area to rehabilitate rangelands that are at less than desired conditions. Regardless of the selected alternative, there is a potential need for watershed improvement projects. Known projects could occur in the following drainages: North Fork Bear Creek, South Fork Amethyst Creek, West Fork Cisneros Creek and on an unnamed tributary to North Fork Pantleon Creek.

Monitoring

Appropriate monitoring at the requisite intervals will be required to ensure those portions of the allotment that are at less than desired conditions are moving toward desired conditions. Data collection will include both types of monitoring, implementation (short-term) and effectiveness (long-term). Input from the hydrologist was provided to the IDT range specialist to develop short and long-term monitoring for special areas of concern.

Data collected from past hydrology surveys can be found in Appendix B of the hydrology report. Photos and site descriptions were collected at many of the recorded global positioning system locations. These recorded sites can be revisited and evaluated to monitor the change in riparian and stream conditions over time. Some of these existing points will be incorporated into the overall monitoring plan for some of these allotments.

General Environmental Consequences

Effects Common to All Alternatives

Livestock have two primary needs when grazing NFS lands; simply put one is to eat and the other is to drink. Typically, the livestock will water in and along riparian corridors at developed sites and from the stream network. In addition, livestock will also drink from naturally wet areas (e.g., ponds, seeps, and springs) across the landscape and from developed sites in the uplands.

The effects from a typical range development depend on many factors: type and configuration of the development, and site location to name a few. Most of the developed watering sites are pits/ponds and tanks or a combination system. A combined system would typically include a source, pipeline and storage device. Most of the developed watering sites are in and adjacent to the riparian corridor, and some of them are in the uplands. Exact configurations, sizes and other relevant information on developed, watering sites can be found in the range files.

On-channel storage structures serve as a watering site for livestock by impounding water. These structures control the movement of water and trap sediment and other debris. They also allow for recharging the local alluvium, evaporating water from its stored contents, and when maintained serve as a grade control in the channel. These structures are susceptible to constant impacts from overland flow and in-channel processes resulting from precipitation, including snowmelt runoff. In addition, livestock create trailing between these sites and trampling in and around the storage structure while grazing and drinking.

Photo 3-11; Example of an upland, on-channel water storage structure.

Off-channel storage structures provide the same purpose, yet generally are located in such a manner to reduce maintenance and exposure to extreme flow conditions. Similar to the on-channel storage structures, livestock create trailing between watering sites and trampling in and around the storage structure while grazing and drinking. Well placed, off-channel storage sites can provide better water quality for livestock. These sites can also improve the general water quality within the pastures as better distribution occurs.

The combined system collects water from a source (often a spring or wet area) and the water is conveyed to a storage structure via a pipeline. Typically an infiltration gallery (or other collection system) is installed at the source. Thus, disturbance would occur at the source, along the pipeline route, and at the storage structure location. The source would be depleted by the amount of water delivered to the storage structure during its period of operation. Depending on design of the structure, overflow from the storage structure may be routed back to the same drainage as the source. Where storage overflow devices are not part of the design, additional trampling can occur when spills occur.

Photo 3-12; Example of an off-channel storage structure in a high meadow.

Table 3-3 summarizes the amount of water consumed by cattle on these allotments. Computations were done for historic numbers, numbers that could be permitted under current management or the proposed action, and also for the average number of livestock that occupied the allotment between the years 2001 and 2005; only years when animals were stocked were included in the average for the latter category. Overall, approximately 51 acre-feet per year were consumed historically. If the allotments were stocked at today's permitted numbers, the annual amount consumed approximates 13 acre-feet. For these estimates, it was assumed that a cow-calf pair would drink 19.5 gallons per day and a yearling would drink 15 gallons per day (consumption rates taken from Lardy, Stoltenow, July, 1999), and the duration was 120 days (average of the average seasons of use under current management and proposed action).

Table 3-3. Water Consumption

Allotment	Permitted Numbers		Average Numbers		Water Consumption (acre-feet)		
	Historic	Current	(2001-05)	Units	Historic	Current	(2001-05)
Williams Creek	2200	735	303	cc pair	15.8	5.28	2.18
Greenhorn	515	392	NC	(a)	2.8	2.82	NC
Ophir	1589	250	194	cc pair	11.4	1.80	1.39
Devils Hole	2200	220	76	cc pair	15.8	1.58	0.55
Devils Hole	n/a	n/a	12	yearlings	n/a	n/a	0.07
Devils Hole (combined)							0.61
Newlin	172	45	45	cc pair	1.2	0.32	0.32
Pantleon	135	35	35	cc pair	1.0	0.25	0.25
Indian Creek	157	58	58	cc pair	1.1	0.42	0.42
West Peak	239	27	37	cc pair	1.7	0.19	0.27
White Creek	n/a	17	17	yearlings	n/a	0.09	0.09

While a new or redeveloped stock water improvement can aid in the distribution of livestock, a thorough evaluation of the existing water-related infrastructure must be evaluated first. Water sources being considered for redeveloped or new, stock water developments must be physically and legally available; therefore all water developments must be allowable under Colorado water law and regulations. All stock water developments, whether existing or new should be verified for the following: compliance with these laws and regulations, permitting/water right needs and costs, and augmentation requirements, if any.

All new, water-related range improvements should also seek input from the hydrologist to aid in appropriate site selection, design, construction and development. Where it makes sense to redevelop or create a new stock water development, existing values and stock water development design must be evaluated and considered. This will ensure that a reliable water supply for stock can be constructed while adequately protecting other existing, resource values.

A healthy riparian and stream corridor provide adequate vegetation, landform, and/or large woody debris to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality. Additionally, a healthy riparian condition provides protection against the extremes of temperature that can limit aquatic life. A healthy, riparian system stabilizes stream banks, supports more vigorous vegetation and thus supports greater biodiversity. As one would expect, dense root masses are formed under healthy systems.

Improper management activities can cause degraded riparian conditions, (something other than desired conditions) and alter the composition, density and vigor of vegetative communities. This in turn can alter rooting depth, rooting character, surface protection, thermal protection, and aquatic habitat. These changes can cause adverse stream channel adjustments such as accelerated bank erosion, increased width/depth ratios, altered channel patterns, reduced channel stability, increased sediment supply, decreased channel substrate size, and damaged fisheries habitat by filling riffle/pool complexes with sediment. When the stream loses its lateral and vertical stability and the gradient changes, channel adjustments result. These adjustments can

lead to downcutting and to the formation of gullies. This in turn lowers the water table and dewaters a corresponding portion of the riparian corridor, depends on the degree of disturbance.

Cumulative Effects Common to All Alternatives

Other past, present and reasonably foreseeable future activities that affect upland and riparian communities and water resources in the project area include: timber-related projects; prescribed fires and wildfires; permitted and public recreational activities; wildlife populations and movements; noxious weed control; road and trail developments; human population and social dynamics; water developments; watershed improvement projects and firewood salvage sales. The affected watersheds support many multiple uses. Livestock grazing impacts uplands, riparian and stream corridors, and other hydrologic features within the project area.

As recreation and private land development continues to increase, so will the associated impacts to watershed health and water quality. Population growth in and around the project area will result in a greater number of forest users. Unauthorized OHV and motorcycle use already impact some of the riparian areas. Social trails and semi-permanent camping areas are developing along some of the creeks as well. In addition to livestock grazing, these actions may have an overall negative effect on the integrity of rangeland and riparian ecosystems by weakening the vegetation and creating ruts and unvegetated scars across portions of the riparian zone.

Timber-related projects and prescribed fires are planned for the watersheds within the project area. Usually, these projects have a short-term negative impact to watershed health; they do provide for long-term benefits to the watershed when implemented properly. Such practices have been shown to improve herbaceous conditions by increasing understory vegetation production and stimulating a variety of herbaceous species. Increased herbaceous vegetation has a positive effect on riparian and water conditions by creating favorable habitats for all types of terrestrial and aquatic life. This increased ground cover also protects soil resources from erosion and high temperatures.

When compared to historic levels, the amount of water consumed by cattle on these allotments has declined by 38 acre-feet per year, see Table 3. Water would be consumed by wildlife from any watering sites retained under Alternative A, and water would be consumed by livestock and wildlife from all developed watering sites under Alternatives 2 and 3.

Alternative A: No Action – No Livestock Grazing

Alternative A: Direct Effects

Discontinuing livestock grazing in the project area would allow for livestock-related recovery of upland and riparian areas. High-use areas would no longer receive repetitive use by cattle thereby eliminating additional compaction, trampling and hoof shearing. Riparian and stream corridors would move toward desired conditions. Problems could still persist where non-range related multiple use activities and other improvements (i.e. roads and trails) exist.

Table 3-4 displays the number of existing, developed watering sites for each allotment; therefore the disposition of these 115 sites would need to be determined. Direct effects for retained watering sites would be the same as those discussed previously. For sites to be removed, the footprint of the entire development would be disturbed, appropriately re-contoured, and seeded with native vegetation.

Table 3-4: Existing, Developed Watering Sites

Allotment (a)	Number of Watering Sites
Williams Creek C&H	42
Greenhorn C&H	0
Ophir C&H	8
Devils Hole C&H	43
Newlin C&H	5
Pantleon C&H	4
Indian Creek	5
Lakes	0
West Peak	8
White Creek	0
Total	115

Note: (a) Even though the Williams Creek and Greenhorn C&H and the Indian Creek and Lakes C&H allotments will be managed together, they are listed separately for specificity.

Alternative A: Indirect Effects

Water quality, upland conditions and riparian health would start to improve as areas recover from the effects of livestock grazing. As riparian corridors recover and connected disturbed areas become disconnected or healed, sediment loads and water temperatures would be reduced. As riparian vegetation regenerates in areas where it is currently absent, bank and channel stability would improve, erosion would be reduced, stream temperatures would become cooler, and streams would trap sediment more efficiently. Overall, water quality would improve.

Alternative A: Cumulative Effects

Under this alternative, livestock grazing would no longer occur, and the direct effects from livestock would cease. As upland and riparian areas improve, the cumulative effects of other activities may have less of an impact on streams and watershed health. Removal of existing, developed watering sites would restore the hydrologic function of affected drainages to more natural conditions. In summary, just over 8800 animal unit months (AUMs, amount of forage required for all allotments) would not be consumed by livestock, and 13 acre-feet of water not consumed by livestock would be made available for other uses on these allotments.

Design Criteria

The design criteria listed in Chapter II are a partial list of those criteria that relate to protecting the hydrologic function of all the watersheds within these allotments. These criteria would be applied to both action alternatives, alternatives 2 and 3. By adhering to these design criteria through sound management and monitoring, desired conditions should be attainable under both action alternatives. The proposed action offers new improvements that could allow the special areas of concern to reach desired conditions at a quicker rate than under Alternative B.

Alternative B: No Change -Livestock Grazing with Current Management

Under this alternative, grazing management would continue as it has in the recent past. Just over 8,800 AUMs and 13 acre-feet of water would be consumed by livestock. As previously stated under the existing condition section of this report, current management has resulted in less than desired conditions on portions of pastures within these allotments.

Alternative B: Direct Effects

Recall that the majority of the livestock use occurs in the accessible portion of the open parks. Table 3-5 summarizes the accessible acreage by allotment, and the percentages of the accessible acreage by vegetative type are also displayed. As indicated in the table, each of the allotments have a significant portion of riparian acreage that is subject to grazing with the exception of the Devils Hole allotment. The Devils Hole allotment is 95% in the lower montane zone (hot and dry) which explains the smaller amount of riparian, yet this acreage is just as important to livestock for watering, feed and shade requirements. Thus the direct impacts by livestock predominantly occur in these accessible, open park acres (see Appendix A for maps).

Table 3-5. Accessible Allotment Acreage Summarized by Vegetative Type

Allotment	Acreage Total	Accessible Open Park Acreage	Accessible Acreage Percent by Vegetative Type		
			Riparian	Grassland	Shrubland
Williams Creek	35,300	8,118	39	50	11
Greenhorn	(a)	2,800	58	32	10
Ophir	8,800	550	49	51	0
Devils Hole	13,200	6,300	7	90	3
Newlin	3,900	570	38	56	6
Pantleon	3,600	450	34	49	17
Indian Creek	7,700	540	38	28	34
Lakes	760	45	78	22	0
West Peak	9,700	430	54	34	12
White Creek	1,960	120	44	8	48

Under current management, livestock can occupy these allotments on average for 98 days. Table 3-6 shows the season of use for both action alternatives. For all allotments, the season of use normally includes occupancy during the full months of July and August (62 days); these are the hottest and wettest of the grazing months which helps explain some of the effects livestock have on the landscape.

Table 3-6. Season of Use

Allotment	Alternative (a)	Season of Use
Williams Creek	CM	6/16 to 10/30
Williams Creek	PA	6/1 to 10/30
Greenhorn	CM	6/16 to 10/7
Greenhorn	PA	6/1 to 10/30
Ophir	CM	6/1 to 9/12
Ophir	PA	6/1 to 10/15
Devils Hole	CM	6/1 to 9/15
Devils Hole	PA	5/1 to 10/15
Newlin	CM	7/1 to 9/20
Newlin	PA	6/15 to 10/15
Pantleon	CM	7/1 to 9/10
Pantleon	PA	6/1 to 10/30
Indian Cr./Lakes	CM	7/6 to 9/5
Indian Cr./Lakes	PA	6/15 to 10/15
West Peak	CM	6/15 to 10/15
West Peak	PA	6/15 to 10/30
White Creek	CM	7/1 to 9/15
White Creek	PA	6/15 to 10/30

Note: (a) CM = current management, PA = proposed action

Direct effects on these open parks include the consumption of palatable vegetation and water. Use can occur both in the drier grassland/shrubland (uplands) and in the wetter ripaian areas. Effects on the ground include disturbance from the hoof action caused by the livestock moving through the pastures while grazing and drinking, and seeking shade for resting periods. The impact that is translated to the ground from the hoof action depends in large part on the ground surface condition, ground cover, soil type and soil moisture. As one would expect, the wetter, alluvial soils are more susceptible to hoof shear, and compaction. Forage is removed and water is consumed from areas where livestock graze within the pasture. Areas that livestock favor tend to have greater impacts. Trailing can and does occur in both upland and riparian areas where livestock move to favored areas, between watering sites, and the like.

When distribution of livestock can be controlled, the direct effects from livestock can be spread across the pasture more evenly in both the uplands and the riparian corridors. From the analysis done for this report, the amount of water required by livestock on a daily basis plays a significant role in where the livestock will feed and drink.

Table 3-7 displays the daily water consumption rate (gallons/day) by allotment. As previously stated the daily rate is shown for numbers that could be permitted under current management or the proposed action, and also for the average number of livestock that

occupied the allotment between the years 2001 and 2005; only years when animals were stocked are included in the average as previously stated. In order to provide this daily water demand, the number of tank fills (assumes a 500 gallon tank) that would be required per day and the required spring flow to meet this demand are also shown in the table.

The results are quite revealing. For the combined Williams Creek (Williams Creek and Greenhorn), Ophir, and Devil Hole allotments, it would take many fills from one tank or several fills at several tanks to provide the entire daily water requirement for the livestock. Because most pastures have a limited number of developed watering sites, the livestock must spend more time in riparian areas in order to meet their daily watering intake. This in part explains the need for livestock to spend more time in these riparian areas regardless of precipitation regimes. As can be seen, this is less of an issue on the remaining allotments.

Table 3-7. Daily Water Consumption, Tank Fills and Required Spring Flow

	Water Consumption (gallons/day)		No. of Tank Fills/ Day		Required Spring Flow (gpm)	
Allotment	Current	2001-05	Current	2001-05	Current	2001-05
Williams Creek	14333	5909	28.7	11.8	10.0	4.1
Greenhorn	7644	NC	15.3	NC	5.3	NC
Ophir	4875	3783	9.8	7.6	3.4	2.6
Devils Hole (combined)	4290	1662	8.6	3.3	3.0	1.2
Newlin	878	878	1.8	1.8	0.6	0.6
Pantleon	683	683	1.4	1.4	0.5	0.5
Indian Creek	1131	1131	2.3	2.3	0.8	0.8
West Peak	527	722	1.1	1.4	0.4	0.5
White Creek	255	255	0.5	0.5	0.2	0.2

There are 115 existing water developments on the eight allotments covered in this hydrology report based on the current GIS coverage used for this report. All water developments tend to congregate cattle which can lead to compaction, loss of ground cover, pedastaling, trampled banks and the like.

Alternative B: Indirect Effects

During the summer months, there would be less vegetation available along the riparian corridors for trapping sediment and stabilizing stream channels, especially in July and August – thunderstorm months. Greater transport of sediment would occur during these months. Surface water temperatures would be higher from the loss of vegetation.

Where stream and riparian areas are at or approaching desired condition, the aquatic systems should also be functioning at or near optimal levels. As water-holding capacities of these systems are increased, the amount of water available for plants, animals and humans is increased as well. Where stream and riparian areas are not at or approaching desired conditions, there may be elevated sediment deposition, changes in stream channel morphology or degradation of aquatic habitat downstream. If the stream incises (loses lateral and vertical stability) as a result of degraded conditions, the water table will drop resulting in a loss of riparian habitat.

Alternative B: Cumulative Effects

Livestock grazing under this alternative would continue, and direct and indirect effects from livestock would continue to occur. Just over 8,800 AUMs and 13 acre-feet of water would be consumed by livestock.

Existing, developed watering sites would continue to alter the hydrology, provide water for livestock and other animals, and would require continued maintenance. Where an on-channel structure fails, the channel will undergo a series of adjustments until it reaches equilibrium. Livestock grazing in such an area would delay such recovery.

Allotment conditions contribute to overall watershed health. Riparian areas that are at less than desired condition may be more susceptible to damage from natural events and anthropogenic influences. As a result, cumulative impacts from other sources may be magnified.

Alternative C: Proposed Action

Overall, the proposed action is quite similar to Alternative B; the amount of AUMs consumed will not change. However, in order to address the special areas of concern, proposed improvements are recommended under this alternative. A summary of the proposed improvements follow:

Williams Creek C&H (combined)

- Add three watering sites each to the East Williams and St. Charles pastures; this will include 1.7 miles of new pipeline.
- Add one watering site to each of the Greenhorn and Snowslide pastures and two watering sites to the Millset pasture; this will include 1.2 miles of new pipeline. All of these will occur on the original Greenhorn C&H allotment.
- Add two, lower elevation pastures, Horse Ranch and West Plantation. These occur on the original portion of the Williams Creek C&H
- Add fences. See proposed action details in EA document.
- Add cow camp. Camp will include an 18 acre fenced pasture, cabin, 1000 gallon cistern, vaulted toilet and driveway.
- Add stock drive. Stock drive will be 20 feet wide by approximately 1.3 miles in length.

Devils Hole C&H

- Add twelve watering sites in the following pastures: one in Black Mountain, one in Blue Springs, two in Mud Springs, one in North Wylie Gulch, two in South Wylie Gulch and five in Reed Gulch. No new watering sites are proposed in Ute Log Gulch; this will include 1.1 miles of new pipeline.

Newlin C&H

- Add one watering site in Pasture 1 and two watering sites in Pasture 4.
- Add fence to keep livestock out of Lion Canyon.

- Add two cattle guards.

Pantleon C&H

- Fence off existing springs.
- Relocate a new tank from an existing spring; this will include 0.1 mile of new pipeline.

Indian Creek/Lakes C&H

- Relocate an existing tank from an existing spring; this will include 0.1 mile of new pipeline.
- Add one watering site in Bonnet Park; this will include 0.2 mile of new pipeline.

If an allotment is not listed above, then no new improvements are proposed for those allotments.

The season of use will change for all allotments between alternatives 2 and 3. Basically, the season of use will be changed from fixed on and off dates averaging 98 days under current management to a flexible season of on and off dates averaging 143 days under the proposed action, again see Table 6.

Alternative C: Direct Effects

In general, the direct effects listed under Alternative B also apply to this alternative.
The direct effects of adding the 26 watering sites will be the same as those effects previously described under the effects common to all alternatives. These proposed developments, if constructed would be built on the Williams Creek combined allotment, the Devils Hole allotment, the Newlin Creek allotment, and the Lakes portion of the Indian Creek/Lakes allotment. Table 3-8 lists the combined total of existing and proposed watering sites for each allotment; the miles of proposed pipeline is also shown. In summary you will have limited site disturbance at the sources, the associated disturbance of installing 4.4 miles of pipeline and the installation of 26 storage structures (likely a 500-gallon tank or a small pond). Again, the source would be depleted by the amount of water delivered to the storage structure during its period of operation.

Table 3-8. Existing Watering Sites vs. Existing and Proposed Watering Sites and Miles of Pipeline

Allotment (a)	Existing Water Developments	Existing and Proposed Water Developments	Miles of Proposed Pipeline
Williams Creek	42	48	1.7
Greenhorn C&H	0	4	1.2
Ophir C&H	8	8	0.0
Devils Hole C&H	43	55	1.1
Newlin C&H	5	8	0.0
Pantleon C&H	4	4	0.1
Indian Creek	5	5	0.1
Lakes	0	1	0.2
West Peak	8	8	0.0
White Creek	0	0	0.0
Total	115	141	4.4

Note: (a) Even though the Williams Creek and Greenhorn C&H and the Indian Creek and Lakes C&H allotments will be managed together, they are listed separately for specificity.

The direct effect of fence installation is limited to ground disturbance associated with installing the fence posts. A two-track vehicle may be used to deliver supplies to various locations along the route. This impact should be minimal and would be limited to soil types capable of supporting such a use and restricted from wet areas. Manual labor will be used to transport and erect fencing in sensitive areas.

Direct effects from the construction of the cow camp will include:

- Ground disturbance associated with laying foundations for the cabin, water cistern and vaulted toilet. Remaining portions of disturbed areas not occupied by structures will be graded such that they can be reclaimed with native vegetation. Silt fences will be used to keep sediment on-site and restricted from entering adjacent mesic meadows and wet areas. At this time, water is to be trucked to and stored in the cistern. Refuse associated with the toilets will be contained of in the vaults and disposed of in accordance with PSICC forest policy.
- Ground disturbance associated with constructing the driveway. Silt fencing can also be used if necessary, and disturbed areas, if any outside of the driveway footprint should also be reclaimed with native vegetation.
- An eighteen acre horse pasture will be created by fencing an area on the west side of the ridge top in the upper part of a drainage tributary to East Williams Creek. This pasture will mostly encompass a mesic meadow. In addition to the direct effects from the fence installation, see above; grazing and watering effects from the horses will be realized. Supplemental pasture outside the fence area will likely be used to meet forage

requirements depending on the number of horses occupying the cow camp at any given time. Water consumption will range from 15 to 90 gallons per day (1800 gallons to 10,800 gallons/season or 0.006 acre-feet to 0.033 acre-feet/season). Estimates are based on 15 gallons per day for an 1100 pound working horse performing moderate work in a warm environment (Lardy, Stoltenow, July, 1999). If needed, a two hundred gallon watering tank would be adequate to meet the daily watering intake for horses pasturing at the cow camp.

Just over three acres of ground will be disturbed when the stock trail is constructed, see EA document for location. Direct effects include vegetation removal along this trail. Once used by cattle, trailing, increased stream channel dimensions at stream crossings, compaction and other related effects could be realized. Input from the soil scientist and hydrologist on final trail location and stream crossings will reduce these impacts. Armored stream-crossings, limited fencing and the like could be required to further reduce any adverse impacts which could occur along this route.

On the Newlin C&H allotment, two cattle guards and a short segment of fence will be used to control cattle distribution. Minimal disturbance will occur from the cattle guard installations. The disturbance associated with the fence is the same as previously stated. This segment of fence will prevent cattle from moving down into Lion Canyon.

Alternative C: Indirect Effects

Similar indirect effects would occur under the proposed action as in Alternative B. During the summer months, there would be less vegetation available along the riparian corridors for trapping sediment and stabilizing stream channels. Greater transport of sediment would occur during these months. Surface water temperatures would be higher from the loss of vegetation.

Where stream and riparian areas are at or approaching desired condition, the aquatic systems should also be functioning at or near optimal levels. As water-holding capacities of these systems are increased, the amount of water available for plants, animals and humans is increased as well. Where stream and riparian areas are not at or approaching desired conditions, there may be elevated sediment deposition, changes in stream channel morphology or degradation of aquatic habitat downstream. If the stream incises (loses lateral and vertical stability) as a result of degraded conditions, the water table will drop resulting in a loss of riparian habitat.

In addition to Alternative B, the added watering sites to be built under this alternative have the potential to improve livestock distribution. The ability of these developments to draw and hold cattle in the uplands could in turn benefit the nearby riparian areas. New fences may congregate livestock in areas that they do not presently congregate in under current management. Excluded areas, like on the North Fork of Bear Creek may put added pressure on other portions of the pasture, yet the excluded area will directly benefit resource conditions in a positive manner.

Alternative C: Cumulative Effects

Livestock grazing under this alternative would also continue, and direct and indirect effects from livestock would also continue to occur. Just over 8,800 AUMs and 13 acre-feet of water would be consumed by livestock. Due to the longer season of use, there is a potential for more water to be consumed under this alternative compared to Alternative B.

Existing, and newly developed watering sites would alter the hydrology, provide water for livestock and other animals, and would require continued maintenance. Where an on-channel structure fails, the channel will undergo a series of adjustments until it reaches equilibrium. Livestock grazing in such an area would delay such recovery.

Table 3-8 displays where the 26 newly, developed watering sites and 4.4 miles of pipeline could be constructed under this alternative. The additive effects for each newly, constructed watering site would be as described under the 'Effects Common to All Alternatives' section.

In general, creating new, developed watering sites in the uplands can improve distribution and relieve pressure on the localized and adjacent riparian area. The difficulty comes in achieving this on allotments where large number of existing, watering sites exist in the riparian corridor, and animal behavior are adapted to these sites. Thus more intensive management will be required by the permittee and Forest Service specialists to maintain or achieve desired conditions in these locations. Additionally, overall maintenance will increase with the addition of each system over that of Alternative B.

Allotment conditions contribute to overall watershed health. Riparian areas that are at less than desired condition may be more susceptible to damage from natural events and anthropogenic influences. As a result, cumulative impacts from other sources may be magnified.

Alternatives Comparison

The environmental consequences of the proposed alternatives were determined from a mostly qualitative watershed perspective. For this report, the following factors were compared:

- Animal unit months
- Permitted numbers
- Average maximum season of use (days)
- Water consumption (acre-feet/season)
- Number of developed watering sites
- New miles of pipeline
- Change in cattle distribution from watering sites
- Water quality
- Riparian/stream recovery
- Watershed improvement projects
- Management and maintenance needs

Comparisons for each of these categories between the three alternatives are summarized in Table 3-9.

Table 3-9. Alternatives Comparison

Category	Alternative A (No Action/ No Grazing)	Alternative B (Current Management)	Alternative C (Proposed Action)
Animal unit months	0	8818	8818
Permitted numbers	0	1762 cow/calf pair, 17 yearlings; can vary	1762 cow/calf pair, 17 yearlings; can vary
Average maximum season of use (days)	0	98	143
Water consumption (Acre-feet/season)	+13, gained	-13, consumed, can vary	-13, consumed, can vary and could be greater than Alt. 2 due to longer season
Number of developed watering sites	115	115	141
New miles of pipeline	0	0	4.4
Change in cattle distribution from added watering sites	Not applicable	Unchanged	Improved where added to pastures
Water quality	Best, improvement in temperature and reduced sediment	Variable	Variable, with some potential improvement over Alt. 2
Riparian/stream recovery	Faster than either Alts. 2 or 3; should see significant improvement within 5 years	Variable	Variable, yet should see better response where Proposed Action directly benefits special areas of concern
Watershed improvement projects	Projects Available	Projects Available	Projects Available
Management and maintenance needs	Low (after disposition of improvements incl. developed watering sites)	Moderate	More than Alt. 2 due to added fencing and watering sites

Conclusion

Alternative A, the no action/no grazing alternative would benefit the overall watershed condition in every allotment over the other two alternatives. Livestock would not graze the open parks or

consume water from any developed or undeveloped site. Approximately 13 acre-feet of water/year would be made available for other uses on these allotments. Overall water quality would improve. Temperatures would increase as riparian vegetation recovers. Similarly, streambanks and channels would improve thereby reducing sediment loads. Some water developments could remain for other purposes on NFS lands.

From a hydrology perspective, Alternatives 2 and 3 are very similar, yet a few differences exists between them. The amount of forage required (animal unit month, AUM) is the same between alternatives. Much of this available forage occurs in riparian systems, and therefore effects from cattle will be realized within them. In Alternative C, with the proposed addition of watering sites and electric fence within some pastures on some allotments, the potential for improved distribution in those pastures exists. This could result in improved, localized riparian conditions where these improvements are implemented. Water consumption between these two alternatives would be the same unless cattle remained in the pastures longer under Alternative C. In this case, higher water consumption would occur. Overall, the management requirements and maintenance needs for the improvements on the allotments would be greater under Alternative C than under Alternative B.

3.4 WILDLIFE

3.4.1 FEDERALLY LISTED SPECIES

This biological evaluation (BE) / biological assessment (BA) analyzes the potential effects of the proposed San Carlos Range Allotment Management Plan on the San Isabel National Forests (Forest) on federally listed threatened, endangered, proposed wildlife species, and critical habitats, pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (ESA). In addition, impacts from these proposed management actions on Forest Service (FS) sensitive species, as identified by the Region 2 Regional Forester (USDA Forest Service 2009) will also be assessed as required in the Forest Service Manual (FSM 2670.31-2670.32).

The FWS (2010) identified all federally listed species (Threatened, Endangered, Proposed, or Candidate [TEPC]) as either present or, potentially present in Huerfano County. Several species are known or have the potential to occur within the analysis area or have suitable habitat present, as indicated in Table 3-10 below.

Table 3-10. Federally Threatened and Endangered species

Common Name	Scientific Name	Status	Potential to Occur in Project Area
Birds			
Mexican spotted owl	*Strix occidentalis lucida*	Threatened	✓
Mammals			
Canada lynx	*Lynx canadensis*	Threatened	✓
Black-footed ferret	*Mustela nigripes*	Endangered	

Forest Service Sensitive Species

The Regional Forester has identified the sensitive species for Region 2 (Forest Service 2005a), and the San Isabel NF has further refined this list, to include only those species with the potential to occur within its administrational boundaries (Wrigley et al. 2007). Forest Service sensitive species are addressed below.

Species and Critical Habitat Eliminated from Further Review

Federally listed species from Table 3-10 above that are not identified as having potential to occur in the project area have been eliminated from further review due to lack of habitat, no historical records of habitat utilization in the project area, or unexpected occurrence (see Wrigley et al. 2007). Species excluded from further analysis include the Gunnison's Prairie Dog, Black-footed Ferret, and New Mexico Meadow Jumping Mouse.

Species Analyzed in this Assessment

The following Threatened, Endangered, and Sensitive (TES) species (no Candidate or Proposed species have potential to occur in the project area) in the table below are analyzed further in this assessment because they either occur, or have the potential to occur, within the project area and/or project activities would impact their habitat. Species from the San Isabel National Forest that are not analyzed further were excluded from further analysis due to one or more of the following reasons: outside of distributional range, no potential habitat present in analysis area, or outside of the species' elevational range.

Table 3-11. TES species with potential habitat or potential to occur

Common Name	Scientific Name	Status
Amphibians		
Boreal Toad	*Anaxyrus (Bufo) boreas*	Sensitive
Northern Leopard Frog	*Lithobates (Rana) pipiens*	Sensitive
Reptiles		
None		
Birds		
Northern Goshawk	*Accipiter gentilis*	Sensitive
Boreal Owl	*Aegolius funereus*	Sensitive
Northern Harrier	*Circus cyaneus*	Sensitive
Olive-sided Flycatcher	*Contopus cooperi*	Sensitive
American Peregrine Falcon	*Falco peregrinus anatum*	Sensitive
White-tailed Ptarmigan	*Lagopus leucurus*	Sensitive
Loggerhead Shrike	*Lanius ludovicianus*	Sensitive
Lewis' Woodpecker	*Melanerpes lewis*	Sensitive
Flammulated Owl	*Otus flammeolus*	Sensitive
American Three-toed Woodpecker	*Picoides dorsalis*	Sensitive
Brewer's Sparrow	*Spizella breweri*	Sensitive
Mexican Spotted Owl	*Strix occidentalis lucida*	Threatened
Mammals		
Common Hog-nosed Skunk	*Conepatus leuconotus*	Sensitive
Wolverine	*Gulo gulo*	Sensitive
Canada Lynx	*Lynx canadensis*	Threatened
American Marten	*Martes americana*	Sensitive
Fringed Myotis	*Myotis thysanodes*	Sensitive
Rocky Mountain Bighorn Sheep	*Ovis canadensis canadensis*	Sensitive
Townsend's Big-eared Bat	*Plecotus townsendii*	Sensitive

EVALUATED SPECIES INFORMATION

Colorado Natural Heritage Program Element Occurrence Records

A review of the Colorado Natural Heritage Program (CNHP 2008) database found no element occurrence records of TEPS species in the analysis area. However, there was an element occurrence for wolverine east of the Greenhorn Allotment near Greenhorn Peak in 1979.

Field Reconnaissance

Several field visits were made to the Allotments by Ron Torretta and other FS interdisciplinary team members during the spring/summer/fall of 2006 and 2007 to review rangeland conditions

and identify problem areas and issues of concern. No site-specific wildlife surveys were conducted specifically for this project.

Several of the above species analyzed for have been observed or are known to use parts of the allotments or analysis area as reported by FS and/or Colorado Division of Wildlife (CDOW) personnel, including: northern goshawk (Indian Creek and West Peak allotments), olive-sided flycatcher and flammulated owl (Newlin allotment), American three-toed woodpecker (Williams Creek allotment), Canada lynx (Wet Mountains, Sangres, and Spanish Peaks allotments), and Rocky Mountain bighorn sheep (Greenhorn, West Peak, and Williams Creek allotments).

Federally Listed Species and Critical Habitat

Mexican Spotted Owl; threatened

See Wrigley et al. (2007) for a detailed species account for Mexican spotted owl, their habitat, and management in Colorado.

The San Carlos Ranger District (District) has approximately 59,467 and 32,528 ac of identified MSO restricted and protected habitat, respectively. The Allotments contain approximately 9,175 and 3,565 ac (15.4 and 10.9% of the District total) of Mexican spotted owl restricted and protected habitat (see Table 6), respectively (see the MSO Recovery Plan [Fish and Wildlife Service 1995] for restricted/protected habitat definitions). Map 3 - Appendix A displays the MSO restricted and protected habitat on the San Carlos Ranger District and its juxtaposition with the allotments being analyzed. There are no MSO Protected Activity Centers (PACs) within the analysis area. There is MSO designated critical habitat within the existing Greenhorn and Williams Creek allotments (see Map 3 – Appendix A, BA/BE).

The nearest MSO sighting from any of the Allotments was about 4.5 miles northeast of the eastern edge of the Greenhorn allotment in the St. Charles River PAC. A reliable private individual (a biologist who has conducted extensive research on MSOs) observed a pair of MSOs during 2004 in St. Charles Canyon with other visual/aural observations in years just prior. Other MSO detections on the District are: Oak Creek (June 2006); Fourmile Creek (2000); Smith Creek (1991); and South Apache Creek (1990). MSO surveys that were conducted in or near the analysis area allotments (Turkey Creek 2004 and 2006; Maes Creek 2004; and Custer Creek 2004) did not detect any spotted owls.

Canada Lynx; threatened

See Wrigley et al. (2007) for a detailed species account for Canada lynx, their habitat, and management in Colorado.

The most recent dataset for lynx habitat modeling occurred in May 2007. Map 4 (Appendix A, BA/BE) shows the LAUs and lynx linkage zones in relationship to the allotments being analyzed. The latest modeling exercise classifies a given area (polygon) as one habitat type.

(Some denning habitat can still function as winter foraging habitat on the ground, but those areas that function as both are classified as denning only, since it was deemed to be the more critical habitat type). Some of the land classified as potential lynx habitat within the LAUs is on private, state, and BLM land, but there is no data available to identify what type of lynx habitat is contained within these areas, and for analysis purposes, only lynx habitat on National Forest lands are considered.

The PSICC will be remodeling lynx habitat again in the near future when the Southern Rockies Lynx Amendment is finalized. At that time, all lands will be either classified as lynx habitat (primary or secondary) or non-habitat.

Table 3-12. Acres of National Forest lands and Canada lynx habitat in the Sangres, Spanish Peaks, and Wet Mountains LAUs.

Habitat Type†	Sangres LAU (ac/%)*	Spanish Peaks LAU (ac/%)	Wet Mountains LAU (ac/%)
National Forest Lands	155,027 (100.0)	69,204 (100.0)	162,456 (100.0)
Denning	41,851 (27.0)	24,339 (35.2)	30,201 (18.6)
Winter	28,388 (18.3)	20,997 (30.3)	54,194 (33.4)
Other**	13,936 (9.0)	4,125 (6.0)	14,717 (9.1)
Unsuitable	47 (0.03)	190 (0.3)	911 (0.6)
Non-habitat	70,804 (45.7)	19,553 (28.3)	62,434 (38.4)
LAU Total	**340,553 ac.**	**259,910**	**314,797**

†Currently, a vegetative cover type (represented as a GIS polygon) is only assigned one habitat type versus the potential for it being classified as more than one habitat in the previous modeling exercise. Areas defined as denning habitat may still function as winter foraging habitat on the ground, but they are only recorded as denning habitat for modeling purposes.

**Percentages of LAU are expressed as a percent of the National Forest System land within a given LAU and do not include private, state, or other federal land.*

***"Other" represents lands that are lynx habitat but are not denning or quality winter habitat.*

No known denning sites have been documented for lynx in the analysis area, but there is individual radio-collar lynx location data from February 1999 to February 2005 (CDOW 2005) documenting that they have been in the Sangre de Cristos, Spanish Peaks, and Wet Mountains, including portions of the analyzed allotments.

Critical Habitat

The FWS has designated Mexican spotted owl critical habitat within the analysis area (Newlin and Williams Creek/Greenhorn allotments) (see Map 3 – Appendix A). There is no other critical habitat designated within the analysis area.

Forest Service Sensitive Species

See the Threatened, Endangered, and Forest Service Sensitive Species on the San Isabel National Forest document (Wrigley et al. 2007) for species account details of those Forest Service sensitive species from Table 3 with potential to occur in the analysis area.

ENVIRONMENTAL BASELINE

See the Threatened, Endangered, and Forest Service Sensitive Species on the San Isabel National Forest document (Wrigley et al. 2007) for the environmental baseline conditions for the analysis area and the Sangres, Spanish Peaks, and Wet Mountains LAUs.

The table below identifies those threatened, endangered, or FS sensitive species that do, or have potential to, exist in the analysis area for each of the allotments.

Table 3-13. Threatened, endangered, or sensitive species with suitable habitat or known presence

Species	Allotment								
	Devil's Hole	Green-horn	Indian Creek	Lakes	Newlin	Ophir	Pant-leon	West Peak	Williams Creek
Boreal Toad		✓	✓	✓		✓	✓	✓	✓
Northern Leopard Frog	✓	✓	✓	✓	✓	✓	✓	✓	✓
Northern Goshawk	✓	✓	✓	✓	✓	✓	✓	✓	✓
Boreal Owl		✓	✓	✓		✓	✓	✓	✓
Northern Harrier	✓								
Olive-sided Flycatcher	✓	✓	✓	✓	✓	✓	✓	✓	✓
American Peregrine Falcon		✓	✓		✓				✓
White-tailed Ptarmigan							✓		
Loggerhead Shrike	✓								
Lewis' Woodpecker	✓								
Flammulated Owl	✓	✓	✓	✓	✓	✓	✓	✓	✓
American Three-toed Woodpecker	✓	✓	✓	✓	✓	✓	✓	✓	✓
Brewer's Sparrow		✓	✓					✓	✓
Mexican Spotted Owl	✓	✓	✓	✓	✓	✓	✓	✓	✓
Common Hog-nosed Skunk	✓	✓	✓	✓	✓	✓	✓	✓	✓
Wolverine	✓	✓	✓	✓	✓	✓	✓	✓	✓
Canada Lynx	✓	✓	✓	✓	✓	✓	✓	✓	✓
American Marten	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fringed Myotis	✓		✓		✓			✓	✓
Rocky Mountain Bighorn Sheep		✓		✓			✓	✓	✓
Townsend's	✓		✓		✓	✓	✓	✓	✓

Big-eared Bat									

Table 3-14 below identifies the approximate acreages of Mexican spotted owl restricted and protected habitat in the allotments analyzed for this document.

Table 3-14. Mexican spotted owl Restricted and Protected habitat[1]

Allotment	Restricted Habitat[1] (ac.)	Protected Habitat[1] (ac.)
Devil's Hole	790	2
Greenhorn	330	538
Indian Creek	1,918	969
Lakes	63	8
Newlin	1,457	531
Ophir	190	17
Pantleon	14	3
West Peak	2,934	1,009
Williams Creek	1,479	488
Totals	**9,175**	**3,565**

[1] *Includes National Forest Lands only – no data available for other ownerships.*

Table 3-15 below identifies the approximate acreages of lynx habitat in the allotments analyzed for this document.

Table 3-15. Approximate area (acres[1]) of Canada lynx habitat types

Allotment	Denning (ac.)	Winter Forage (ac.)	Other[2] Habitat (ac.)	Currently Unsuitable (ac.)	Non-Habitat (ac.)
Devil's Hole	34	44	0	0	13,151
Greenhorn	2,972	2,573	1,535	0	3,122
Indian Creek	1,750	2,423	529	0	2,958
Lakes	218	368	104	0	63
Newlin	467	559	429	0	1,057
Ophir	3,230	3,342	967	41	1,240
Pantleon	0	9	0	0	3,629
West Peak	4,840	3,697	253	0	2,550
Williams Creek	6,449	6,790	3,961	60	10,463
Totals	**19,960**	**19,805**	**7,778**	**101**	**38,233**

[1] *Includes National Forest Lands only – no data available for other ownerships*
[2] *Lands that are lynx habitat but are not classified as denning or winter habitat*

EFFECTS to EVALUATED SPECIES and DETERMINATIONS

As previously stated, the Forest Service is requesting consultation on Alternative C (Proposed Action).

Cumulative Effects (All TEPS Species)

Cumulative effects are analyzed at the LAU scale for Canada lynx and at the watershed or home range scale (whichever is larger) for Mexican spotted owl and FS sensitive species. Threshold standards and guidelines for Canada lynx are adhered to by LAU as required by the LCAS as specified above. Other more general cumulative effects to lynx are analyzed at the LAU level. Threshold standards and guidelines for MSO are adhered to as recommended in the MSO Recovery Plan.

Alternative A – No Action (No Grazing)

This alternative would not add any negative cumulative effects to any of the TEPS species being analyzed for this document. However, this alternative would have some minor beneficial cumulative effects on TEPS species when added to the environmental baseline. Not grazing the allotments would provide for minor improvements in the biodiversity and heterogeneity of the landscape. Ecological processes would allow habitat areas that are not within the HRV to recover and attain it in the quickest timeframe. There are currently numerous environmental baseline activities that are creating cumulative effects (see environmental baseline discussion in Wrigley et al. [2007]) which are incorporated here by reference. As discussed below (and incorporated by reference here) for the NEPA cumulative effects of the Action Alternatives, there will likely be numerous future federal and non-federal activities occurring in the LAUs, analysis area, and surrounding vicinities.

Alternatives B and C – All Action Alternatives

Future federal/non-federal activities reasonably likely to occur are essentially the same as those listed above under the non-federal activities but with more emphasis on the recreational activities on public lands versus private lands. Fuels reduction work would be likely to continue using both mechanical treatments and prescribed fire on federal lands that were not addressed above in the ESA cumulative effect analysis. The long-term cumulative effects of the Action Alternatives, in addition to the environmental baseline, are expected to provide some minor beneficial and negative effects to MSO, lynx, and other FS sensitive species.

Long-term grazing of the area will likely cause some shifts in plant species composition, vertical and horizontal structure, percent cover, seral stages present, and litter quantities. These changes are likely to result in a reduction of the heterogeneity and biodiversity of the allotment if not monitored (long-term trends) and actively managed to prevent unacceptable changes. Range management techniques that “force” livestock to more evenly utilize the allotment as a whole (i.e., water developments, riding, salting, pasture size, and fencing, etc.) will tend to homogenize the forage types within the allotment over time, and therefore, reduce the allotment heterogeneity and biodiversity. These changes would add to the existing baseline condition.

In conclusion, the impacts from all federal and non-federal activities are expected to have both positive and negative impacts to TEPS species and their habitats. The cumulative impacts from the Action Alternatives are considered minor in nature and undetectable in the short-term. Alternative B would likely have minimally slightly greater cumulative impacts than Alternative C due to the lack of adaptive management options available to address issues or concerns with habitat recovery or maintenance in as timely of a manner as Alternative C could provide. It is

imperative that design criteria and critical monitoring are implemented to reduce any cumulative impacts to a level where they are insignificant and discountable.

8.2 Federally Listed Species

Effects of the action refer to the direct and indirect effects on the species and critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, combined with effects from the environmental baseline section above. Interrelated actions are those that are part of a larger action and depend on that action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur. Cumulative effects include the effects of future state, tribal, and private actions that are reasonably certain to occur in the action area (i.e., analysis area) considered in this assessment. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 consultation with the FWS at a later time.

Mexican Spotted Owl

MSO nesting habitat is typically in rocky canyons or forested mountains below 9,500 feet with high canopy closure, high stand density, and a multilayered canopy resulting from an uneven-aged stand (Kingery 1998). In Colorado, most nests are in caves or on cliff ledges in steep-walled canyons (FWS 1995). The Colorado Recovery Unit contains only 1.8% of the known owl sites, therefore the known sites constitute only a very small portion of the MSO's population as a whole. Since the Colorado Recovery Units constitute such a small portion of potential habitat, this EA will incorporate the protected and restricted areas guidelines from the Mexican Spotted Owl Recovery Plan (FWS 1995)

Photo 3-13; Mexican Spotted Owl.

In this portion of its range, the MSO is associated with rock outcrops, steep terrain, and dense forest structure. Many of these habitats are generally not accessible to livestock and they lack adequate livestock forage, with the exception of riparian areas which are transition pastures. They are used primarily as movement corridors – livestock are moved between pastures and on/off forest. In general, cattle tend to occupy low elevation riparian and meadow habitats which MSO typically do not use as much. These areas are also more likely to be occupied by competitive species such as the great horned owl. Additional natural history and distribution information can be found in the Recovery Plan (FWS 1995) and Wrigley et al. (2007).

Recovery Plan Guidelines

The Mexican Spotted Owl Recovery Plan (FWS 1995) lists three specific livestock grazing guidelines that should be applied to Protected and Restricted Areas as follows (no PACs are located within the Analysis Area):

1. Monitor grazing use by livestock and wildlife in key grazing areas (riparian areas, meadows, and oak types).
2. Implement and enforce grazing utilization standards that would attain "good" to "excellent" range conditions within key grazing areas.
3. Implement management strategies that will restore "good" range condition to degraded riparian communities as soon as possible.

As noted above, very steep slopes and rugged terrain are not generally accessible to livestock and these areas are not grazed, or little utilization by cattle occurs in these areas. Many of these areas within allotments do not provide the necessary habitat characteristics for the owl. However, riparian areas and adjacent forested areas can and are used by livestock; thus, use may occur and affect these habitats under both Action Alternatives 2 and 3 as discussed below.

Alternative A – No Action (No Grazing)

Direct and Indirect Effects

The four primary influences the Recovery Plan identified as to how livestock grazing affects MSO would generally be improved from the baseline condition. Prey availability and their habitat conditions would generally improve and the trend to a more natural condition would occur. Vegetation shifts caused by past livestock grazing that could increase the susceptibility of MSO habitats to increased fire and changes in fire intensities would not occur under this alternative, although other factors discussed below would still cause impacts. The health and condition of riparian communities would benefit from the lack of livestock herbivory in these important habitats. Lastly, the development of MSO nesting, roosting, foraging, and dispersal habitats would be more likely in these areas due to the lack of livestock grazing. Each of these factors would generally improve current habitat conditions, restore degraded habitats, and benefit MSOs directly and indirectly. *Therefore, Alternative A (No Grazing) would be the 1st (best) choice for MSO.*

Effects Determination

Based on the above rationale, **Alternative A (No Grazing)** would have wholly beneficial effects to this species; therefore, it "***may affect, not likely to adversely affect***" the Mexican spotted owl.

Alternative B – Current Management

Direct and Indirect Effects

Effects on the four primary influences (altered prey availability; altered susceptibility to fire, degeneration of riparian plant communities, and impaired ability of plant communities to development into spotted owl habitat) identified in the Recovery Plan that livestock grazing can

have on MSO would also be very similar to those discussed above for the Proposed Action . See the discussion above under the Proposed Action for details that is incorporated here by reference. The primary difference would be that, under this alternative, there would not be the additional adaptive management tools available to implement if the design criteria were not providing the desired amount of resource protection or recovery rates desired for specific locations throughout the allotments. Consequently, this alternative would likely have slower recovery rates in damaged or degraded areas and retard the recovery of areas that are not currently at the desired condition compared to the Proposed Action alternative.

Another difference between this alternative and the Proposed Action is that there are **no** new/redeveloped range water developments proposed for this alternative. This would eliminate some of the short-term vegetation and ground disturbance impacts (0-2 years) associated with range water developments and prevent any potential water depletions at those sites. However, the mid- to long-term impacts (3+ years) to MSO habitat would likely be of a greater magnitude since range water developments would likely improve livestock distribution away from riparian areas thereby reducing negative impacts to riparian habitat which is important to MSO and their prey base. The amount of water depleted from the range water improvements is likely to be insignificant and discountable, so therefore, the benefits of not developing the water developments (this alternative) would not be as valuable to MSO as those received by having improved livestock distribution and riparian habitat conditions (Proposed Action alternative) which would occur if livestock did not utilize riparian areas as heavily to attain water, forage, thermal regulation, and for lingering. Livestock concentrating in riparian areas to attain water, forage, or regulate body temperature frequently causes trampling, post-holing, pedestaling, water table depletion, erosion, etc. Without range water developments, the above impacts to riparian areas are more likely to occur in those areas not possessing ample watering sources located away from riparian areas.

This alternative would address the MSO Recovery Plan livestock grazing guidelines within Protected and Restricted Areas in a very similar manner as that described in the Proposed Action alternative. However, it would probably take longer to attain recovery and desired conditions in degraded/damaged areas and be more difficult to maintain some of the areas that are presently at desired condition since there would not be the benefit of the new water developments in uplands that should draw livestock away from some of the sensitive riparian areas. Also, there would not be the additional adaptive management tools available to address issues that may not be resolved as quickly as desired, given the management options currently available. Alternative B would have greater impacts to MSO than either Alternative A or C. *Therefore, Alternative B (Current Management) would be the 3rd choice (least beneficial) for MSO.*

Effects Determination

Based on the above rationale, **Alternative B (Current Management)** "***may affect, not likely to adversely affect***" the Mexican spotted owl.

Alternative C – Adaptive Management (Proposed Action)

Direct and Indirect Effects

Specific studies as to the effects of livestock grazing on MSO are lacking. Therefore, we have used the best available information where possible to assess the potential effects to the owl from grazing, which includes changes in the vegetation in important habitats. For example, the Recovery Plan (FWS 1995) states that livestock may not directly affect MSO roost and nest sites immediately, but could alter riparian habitats indirectly by reducing, eliminating, or suppressing regeneration. Over time, this could limit the structure needed for nesting, roosting, and other life history requirements in addition to the long-term sustainability of these habitats. Additionally, adverse effects to their prey from habitat degradation from livestock grazing in riparian areas may potentially occur. However, design criteria and adaptive management options that directly or indirectly reduces/minimizes adverse effects to MSO, their prey, or their habitats will be implemented with this alternative. See Appendix E for a complete list of design criteria and adaptive management options which also may further minimize potential effects.

Grazing can alter plant communities directly, indirectly, or both. Plant herbivory by livestock includes plant consumption, trampling, decreased seed source, and soil compaction (Dwyer et al. 1984, Fleischner 1994). Grazing can also reduce plant density, cover, biomass, vigor, and regeneration. These impacts can alter the relative composition and structure of grass, forb, shrub, and tree components of MSO habitat (FWS 1995). The Recovery Plan states that within coniferous forests, grazing can remove or greatly reduce grasses and forbs, thereby allowing large number of conifer seedlings to become established because of reduced competition for water and nutrients (FWS 1995). The establishment of these dense seedling and smaller trees, coupled with the reduction in light ground fuels such as grasses and forbs (due to their selective consumption by livestock) may act synergistically with fire suppression to contribute to dense overstocking of ladder fuels. This dense overstocking can alter forest structure and composition and degrade MSO and prey habitats while increasing the risks of stand replacing fires. Although livestock generally do not use coniferous forests extensively *per se*, they are within the allotments assessed and use may occur there, especially adjacent to their riparian concentration areas which also contain areas owls are more likely to use.

The spread of non-native invasive/noxious plant species may continue to occur as a result of livestock grazing under this alternative; however, where found, appropriate control measures would be taken to eliminate or minimize their spread, as would occur under this alternative.

The Recovery Plan identified four primary influences livestock grazing can have on the MSO, which are 1) altered prey availability; 2) altered susceptibility to fire; 3) degeneration of riparian plant communities, and 4) impaired ability of plant communities to development into spotted owl habitat.

In summary, each of the four grazing influences discussed would be substantially minimized (although not completely eliminated) by the implementation of the design criteria and adaptive management options, primarily those measures specifically for MSO. Specifically, allotments would be managed in riparian areas to maintain or achieve mid-seral or higher condition to provide cover and forage for prey species where the potential occurs. Each of these measures would minimize the effects to prey availability, reduce the susceptibility to increased fire, maintain or improve the baseline riparian community conditions, and lastly, not inhibit the development of habitat components. These objectives would be achieved by: 1) limiting

utilization of grasses, forbs, and woody species by livestock; 2) timely monitoring of range conditions; and 3) implementation of the proper adaptive management options to achieve or move in an upward trend towards desired conditions.

The proposed development of springs and seeps would likely result in better distribution of livestock to the uplands, away from riparian areas (and important habitats for these species), reducing concentrations of livestock in sensitive riparian areas and allowing quicker recovery of impacted riparian areas. The potential impact of these depletions will be greatly minimized through use of these design criteria (use of shut-off valves/floats, return to near point of origin, limited use, monitoring to ensure hydrologic function – chemical, biological, and physical integrity of the spring and surrounding aquatic and terrestrial habitat supporting the spring will be maintained). Natural waterbodies (i.e., kettles, ponds, and lakes) would not be developed as a source for off-site watering; however, livestock will likely use them as a water source when they are present and accessible in areas being grazed. All new ponds will be less than ¼ acre, less than 10 ft in depth, and have gently sloped banks which could benefit some prey species.

Each of the above impacts would be both short-term (one year or less) and long-term (multiple years); however, impacts would be minimized by implementing the design criteria and using monitoring results and other adaptive management strategies to limit livestock use of riparian habitats and encourage use away from them. Specifically, those design criteria and adaptive management options that limit livestock utilization of herbaceous and woody species and the amount of bare ground and soil compaction would be used to move towards and achieve the desired condition for MSO and their habitats.

Recovery Plan Guidelines

The Proposed Action would address the MSO Recovery Plan livestock grazing guidelines within Protected and Restricted Areas as follows:

1. Monitoring of grazing use by livestock and wildlife in key grazing areas (riparian areas and meadows) would be achieved by measures in the *Monitoring Plan* and the design criteria.
2. Implementation and enforcement of grazing utilization standards listed as design criteria would attain “good” to “excellent” range conditions, or move those areas in an upward trend within key grazing areas, meeting this measure.
3. Management strategies that would restore “good” range conditions to degraded riparian communities as soon as possible would be met by implementing design criteria, monitoring, and timely use of the proper adaptive management options to reach the desired conditions.

Alternative C would have slightly fewer negative impacts to MSO than Alternative C, but more than under Alternative A. *Therefore, Alternative C (Proposed Action) would be the 2nd best choice for MSO.*

Effects Determination

Based on the above rationale, **Alternative C (Proposed Action)** “***may affect, not likely to adversely affect***” the Mexican spotted owl.

Photo 3-14; Canada Lynx.

Canada Lynx

This project was originally analyzed using the Canada Lynx Conservation Assessment and Strategy (LCAS; Ruediger et al. 2000) – Standards and Guidelines. However, just recently (October 29, 2008), the Southern Rockies Lynx Amendment (SRLA; Forest Service 2008) was signed and the PSICC is beginning to implement the standards and guidelines from it. Many of the standards and guidelines from the LCAS were carried over into the SRLA and it will supersede the LCAS. SRLA compliance for the different alternatives is discussed below.

Linkage Areas
The analysis area contains three lynx linkage areas. (Map 4, App A, BA/BE)

The following analysis is conducted under the assumption that "adaptive management" techniques (i.e., implementation of project design criteria [PDC], Forest Plan standards and guidelines, and progressively more aggressive management actions taken to address any unacceptable resource damage issues, etc.) used will meet or exceed all applicable SRLA objectives, standards, and guidelines.

Alternative A – No Action (No Grazing)

Direct and Indirect Effects

This alternative would not have any additional effects on lynx or lynx habitat. Natural ecological processes would continue and succession would cause changes in vegetation structure and composition. Biological/ecological processes (unrelated to livestock grazing) that would occur under this alternative are similar to those described below for Alternative C, except that they would occur at a quicker rate. Natural disturbances such as fire, insects, disease, wind, and ice/snow damage, etc. would set back seral stages in a patchwork or mosaic fashion over time. (Wildland fire use [WFU] will be considered on naturally ignited fires on the National Forest lands.) Species composition, species abundance, seral stage, and structural stage would all move toward conditions that are within the historical range of variability (HRV) in those areas where the vegetation is currently outside of it. This alternative would allow areas outside of the HRV to attain it in the shortest time frame. Recovery or restoration of any areas that are not in optimal condition for the given vegetation type would also be attained in the shortest time frame. Not grazing the area with livestock would allow more of the forage species to mature and go to seed, thereby promoting better regeneration and replacement of older, stagnant, and/or decadent plant roots, shoots, etc. Natural and/or prescribed fires (the proposed fire management strategy under the WFU Plan) that mimic the natural fire regime intensity and severity would aid in improving the long-term biodiversity and heterogeneity of the area.

This alternative would provide for the maximum biological diversity and local area heterogeneity naturally attainable in the shortest time. Alternative A would have only beneficial effects on Canada lynx. Therefore, *Alternative A (No Action/No Grazing) would rank as the first (1st) choice (most beneficial) for lynx and lynx habitat*, since it would mimic natural processes the closest of any of the alternatives.

Effects Determination

Based on the above rationale, **Alternative A** would have *wholly beneficial effects*, therefore, the effects determination by definition is "***may affect, not likely to adversely affect***" the Canada lynx.

Alternative B - Current Management

Direct and Indirect Effects

This alternative would have similar effects on lynx and their habitat as Alternative C above, except at higher intensities since there would not be as many adaptive management tools and options available for the allotments. There would be less management flexibility to adjust for undesirable impacts from grazing since Alternative B has fewer options to address undesirable impacts to the vegetation and rangelands than the Proposed Action. Consequently, with this alternative, it would be more difficult to maintain or improve the vegetation health and vigor. Alternative B could stall or retard the progression of the vegetation community structure, composition, and cover from reaching HRV conditions in those areas that are currently outside of it, when compared to the other alternatives. The effects of this alternative would likely be less favorable for lynx prey (primarily snowshoe hare). This alternative would likely result in more grazing pressure and forage consumption than the other alternatives due to fewer "checks and

balances" available to catch problems or issues in the allotments early on, and it could alter lynx prey base habitat enough to have discernable or detectable effects on lynx prey densities and lynx habitat.

In conclusion, Alternative B would have greater negative impacts to Canada lynx than either Alternative A or C. Therefore, *Alternative B (Current Management) would rank as the third (3rd) choice (least beneficial) for lynx and lynx habitat*.

Risks to Lynx Movement and Dispersal
Risks to lynx movement and dispersal from this alternative are very similar to those described for Alternative C except for a potential very slight increase in impact levels to lynx habitat due to the lack of additional adaptive management options available. Without having the adaptive management tools of the Proposed Action available there would be less ability to address any concern areas that may not be maintaining or reaching desired conditions at the desired time frame given the management options available under this alternative.

Non-Native Invasive Plant Species
Risks to lynx habitat from non-native invasive plants from this alternative are very similar to those described for Alternative C except for a potential very slight increase in impact levels to lynx habitat due to the lack of additional adaptive management options available mentioned above for lynx movement and dispersal risks.

Effects Determination
Based on the above rationale, Alternative B would have insignificant and discountable negative effects, and therefore, the effects determination by definition is "***may affect, not likely to adversely affect***" the Canada lynx.

<u>Alternative C – Adaptive Management (Proposed Action)</u>

Direct and Indirect Effects
Lynx denning habitat would not be affected by livestock grazing in the analysis area due to the lack of actual livestock grazing in these areas. However, suitable habitat within riparian areas, shrubby areas, meadows, and openings in forested areas where livestock tend to concentrate would continue to be grazed in most instances. Specific design criteria would be implemented by using adaptive management to minimize adverse effects. Management activities will vary somewhat allotment by allotment, and even pasture by pasture, case depending upon the site-specific conditions present. For example, some areas are currently degraded and/or not at the desired condition may be fenced off or have very limited numbers/duration of livestock grazing on them, while other areas in good condition may have the full stocking rates applied to them.

The LCAS explicitly identifies livestock as directly adversely affecting the snowshoe hare – primary prey of lynx. In summer, snowshoe hares eat forbs, grasses, leaves of shrubs, and some woody browse, while their winter diet is restricted to smaller-diameter twigs and bark of shrubs and trees. Livestock grazing can affect these critical habitat components, thereby limiting the amount and quality of hare habitat, particularly in riparian areas and aspen forests where livestock use is higher.

As specified in the LCAS, snowshoe hare densities and overwinter survival appear to be positively correlated with understory density. Particularly in riparian areas within lynx habitat, large ungulate (such as livestock) forage use levels may result in competition for forage resources. Browsing or grazing can have a direct effect on snowshoe hare habitat if it reduces winter browse. Browsing or grazing may also affect plant communities that connect patches of lynx habitat within a home range. Implementation of the design criteria would minimize the effects from livestock grazing by maintaining an understory.

In conclusion, even though livestock grazing may have impacts on lynx and lynx habitat, the LCAS operates under the assumption that if the range condition is in good shape and Forest Plan and/or Resource Management Plan standards and guidelines are being implemented, livestock grazing activities will not have any significant adverse effects on lynx or lynx habitat (N. Warren, FS, pers. comm.). Monitoring of the grazing activities' impacts on habitat in the allotments would be used to assist in validating the above assumption at the site specific scale and is of paramount importance to achieve the desired results.

Risks to Lynx Movement and Dispersal

The proposed activity contains three lynx linkage corridors. While there would be some impacts to the vegetation within the linkage areas from grazing, Grazing Standards and Guidelines and design criteria would prevent any undesirable impacts from reaching a level considered to be significant. In other words, the vegetation structure, species composition, or vertical and horizontal cover would not be modified to the degree that they do not provide ample security habitat for lynx moving through the area. Therefore, this alternative would have insignificant and discountable effects on the lynx linkage areas.

No suitable habitat of any type would be converted to unsuitable habitat under the Proposed Action. The function of important habitat components discussed above (such as foraging, denning, or movement corridors) would not be adversely affected. Under the Proposed Action, Grazing Standards and Guidelines and design criteria would be fully implemented and would maintain or move habitats toward the desired conditions. As a result, negative effects to lynx and their prey would be minimized, although not be eliminated. Frequent quantitative monitoring would be performed (see Appendix C – Monitoring Plan), allowing rangeland managers ample time to adjust to minimize adverse effects to this species to a level that they would be insignificant and discountable.

In conclusion, Alternative C would have fewer negative impacts to lynx than Alternative B, but more than Alternative A. Therefore, *Alternative C (Proposed Action) would rank as the 2nd best choice (better) in regards to effects and impacts on Canada lynx.*

Effects Determination

Based on the above rationale, Alternative C would have insignificant and discountable negative effects, and therefore, the effects determination by definition is "***may affect, not likely to adversely affect***" the Canada lynx.

Forest Service Sensitive Species

The analysis area of concern for FS sensitive species is the National Forest lands portion of the proposed project. Species that utilize similar habitat types are grouped together for simplification of analysis purposes. See Wrigley et al. (2007) for a detailed species account discussion on each FS sensitive species', which is incorporated here for each species by reference.

The analysis for the Proposed Action (Alternative C) and the resulting effect determinations for each of the species below are based on the below four critical assumptions:

1. Each of the design criteria specified in Appendix E above are fully executed;
2. Appropriate monitoring of items specified in the *Monitoring Plan* (Appendix C) and the *Proposed Action – Allotment Management Actions* (Appendix D) will occur with the frequency necessary to effectively evaluate livestock grazing effects;
3. Monitoring results will be used to determine an adaptive management action to bring about the desired change (achieving or moving toward the desired condition for allotments as stated the LMRP (U.S. Forest Service 1984); and
4. Appropriate adaptive management actions (Appendix D) will be implemented in a timely fashion.

The following effects determinations are not robust to violation of any of the above four assumptions. In other words, if an assumption is violated (or not fully implemented), the analysis in this assessment and the resulting effect determinations for Alternative C – Proposed Action) will not be valid, and a re-evaluation will be warranted because those actions are outside of the scope of this analysis and the basis of the determinations. Additionally, if our actions fall outside of these assumptions, a re-analysis may be necessary under provisions of NEPA. For the Proposed Action (Alternative C), we based our analysis on the assumption that design criteria and adaptive management options, as described in earlier in this EA will be successful and the desired condition will be achieved.

Boreal Toad and Northern Leopard Frog

In Colorado, boreal toads occupy habitats between approximately 8,000-12,000 ft in elevation, while leopard frogs have been found in ranges from below 3,500 ft to above 11,000 ft (Hammerson 1999). Significant portions of the leopard frog's habitat throughout their range are lower elevations (within and outside of the Analysis Area), that are on private and other lands (Smith and Keinath 2007). Both species inhabit marshes, wet meadows, and the margins of streams, beaver ponds, lakes, and glacial kettle ponds in subalpine areas, and there is considerable overlap.

There appears to be suitable habitat within the Analysis Area for boreal toads and northern leopard frogs. However, according to Hammerson (1999) boreal toads are apparently absent from the Sangre de Cristo and Wet Mountains of Colorado, which includes the Analysis Area. Northern leopard frogs have been documented (Hammerson 1999) near or in the Analysis Area. Several surveys have been conducted for boreal toads in the Wet Mountains and Sangre de

Cristos by Forest Service and Colorado Division of Wildlife personnel in the last several years, but no boreal toads or northern leopard frogs were observed or documented. No known leopard frog breeding sites are within any of the allotments analyzed here; however, adequate surveys have not been completed to date in many areas. The nearest known population of boreal toads is located approximately 60 miles northwest of the closest allotment (Newlin) on the Salida Ranger District.

Photo 3-15; Boreal Toad

Photo 3-16; Northern leopard frog

The Analysis Area contains approximately 8,100 acres of riparian habitat total. Table 3-16 below shows potential acreage of boreal toad and northern leopard frog breeding/adjacent areas by allotment, which includes the riparian habitat plus a 500 ft extension beyond the riparian areas. Boreal toad habitat is assumed to be above 8,000 ft elevation whereas there are no limitations on elevation for northern leopard habitat.

Table 3-16. Amount of potential boreal toad and northern leopard frog breeding/adjacent habitats within each existing allotment (rounded to the nearest 100 acres).

Allotment	Approx. area (acres) of Potential Boreal Toad Breeding/Adjacent Habitats	Approx. area (acres) of Potential Leopard Frog Breeding/Adjacent Habitats
Devil's Hole	6,500	6,900
Greenhorn	5,300	5,300
Indian Creek	3,800	3,900
Lakes	300	300
Newlin	2,500	2,700
Ophir	3,800	3,800
Pantleon	2,300	2,300
West Peak	4,400	4,400
Williams Creek	18,700	18,900
Total Area	**47,600**	**48,500**

Alternative A – No Action (No Grazing)

Direct and Indirect Effects
This alternative would not have any negative effects or impacts on boreal toad or northern leopard frog. In general, the effects to the above species' habitat would be wholly beneficial and similar to those described under Alternative A for Canada Lynx.

Under this alternative, there would be no possibility for direct impacts in the form of trampling by livestock (mortality) of boreal toad or leopard frog adults, metamorphs, or eggs. Indirect impacts described under Alternatives B and C would not occur under this alternative; thus negative impacts to these amphibians and their habitats would not occur, rather current impacts would cease – benefiting these species. The exclusion of livestock grazing in general can have substantial short-term (one year or less), long-term (multiple years), and permanent changes such as vegetation species composition shifts back to native species and improved channel and water table conditions (where possible). These other changes in vegetative communities would indirectly, directly, and cumulatively benefit these species. All of the above factors would contribute to improved habitat conditions for these species, compared to the baseline condition. There would be no direct, indirect, or cumulative adverse impacts from this alternative to these species; rather, habitat conditions would be expected to improve for each of these species in both the short and long-term.

Alternative A (No Grazing) would rank as the first (1st) choice (*most beneficial*) for boreal toad and northern leopard frog habitat, since it would allow recovery of degraded habitat areas the quickest and mimic natural processes the closest of any of the alternatives.

Effects Determination
Based on the above rationale, **Alternative A (No Grazing)** would have a ***"beneficial impact"*** for the boreal toad and northern leopard frog.

Alternative B – Current Management

Direct and Indirect Effects
Alternative B would have very similar impacts to boreal toads and northern leopard frogs as Alternative C below except at a small incrementally higher level due to the lack of adaptive management options available to aid in speeding the recovery of degraded areas that are not reaching desired conditions in the desired timeframe.

Alternative B (Current Management) would rank as the third (3rd) choice (*least beneficial*) in regards to effects and impacts on boreal toad and northern leopard frog habitat.

Effects Determination
Based on the above rationale, **Alternative B (Current Management)** ***"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing"*** for the boreal toad and northern leopard frog.

Alternative C – Adaptive Management (Proposed Action)

Direct and Indirect Effects

Livestock grazing under the proposed action would have some short-term (one year or less) and long-term (multiple years) impacts; however, permanent changes such as vegetation composition shifts to non-native or undesirable species, down-cutting and erosion of streams, or changes/lowering of the water table probably would not occur as long as the design criteria and adaptive management-based monitoring principles are implemented. Most likely, several management techniques will need to be employed to prevent livestock from damaging riparian areas (obligate sites for breeding and rearing of young), which are the most sensitive habitats for leopard frogs and boreal toads. Impacts and other changes in vegetative communities from livestock grazing could indirectly, directly, and cumulatively affect potential habitat for the species addressed here; however, implementing the proposed design criteria and using adaptive management options would help to minimize adverse impacts from Alternative C implementation.

Protective measures designed to minimize the above impacts (design criteria and adaptive management options) and habitat assessments, surveys of habitat for toads and frogs, or monitoring of sites within allotments would occur under this alternative, lowering the potential of substantial adverse impacts. Adverse impacts would be reduced but not eliminated during critical periods (breeding, foraging, hibernation, etc.). Thus, adverse impacts could occur to toads and frogs under this alternative, as they would under Alternative B, but less because of the general adaptive management options available. As a result, this alternative would not substantially impact shelter and other important components of the life history of boreal toads or leopard frogs, but there would likely be some impacts, especially to leopard frogs, since they have a much higher potential to be present in the allotments. The design criteria (listed in Appendix E) would generally move toad and frog habitats toward the desired conditions (see LRMP [U.S. Forest Service 1984] and Smith and Keinath (2007)), minimizing impacts to this species, although they would not be eliminated entirely. Frequent quantitative monitoring (see Appendix C – Monitoring Plan) shall be performed, allowing rangeland managers ample time to adjust management to minimize adverse effects from livestock grazing.

This alternative would add to the cumulative effects to each of these species. Other cumulative effects of on-going and future federal, state, private, and other activities include mining, livestock grazing, fire suppression, road construction and maintenance, motorized and non-motorized recreation, water developments, timber harvesting, and human development. Direct and indirect short-term (one year or less), long-term (multiple years), and permanent impacts to these species from each of these activities would continue to occur. Refer to the cumulative effects discussion above (Section 8.1) for a further discussion of the effects from these activities which are incorporated here by reference.

Alternative C (Proposed Action) would rank as the second (2nd) best choice in regards to effects and impacts on boreal toad and northern leopard frog habitat.

Effects Determination

Based on the above rationale, **Alternative C (Proposed Action)** ***"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing"*** for the boreal toad and northern leopard frog.

Northern Goshawk, Boreal Owl, Olive-sided Flycatcher, Lewis' Woodpecker, Flammulated Owl, American Three-toed Woodpecker, Wolverine, and American Marten

This guild of species is primarily found in forested habitats with the occasional exception of wolverines being found in high elevation alpine and rocky talus slopes during part of the year.

Alternative A – No Action (No Grazing)

Direct and Indirect Effects
This alternative would not have any negative effects on the above sensitive species. In general, there would be slight beneficial effects to the above species and their habitat. The effects would be similar to those described above in Alternative A for Canada lynx which is incorporated here by reference. Under this alternative, the above species' habitat would maintain its habitat effectiveness in those areas that are in good condition and recover in any degraded areas as succession and ecological processes would be allowed to proceed unimpeded by any impacts from livestock grazing. As the vegetation would be allowed to return to conditions within HRV in any areas not presently at it, habitat suitability and effectiveness for the above species would improve and more closely mimic historical conditions; providing for productivity and viability levels expected under a naturally functioning ecosystem.

Alternative A would rank as the first (1st) choice (*most beneficial*) for the above species' habitat, since it would mimic natural processes the closest of any of the alternatives and allow for any degraded areas to recover the quickest.

Effects Determination
Based on the above rationale, **Alternative A (No Grazing)** would have a ***"beneficial impact"*** for northern goshawk, boreal owl, olive-sided flycatcher, Lewis' woodpecker, flammulated owl, American three-toed woodpecker, wolverine, and American marten.

Alternatives B and C – All Action Alternatives

Direct and Indirect Effects
Many of the effects on the above species' habitat would be similar to those described above in Alternative C for Canada lynx which is incorporated here by reference.

This alternative would not have any direct impacts on the above species but there is the possibility of indirect effects on some or all of them, most notably the Lewis' woodpecker. Some of the above species such as the boreal owl, olive-sided flycatcher, three-toed woodpecker, Lewis' woodpecker, flammulated owl, and marten depend on cavities for nesting and/or roosting and also require standing, dying trees, snags, and downed logs for foraging or prey habitat.

Although livestock grazing does not generally affect these habitat components directly, it can impact the regeneration of trees (willows, cottonwoods, and aspen) and shrubs which ultimately provides future habitat. However, most of the above species (primarily dense forest dwellers such as boreal owl, goshawk, marten, and three-toed woodpecker) would exhibit very minor or insignificant impacts from livestock grazing since livestock do not tend to utilize their primary habitat types (i.e., heavily-forested areas; approximately 63,000 ac or 70% of the analysis area). There could be a low risk to the long-term persistence of snags due to a lack of snag recruitment if livestock grazing prevented regeneration of conifer and hardwood trees in forested areas, which would eventually be a significant concern. However, since grazing in heavily forested areas is not preferred by livestock, loss of snag recruitment due to overgrazing is very unlikely to occur given that design criteria would trigger the removal of livestock from the pasture before they had any significant impacts on long-term snag recruitment.

There are a few locations within the Analysis Area where Lewis' woodpeckers could inhabit (primarily the lower elevation riparian areas). Most notably, Reed Gulch, Wylie Gulch, and Williams Creek (Devil's Hole allotment), lower White Creek (White Creek allotment), along with Indian Creek and Tracy Canyon (Indian Creek allotment). Most of the riparian cottonwood habitat in the Analysis Area is in a degraded condition due to past management activities over the last one to two centuries. However, most of these areas that are currently degraded are showing signs of recovery due to changes in management (including livestock management) over the last several decades. Implementation of design criteria (and adaptive management options for Alternative C) would help to speed up the riparian woodland recovery rates by providing ample protection of riparian habitat, and consequently, enable the water tables in degraded areas to rise, promoting better cottonwood recruitment and survivability. This should provide for more suitable Lewis' woodpecker habitat over time.

In summary, there may be some negative effects on the above species and their habitat. However, the magnitude of effects from either of these alternatives would be insignificant and discountable and not be on a large enough scale to threaten any of the species' viability at the planning level or range wide. Alternative B would have a very slight increase in the magnitude of impacts to the above species versus Alternative C due to the lack of additional adaptive management options available to address any concerns where any degraded areas are not recovering to the desired condition as quickly as expected.

In conclusion, due to the adaptive management strategies available, Alternative C ranks as the 2nd best choice (*better*), while Alternative B ranks as the 3rd (*least desirable*) choice in regards to effects and impacts to the above sensitive species.

Effects Determination

Based on the above rationale, **Alternatives 2 and 3 *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing"*** to the northern goshawk, boreal owl, olive-sided flycatcher, Lewis' woodpecker, flammulated owl, American three-toed woodpecker, wolverine, and American marten.

Brewer's Sparrow, Common Hog-nosed Skunk, Fringed Myotis, Rocky Mountain Bighorn Sheep, and Townsend's Big-eared Bat

This group of species is typically found in drier rocky, shrublands, and forest types (as well as rocky cliff and cave areas for the bats).

Table 3-17 below shows the amount of bighorn sheep summer and winter range by allotment.

Table 3-17. Mapped bighorn sheep summer and winter habitat for each allotment (rounded to nearest 10 ac).

Allotment	Approximate Area of Habitats (acres)	
	Bighorn Sheep Summer Habitat	Bighorn Sheep Winter Habitat
Devil's Hole	0	0
Greenhorn	10,320	2,330
Indian Creek	0	0
Lakes	0	0
Newlin	0	0
Ophir	0	0
Pantleon	10	0
West Peak	11,440	5,530
Williams Creek	7,780	0
Totals	**29,550**	**7,860**

Alternative A – No Action (No Grazing)

Direct and Indirect Effects

This alternative would not have any negative effects on the above sensitive species. In fact, there would be beneficial effects to the above species and their habitat as degraded areas are allowed to recover in the quickest timeframe. Under this alternative, the above species' habitat would maintain its habitat effectiveness in those areas that are in good condition and recover in any degraded areas as succession and ecological processes would be allowed to proceed unimpeded by any impacts from livestock grazing. Effects to the above species' habitat would be similar to those described above for Canada lynx under Alternative A and are incorporated here by reference. As the vegetation would be allowed to return to conditions within HRV in any areas not presently at it, habitat suitability and effectiveness for the above species would improve and more closely mimic historical conditions; providing productivity and viability levels expected under a naturally functioning ecosystem.

Alternative A (No Grazing) would rank as the 1st choice (*most beneficial*) for the above species' habitat, since it would mimic natural processes the closet of any of the alternatives and allow for any degraded areas to recover the quickest.

Effects Determination
Based on the above rationale, **Alternative A (No Grazing)** would have a ***"beneficial impact"*** for Brewer's sparrow, common hog-nosed skunk, fringed myotis, Rocky Mountain bighorn sheep, and Townsend's big-eared bat.

Alternatives B and C – All Action Alternatives

Direct and Indirect Effects
The Analysis Area does not have Brewer's sparrow obligate habitat type (sagebrush), but does contain some of the other habitat types they are known to occur in (shrubby openings in pinyon-juniper [*Pinus edulus-Juniperus* spp.], mountain mahogany [*Cercocarpus* spp.] woodlands, and large shrubby parklands within conifer forests). In Holmes and Johnson (2005), livestock grazing impacts to Brewer's sparrow were primarily limited to those effects livestock have on sagebrush habitat with little mentioned about impacts to other types of habitat utilized by Brewer's sparrow. Most likely, any impacts to Brewer's sparrow from this proposed project would be related to conversion of shrublands to exotic annual grasslands which favors other species of birds, causing habitat loss for Brewer's sparrow. Implementing design criteria would minimize these types of impacts to the vegetation and potentially to Brewer's sparrows.

Heavy grazing reduces the understory grass and forb communities. This in turn reduces available habitat for ground-dwelling invertebrates and insects that are the main food resource for hog-nosed skunks. Alteration of the herbaceous components of habitats from grazing practices (i.e., reduced ground cover and leaf litter, accelerated decomposition of organic matter) should be considered a threat to American hog-nosed skunk persistence (Meaney et al. 2006).

Both of the Action Alternatives could reduce hog-nosed skunk prey base densities and possibly reduce snag recruitment in the long-term from the potential impacts described above in Alternative C for Canada lynx. A decrease in prey base could reduce the productivity of any one of the above species within the analysis area and a lack of snag recruitment in the long term could degrade habitat effectiveness for the snag dependent bat species by reducing available roosting habitat and possibly hibernacula for the fringed myotis. Although there is potential for impacts to the above species that vary to a small degree by alternative, design criteria implementation (and adaptive management tools for Alternative C) would minimize them to be insignificant and discountable and not lead to any detectable declines in the above species' population viability or sustainability.

The following paragraph of information comes from Beecham et al. (2007). The authors identified some of the principal impacts of livestock grazing on bighorn sheep to be: competition for forage, water, and space, and possibly from disease transmission (primary threats of disease transmission are from domestic sheep and goats versus cattle). Overgrazing by domestic livestock in the late 19th and early 20th century caused preferred forage species for bighorn sheep to be reduced significantly or disappear altogether. Conversion of grasslands to shrublands from severe overgrazing made the habitat more suitable for mule deer and likely supported higher densities of predators, which are capable of preying heavily on lambs and even adult female bighorns. Competition between cattle and bighorns is especially critical during periods of the year when forage is limited or of low quality. The presence of cattle in riparian or alpine areas

may reduce the availability of high quality forage to bighorn sheep. Research has suggested that wild sheep were socially intolerant of cattle. Other researchers reported that cattle were serious dietary and spatial competitors of bighorn sheep.

Implementation of design criteria would ensure adequate forage quantity and quality is available for wildlife species such as bighorn sheep and the prey species that provide food for the above secondary or tertiary consumers.

In summary, there may be some negative effects on the above species and their habitat. However, the magnitude of effects from either of these alternatives would be insignificant and discountable and not be on a large enough scale to threaten any of the species' viability at the planning level or range wide. Alternative B would have a very slight increase in the magnitude of impacts to the above species versus Alternative C due to the lack of additional adaptive management options available to address any concerns where any degraded areas are not recovering to the desired condition as quickly as expected.

In conclusion, due to adaptive management options available, Alternative C ranks as the 2nd best choice (*better*) and Alternative B ranks as the 3rd choice (*least beneficial*) in regards to effects and impacts to the above sensitive species.

Effects Determination
Based on the above rationale, **Alternatives 2 and 3 *"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing"*** for Brewer's sparrow, common hog-nosed skunk, fringed myotis, Rocky Mountain bighorn sheep, and Townsend's big-eared bat.

Northern Harrier and Loggerhead Shrike

These species tend to inhabit grasslands, agricultural areas, and lowland mesic habitat types such as marshes and open riparian areas.

<u>Alternative A – No Grazing</u>

Direct and Indirect Effects
Under this alternative, northern harrier and loggerhead shrike habitat would maintain its habitat effectiveness in those areas that are in good condition and recover in any degraded areas as succession and ecological processes would be allowed to proceed unimpeded by any impacts from livestock grazing. Effects to northern harrier and loggerhead shrike habitat would be similar to those described above for Canada lynx under Alternative A and are incorporated here by reference. As the vegetation would be allowed to return to conditions within HRV in any areas not presently at it, habitat suitability and effectiveness for shrikes and harriers would improve and more closely mimic historical conditions; providing productivity and viability levels expected under a naturally functioning ecosystem.

Alternative A would be the 1st choice (*best*) for northern harrier and loggerhead shrike since it would mimic natural processes the closet of any of the alternatives and allow for any degraded areas to recover the quickest.

Effects Determination
Based on the above rationale, **Alternative A (No Grazing)** would have a ***"beneficial impact"*** for northern harrier and loggerhead shrike.

Alternatives B and C – All Action Alternatives

Direct and Indirect Effects
The Analysis Area contains a rather limited amount of suitable northern harrier and loggerhead shrike habitat (Devil's Hole/Black Mountain allotment) in the lower elevation riparian areas that are difficult to delineate with the existing vegetation database since cottonwoods were not a large enough percentage of the vegetative cover to type out as a unique habitat type. The action alternatives would have similar effects on loggerhead shrike and northern harrier habitat as those described above for Canada lynx under Alternative C which is incorporated here by reference. While there is not a direct overlap of lynx habitat with shrike and harrier habitat, many of the ecological processes and successional progressions described above for it are very similar and applicable for shrike and harrier habitat as well. The principals of habitat development discussed under the lynx discussion referenced apply equally to both lynx and shrike/harrier habitat types even though there is not direct overlap. Design criteria would minimize adverse effects to the above species but would not eliminate them totally. Alternative B would have a slightly higher level of adverse impacts to shrike and harriers due to the lack of adaptive management options available that could assist in speeding up the recovery process in degraded areas that are not progressing to the desired conditions as quickly as expected.

Alternative B would be the 3rd choice (*least desirable*) and Alternative C would be the 2nd choice (*better*) for loggerhead shrike and northern harrier.

Effects Determination
Based on the above rationale, **Alternatives 2 and 3** ***"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing"*** for northern harrier and loggerhead shrike.

American Peregrine Falcon and White-tailed Ptarmigan

Peregrine falcons utilize open-faced steep, rocky cliff areas for nesting while white-tailed ptarmigan utilize alpine tundra and willow thickets.

Alternatives A, B, and C

Direct and Indirect Effects
There is peregrine falcon and white-tailed ptarmigan habitat within the Analysis Area (peregrine habitat in Greenhorn, Indian Creek, Newlin, and Williams Creek; white-tailed ptarmigan habitat in Pantleon). However, livestock would not impact the habitat for either of these species under

any of the above alternatives due to lack of them actually grazing in the habitat types (difficult access) utilized by peregrine falcons and white-tailed ptarmigan for this particular project.

There are no known falcon eyries in the Analysis Area. Peregrines utilize rocky cliff areas for nesting and roosting and prey upon various bird species, attacking them in mid-air. None of the alternatives would have any detectable impacts on peregrine falcons, even if they were present in one or more of the allotments, since peregrines have virtually no known direct or indirect interaction with livestock. Peregrine nesting, roosting, and foraging behavior is not influenced by livestock grazing in an area. Peregrine numbers have increased dramatically over the last 30+ years, primarily due to removing DDT from their environment, all the while grazing has continued in the vicinity of many of the areas where peregrines forage. Therefore, removing or continuing grazing in an area where peregrines nest, which are inaccessible to livestock, would not impact their productivity or viability.

The Pantleon allotment has a small amount of potential white-tailed ptarmigan habitat up on the extreme western ridge top. However, this area is virtually all but inaccessible to livestock in the allotment due to the steepness of the slope and the heavily-forested habitat that would have to be traversed in order for livestock to access the area where potential ptarmigan habitat exists. According to J. Outhier, (FS operations specialist, pers. comm.) livestock have never been known to be in the area of the allotment that is suitable ptarmigan habitat.

Since none of these alternatives would have any impacts on peregrine falcon and white-tailed ptarmigan, they all rank the same (*neutral*) in regards to the degree of benefits/impacts to the above species.

Effects Determination
Based on the above rationale, **Alternatives 1, 2, and 3** would have ***"no impact"*** for peregrine falcon and white-tailed ptarmigan.

EFFECTS DETERMINATION SUMMARY

Table 3-18. Effect determinations for each wildlife species addressed

[1] **STATUS CODES: E**=federally listed endangered; **T**=federally listed threatened; **C**=federally proposed/candidate for listing; and **S**=FS sensitive
[2] **FEDERAL SPECIES** - **NE**=no effect; **NLAA**=may affect, not likely to adversely affect; **NLAA –B**=may affect, not likely to adversely affect – wholly beneficial; **LAA**=may affect, likely to adversely affect; and **NLJCE**=not likely to jeopardize the continued existence or adversely modify proposed critical habitat; **FS SENSITIVE SPECIES - BI**=beneficial impact; **NI**=no impact; **MAII**=may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing; and **LRLV**=likely to result in a loss of viability in the Planning Area, or in a trend toward federal listing.

SPECIES NAME	SCIENTIFIC NAME	STATUS CODE[1]	DETERMINATIONS OF EFFECT [2]		
			ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C (PROPOSED ACTION)
AMPHIBIANS					
Boreal toad	*Anaxyrus boreas*	S	BI	MAII	**MAII**
Northern leopard frog	*Lithobates pipiens*	S	BI	MAII	**MAII**
BIRDS					
American peregrine falcon	*Falco peregrinus anatum*	S	NI	NI	**NI**
American three-toed woodpecker	*Picoides dorsalis*	S	BI	MAII	**MAII**
Boreal owl	*Aegolius funereus*	S	BI	MAII	**MAII**
Brewer's sparrow	*Spizella breweri*	S	BI	MAII	**MAII**
Flammulated owl	*Otus flammeolus*	S	BI	MAII	**MAII**
Lewis' woodpecker	*Melanerpes lewis*	S	BI	MAII	**MAII**
Loggerhead shrike	*Lanius ludovicianus*	S	BI	MAII	**MAII**
Mexican spotted owl	*Strix occidentalis lucida*	T	NLAA-B	LAA	**NLAA**
Northern goshawk	*Accipiter gentilis*	S	BI	MAII	**MAII**
Northern harrier	*Circus cyaneus*	S	BI	MAII	**MAII**
Olive-sided flycatcher	*Contopus cooperi*	S	BI	MAII	**MAII**
White-tailed ptarmigan	*Lagopus leucurus*	S	NI	NI	**NI**
MAMMALS					
American marten	*Martes americana*	S	BI	MAII	**MAII**
Canada lynx	*Lynx canadensis*	T	NLAA-B	NLAA	**NLAA**
Common hog-nosed skunk	*Conepatus leuconotus*	S	BI	MAII	**MAII**
Fringed myotis	*Myotis thysanodes*	S	BI	MAII	**MAII**
Rocky Mtn. Bighorn Sheep	*Ovis canadensis canadensis*	S	BI	MAII	**MAII**
Townsend's big-eared bat	*Plecotus townsendii*	S	BI	MAII	**MAII**
Wolverine	*Gulo gulo*	S	BI	MAII	**MAII**

MITIGATION MEASURES

There are no mitigation measures for this Biological Assessment/Evaluation. Measures to assist in reducing impacts to species addressed in this analysis have been incorporated into the project design criteria.

3.4.2 WILDLIFE MIS

Amendment 30 to the LRMP (Forest Service 2005) identified two wildlife MIS for the Pike and San Isabel National Forests. All species analyzed are identified in Table 3-19.

Table 3-19. Wildlife Management Indicator Species

Species	Species expected in project area?	Habitat affected by project?	Further evaluation as MIS?	Primary Habitat type
Abert's Squirrel	Yes	Yes	Yes	Mature Ponderosa Pine
Elk	Yes	Yes	Yes	Widespread

The following sections address MIS documented in the Analysis Area and/or whose habitat may be affected by the proposed alternatives.

The analysis for the Proposed Action (Alternative C) and the resulting effect determinations for each of the species below are based on the following four critical assumptions:

1. each of the design criteria specified are fully executed;
2. appropriate monitoring of items specified in the *Monitoring Plan* will occur with the frequency necessary to effectively evaluate livestock grazing effects;
3. monitoring results will be used to determine an adaptive management action to bring about the desired change (achieving or moving toward the desired condition for allotments as stated in the Land and Resource Management Plan; and
4. appropriate adaptive management actions will be implemented in a timely fashion.

MIS Evaluations and Population Trends

Forest Plan Standards and Guidelines
Grazing activities do not alter vegetation communities or habitat structural stages in a reasonable timeframe that would enable managers to detect differences in habitat attributes or capabilities, for either Abert's squirrel or elk, between the three alternatives analyzed in this document. In other words, the acreage values for habitat structural stages and vegetative cover classes are the same for all three alternatives modeled; consequently, the three alternatives all have the same habitat capability value using the available data.

Abert's Squirrel (*Sciurus aberti*)

Population Trend – Abert's squirrel population trend estimates for Colorado suggests stable or increasing abundance, and populations are sufficient to withstand some hunting in Colorado, Arizona, and New Mexico. Elevated mountain pine beetle (MPB) (*Dendroctonus ponderosae*) populations in Colorado in recent years have resulted in increased ponderosa pine mortality upon which this species relies heavily for food and shelter.

Photo 3-17; Abert's squirrel

Direct effects to Abert's squirrel populations on the Pike and San Isabel National Forests (PSI) or in Colorado have not been quantified. In areas inhabited by Abert's squirrels that have experienced high mortality of mature ponderosa pine, squirrel populations could remain the same or decrease depending on their densities prior to the MPB attack, and the extent of ponderosa pine mortality. Given ongoing MPB activity on the PSI and resulting ponderosa pine mortality, squirrel populations on the PSI will likely decline and range expansion will subside or retract until quality Abert's habitat stabilizes. Extensions of the known range have occurred in recent years in southwest and western Colorado. Population dynamics are poorly known. Population estimates range from 12 to 30 animals per km^2 (31 to 78 per mi^2) in the Black Forest of El Paso County, Colorado, and from 82 to 114 squirrels per km^2 (212 to 295 per mi^2), near Boulder, Colorado. Spring population counts tend to be lowest. Population estimates contain spatial and temporal variation, attributed to normal cyclic variations in annual biomass production of pine seeds (Patton 1974, Pederson et al. 1987).

Abert's squirrel is a species with specific habitat needs yet covers a significant portion of the forest in the landscape context. Forest-wide Abert's squirrel sign monitoring was initiated by the PSICC in 2006. Subsequent annual monitoring is planned and is needed to measure trends on the Forest as additional data have been collected. Table 3-20 depicts an estimate of Abert's squirrel habitat at several different scales.

Table 3-20. Approximate acres of potential Abert's squirrel habitat on National Forest

Habitat Quality*	San Carlos RD[1]	San Isabel NF[2]	PSI[2]
High	7,100	33,000	156,000
Moderate	8,200	16,000	70,000
Forage	3,400	9,000	36,000
Total	**18,700**	**58,000**	**262,000**

*All habitat structural stages (HSS) are for ponderosa pine habitats only.
High quality = HSS 4B, 4C or 5
Moderate quality = HSS 4A
Forage = HSS 3A, 3B, or 3C
[1]Rounded to nearest 100 acres
[2]Rounded to nearest 1,000 acres
Vegetation information was obtained from CVU data where available and RIS data for all other areas. This information does not account for recent mountain pine beetle activity.

Table 3-21 below displays the approximate acres of potential Abert's squirrel habitat in the Analysis Area by allotment.

Table 3-21. Abert's Squirrel Habitat by Allotment

Allotments	Acres of Abert's Squirrel Habitat			
	High	**Moderate**	**Forage**	**Total**
Devil's Hole	265	265	943	1,473
Greenhorn	11	11	11	33
Indian Creek/lakes	301	302	170	773
Newlin	178	178	91	447
Ophir	0	0	0	0
Pantleon	0	3	0	3
West Peak	1	1	19	21
Williams Creek	42	42	261	345

*All habitat structural stages (HSS) are for ponderosa pine habitats only.
High quality = HSS 4B, 4C or 5
Moderate quality = HSS 4A
Forage = HSS 3A, 3B, or 3C
Vegetation information was obtained from CVU data where available and RIS data for all other areas. This information does not account for recent mountain pine beetle activity.

Direct and Indirect Effects to Abert's Squirrels

The tables above show that approximately 18,700 and 3,095 acres of potential Abert's squirrel habitat exits within the San Carlos Ranger District and in the allotments analyzed in this report, respectively.

ALTERNATIVE A (NO GRAZING)

The relationship between past anthropogenic activities such as livestock grazing, fire suppression, and timber harvest and their impacts on Abert's squirrel habitat are complex. In general, ponderosa stands are more dense and uniform in age than during pre-European settlement times. This stems in part from intense domestic livestock grazing in the early 1900's which reduced fine fuels and altered fire frequency (see cumulative effects discussion for further detail). Eliminating grazing would increase fine fuels and increase the probability of fire starts throughout the range allotments. An increased number of fires could be beneficial or detrimental to Abert's squirrel and the ponderosa pine ecosystem depending on current vegetation conditions.

Ponderosa pine areas with multiple age classes, moderate to low densities, or experiencing very little mortality would benefit from more frequent fires. Fires in these areas would cause mortality in individual trees and small groups of trees, but large high intensity, high severity fires would not be expected. If fires are allowed to burn in these areas, then Abert's habitat would be maintained or improved over the long term; however, areas in this condition are relatively few currently. If aggressive fire suppression continues, then stands would remain dense or become more dense in the absence of fire and/or mechanical treatments. Abert's habitat quality would remain suppressed and fluctuate considerably with large-scale fires and insect epidemics. Grazing, or the lack of it, plays an indirect role in all these circumstances.

ALTERNATIVE B (CURRENT MANAGEMENT)

Ponderosa pine forests have been changed from more open park-like stands with an understory of grass to denser stands of pine with less understory (Rummell 1951, Cooper 1960). These changes are due to many factors, primarily fire suppression and widespread logging, but livestock grazing has also played a role in the changes seen in montane forest types. After logging, cattle and sheep were introduced to take advantage of the initial growth of forage. Heavy grazing led to a decrease in vigor of the understory (Painter and Belsky 1993) and the establishment of a dense stand of tree seedlings. Continued grazing removed fine fuels that carried surface fires, leading to the development of a dense stand of fire-sensitive tree species (Belsky and Blumenthal 1997). Rummell (1951) compared two similar ponderosa pine sites in central Washington State; neither site had been logged, but one site was subjected to grazing while the other site was not grazed. The ungrazed site had higher understory species diversity and cover and less tree reproduction (a "handful" of young trees per acre on the ungrazed site versus 3,291 young trees per acre on the grazed site). Grazing reduced litter and vegetative cover and disturbed the ground, leading to ideal condition for tree seed germination. Cooper (1960) reaches a similar conclusion. No monitoring data exists to correlate contributions of livestock grazing to tree density in ponderosa pine forests in the Analysis Area. However, many ponderosa pine stands within allotments are dense and have suffered extensive mortality from MPB in the past 5-7 years.

Grazing under current livestock grazing management would continue to remove fine fuels and alter species composition to favor plants that are more tolerant of grazing or less palatable. Fire frequencies would continue to be suppressed to some degree - in part from the fine fuel reduction associated with grazing. Fires that do get established would likely follow the paths described in Alternative A (e.g., larger and more intensive fires than typically occurred prior to Euro-American settlement).

ALTERNATIVE C (THE PROPOSED ACTION)

This alternative provides the most flexibility to tailor habitat manipulation with grazing management. On the surface, it may appear similar to current grazing management, but the benefits of Alternatives A and C would generally improve baseline conditions, improving natural ecological processes and habitat conditions if measures as described in Appendices C, D, E, and F of the BE/BA are implemented. This alternative would include the development of a "cow camp" facility in the Williams Creek pasture of the Williams Creek/Greenhorn Allotment. Pastures that need a prescribed burn would be rested pre- and post-burn to let fine fuels accumulate and vegetation recover without additional domestic grazing stress. Large, high intensity/severity fires described above are still possible in the Proposed Action, but several tools (e.g., prescribed fire, forest thinning, along with proper livestock grazing management) are available to move ponderosa pine communities to conditions that are more desirable. Additionally, the desirable grass communities should stabilize or improve in condition if adequate monitoring that is proposed is realized. Large, high intensity/severity fires discussed in Alternative A and B are still possible, but are less likely in Alternative C than in Alternative B.

Cumulative Effects to Abert's Squirrels

Cumulative effects to this species come from many sources. Below is a summary of historic and on-going activities within the Analysis Area that directly and indirectly affect plant and wildlife species addressed in this assessment.

- Fire suppression has led to increased fuel loading and canopy closure. For example, fire suppression has prevented natural thinning of the Douglas-fir, white fir, and ponderosa pine stands and limited tree growth. These small, dense stands are now relatively homogenous and are more susceptible to abnormal levels of insect and disease populations and tree mortality. Another example is that fire suppression in ponderosa pine forests, has created a dense understory of shade tolerant tree species (Douglas-fir and others) versus a more natural open understory of grasses and shrubs with larger diameter ponderosa overstory that occurred in the pre-suppression era. Few snags were created as a result of fire suppression and existing snags continued to be harvested for fuel. These historic activities combined to produce a forest that has smaller trees, less structure (snags and CWD), less species diversity, and a low stand age diversity (more older stands) that have directly and indirectly affected many of the wildlife species addressed here.
- Numerous activities require continued use of, or construction of new roads and trails. Roads in particular (as discussed in Wrigley et al. 2007) increase soil erosion, increase sedimentation, fragment, and directly remove habitat, facilitate the spread of invasive and noxious weeds. The spread of noxious weeds has led to changes in species composition

of the Forest, increased competition with native plant species, and altered fire regimes that have adversely affected wildlife species addressed here. Motorized and non-motorized recreational use (including OHV use, camping, horseback riding, mountain biking, hiking, hunting, and fishing) has led to the development of non-system roads and trails, development of dispersed campsites, erosion, disturbance to wildlife species, and the vectoring of invasive and noxious weeds in previously pristine areas. Each of these activities impact wildlife and plant species directly, indirectly, and cumulatively through fragmentation, habitat loss, and loss of effectiveness.

- Recreation is the major use of the Forest within a majority of the Analysis Area. Motorized touring (i.e., automobiles, four-wheeled drive vehicles, ORVs, and snowmobiles) are the most prevalent recreational activity on the Forest, followed by camping, hiking, and mountain climbing, and other activities such as fishing, hunting, and horseback riding. There are numerous campgrounds, trails, and roads used for recreation. Each of the above activities have incrementally impacted wildlife species addressed in this assessment directly, indirectly, and cumulatively through fragmentation, habitat loss, and loss of effectiveness through human disturbance.
- Grazing on state and private lands lead to biomass removal and trampling. It has led, and will continue, to changes in species composition, compaction of soils, changes in fuel loading, and the fire regimes. Each of these factors as a result of grazing have, and will incrementally, impact wildlife species addressed in this assessment directly, indirectly, and cumulatively through fragmentation and habitat loss.
- Timber harvest and thinning has led to a more open canopy with additional light reaching the forest floor (which may be beneficial or detrimental depending on the species), soil disturbance and compaction, development of skid roads, and noxious weed invasion. Changes in forest composition, structure, and fire frequency have also taken place and will continue to do so with future projects. These actions have and will continue to incrementally impact wildlife species addressed here directly, indirectly, and cumulatively through fragmentation, habitat loss, and loss of effectiveness through human disturbance.

In addition to the activities outlined above, several hazardous fuels and salvage projects are currently being implemented and planned on the ranger district within or immediately adjacent to the following allotments: Devil's Hole, Greenhorn, and Williams Creek.

Each of the above activities has cumulatively impacted Abert's squirrel populations through habitat fragmentation, habitat loss and habitat degradation. The implementation of the proposed alternative (Alternative C) with the implementation of the design criteria and monitoring would not contribute to the cumulative effects on Abert's or their habitats.

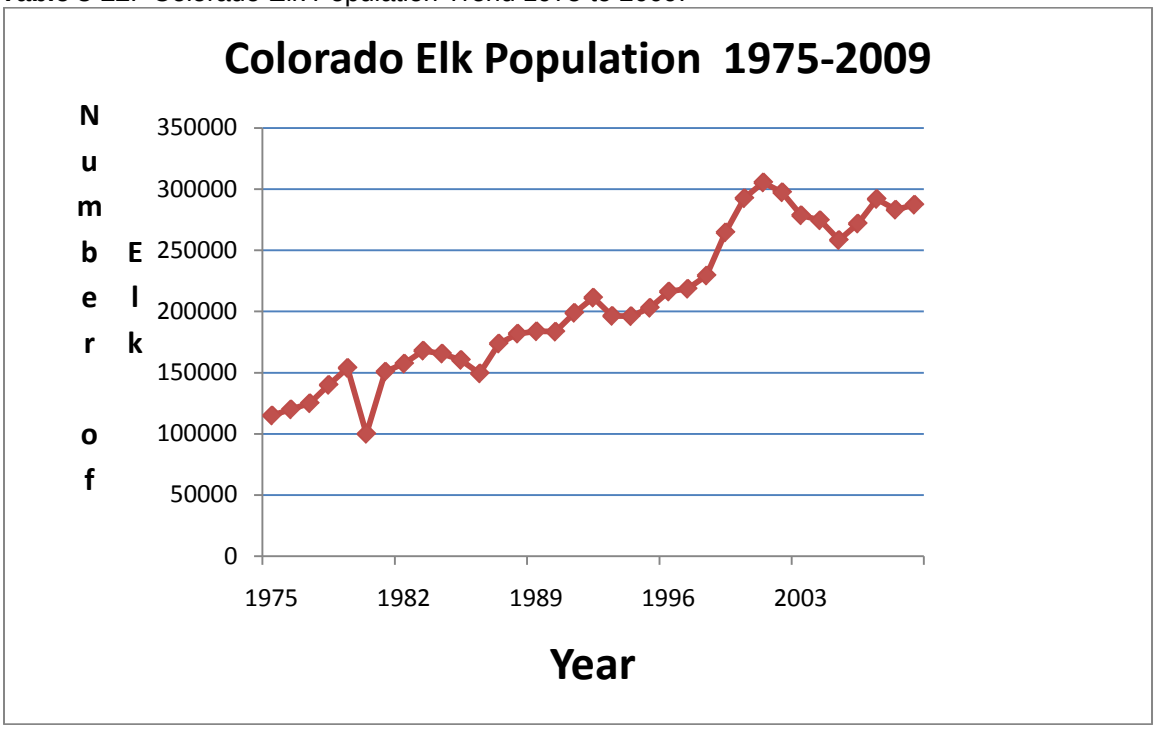
The effects of the Proposed Action are not expected to interact with any other past, present or foreseeable future actions within the project area in a manner that would produce a collectively significant effect on Abert's squirrels (or elk), their habitat, or population viability over the Planning Area.

Elk (*Cervus elaphus*)

Elk tend to inhabit coniferous forests associated with rugged, broken terrain or foothill ranges. During summer elk spend most of their time in high mountain meadows in the alpine or subalpine zones or in stream bottoms (Adams 1982). Elk may use more open areas during spring and summer because of earlier spring green-up (Edge et al. 1987). During hot summer months, elk seek shaded, cool habitats. Use of forage areas depends on proximity to cover. Use is typically concentrated to within 200 to 600 ft of cover edge. Either cover or forage may be limiting to elk, particularly on winter ranges or calving habitats (Roderick and Milner 1991

Population Trend: Global and Colorado elk populations are known to be increasing (COVERS 2001). Elk are widespread throughout the northern United States and southern Canada. They are intensively managed and there are good data on population size and trends (Fitzgerald et al. 1994, Zeveloff 1988, Peek 1982). Elk are expanding their range due to reintroductions, management, and habitat conversion (COVERS 2001). Elk populations have generally increased in Colorado since 1975 with a somewhat leveling off after 2001.

Table 3-22. Colorado Elk Population Trend 1975 to 2009.



Habitat Trend:

The structure, composition, and landscape pattern of vegetation in many areas used by elk on the PSI, particularly the lower montane zone, has been substantially altered from its pre-Euro American settlement conditions by cumulative human impacts as discussed above. Before logging, grazing, and fire suppression, ponderosa pine stands along the Colorado Front Range were less dense, more open, and less vulnerable to diseases, insects, and large intense wildfires (Foster Wheeler 1999).

Forested areas shifted dramatically because of the effects of logging, grazing, fire suppression, and transplanting, all of which are likely to increase tree density. Logging decreased the amount of old-growth. Grazing probably reduced understory competition and establishment of new seedlings, and the lack of fire allowed seedlings to survive. The result was a sharp increase in tree density, expansion of the area having a significant Douglas-fir component, and the loss of openings that temporarily increased during intense logging during the late 1800's (Kaufmann et al. in prep.). Many of these same activities also occurred on the remainder of the PSI and yielded similar results in lodgepole pine, Douglas-fir and spruce-fir habitats at lower elevations.

Winter range and calving areas include approximately 45,000 acres (51%) and 25,000 acres (28%) of the Analysis Area, respectively (Colorado Division of Wildlife 2005). The RAMPS allotments contain approximately 17% and 9% of the elk winter range on the San Carlos Ranger District and San Isabel NF, respectively (Table 6). Mapped big game habitat for elk/mule deer winter and calving /lambing areas are shown in Table 7.

Table 3-23. Potential elk winter range and calving areas

MIS Habitat	Acres of Potential Winter Range on National Forest Lands			
	Allotments[1]	San Carlos RD[2]	San Isabel NF[2]	PSICC[2]
Elk Winter Range	45,000	270,000	480,000	820,000
Elk Calving Area	25,000	120,000	160,000	220,000

[1]Rounded to nearest 1,000 acres
[2]Rounded to nearest 10,000 acres

Table 3-24. Mapped big game habitat within allotments.

Allotments	Acres of Big Game Habitat				
	Elk Winter[1]	Mule Deer Winter[1]	Bighorn Sheep Winter[1]	Elk Calving[1]	Bighorn Sheep Lambing[1]
Devil's Hole	13,200	13,200	0	0	0
Greenhorn	5,100	4,200	2,300	6,400	0
Indian Creek/lakes	900	2,300	0	0	0
Newlin	3,900	800	0	1,300	0
Ophir	4,800	0	0	2,600	0
Pantleon	1,500	0	0	1,800	0
West Peak	0	1,400	5,500	0	0
Williams Creek	15,500	12,300	0	12,800	0
Total	**44,900**	**34,200**	**7,800**	**24,900**	**0**

[1]Rounded to the nearest 100 acres.

Habitat for elk in the Analysis Area is currently supporting the State's elk population objectives in all three DAUs. Therefore, it is logical to infer that the habitat capability is meeting the Forest Plan Standards and Guidelines' for habitat capability and is providing the habitat suitability needed for desired elk population levels.

Table 3-25. Elk 2007 post-hunt population estimates and population objectives

Data Analysis Unit (DAU)	2007 Post-Hunt Population Estimate	CDOW Population Objective
E-27 (Elk)	1,790	1,550-1,650
E-28 (Elk)	1,480	1,400-1,600
E-33 (Elk)	17,130	16,000-18,000

Direct and Indirect Effects to Elk

ALTERNATIVE A (NO GRAZING)

Eliminating livestock grazing would generally increase forage availability for elk, especially vegetative species that are desired by domestic livestock and reduce any competition between these two herbivores. However, in some instances grazing by cattle can benefit elk. Early summer grazing by cattle may improve forage quality of elk winter range. Therefore, the no grazing alternative could have some negative effects on forage quality for elk due to increased standing dead litter accumulation and reduced growth of new, vigorous grasses and forbs.

Allotments with stable or downward trends should improve as a result of reduced grazing pressure and forage competition. Available forage quantity on winter ranges should increase since approximately 17 percent of San Carlos' elk winter range is within the analyzed livestock allotments and current management has caused some negative to neutral trends in range condition. Improving winter range for ungulates increases the carrying capacity and reduces the chance for large-scale winter mortality, which is particularly important given the elk population trend from around 180,000 elk in 1990 to nearly 270,000 elk by 2006. Additionally, noxious weed spread would not be exacerbated by domestic livestock and riparian areas should see an increase in woody species and improved elk calving habitat.

As stated above, increasing the fine fuels would increase the fire potential in and around the allotments. Fires would increase early successional habitat, which would improve forage quantity and quality in many areas for elk. A reduced canopy cover would also increase visibility and reduce security habitat for elk. Overall, fires would be a great benefit to elk habitat.

ALTERNATIVE B (CURRENT MANAGEMENT)

Early summer grazing by cattle may improve forage quality of elk winter range. In Montana, elk selected sites that were grazed by cattle during the previous growing season under a rest-rotational grazing system. Spring forage utilization may be enhanced by removing standing dead litter late in the preceding grazing season (Willms et al. 1985). Similarly, springtime grazing may also help establish high quality early spring forage habitat for elk the following spring. Thus, domestic and/or wild herbivory during one year may affect subsequent forage availability, forage quality, and/or herbivore diet selection, and the patch choice of cattle and elk the

following season under a rest-rotation grazing system. Elk may be attracted to grazed areas because removal of dense overstory allows sunlight to stimulate forb production. However, if vegetation is reduced too much it can significantly reduce both foliage and seed production on winter range.

Winter range areas, such as lower elevation and steep southerly aspects, are critically important to big game (including elk) survival during severe winters. Many of these critical areas lie adjacent to agricultural or residential areas, and the potential for additional development exits. Public land summer range has also been drastically altered in recent years by increased demands for logging, grazing, road building, and particularly, recreation within the Analysis Area.

Precipitation likely plays an important role in elk use of livestock grazed areas. For example, in wetter summers, high September and October densities occur in areas grazed in early summer by livestock. Observations of foraging elk indicated they were selectively grazing regrown herbaceous vegetation, and thus early summer livestock grazing might increase herbaceous quality in late summer. Conversely, in dry years (such as typically occurs one or more times per decade within the Analysis Area), late summer herbaceous regrowth is lacking. Elk and cattle alike use ungrazed areas and browse (shrubs and woody species) in lieu of herbaceous regrowth.

Continuing current livestock grazing management could eventually cause an elk population decline and/or reduction in carrying capacity to a limited degree and those areas with static or downward trends could begin to, or continue, a downward trend. However, design criteria implementation should limit any significant declines in carrying capacity for deer and elk due to conflicts with livestock grazing. Even though proper grazing can be beneficial to ungulates, improper management can be detrimental. In the short-term (10 years) elk habitat could diminish and support slightly fewer elk with an increased chance of winter mortality.

ALTERNATIVE C (PROPOSED ACTION)

Under the Proposed Action, specific design criteria and adaptive management options have been developed to address protection and improvement of any areas currently showing downward trends. In addition, other design criteria listed in Appendix E of the BE/BA would also improve habitat conditions for elk as well. These measures are outlined in Table 8 below together with potential management options to be used to achieve the desired conditions. Potential impacts would be eliminated altogether or significantly reduced by the implementation of these criteria for elk.

One activity included as part of the proposed action is to develop a “cow camp” in the Williams Creek pasture of the Williams Creek/Greenhorn allotment. This proposed development would probably cause some local displacement or avoidance by elk in the immediate area of the cow camp during those periods when humans are active or present in the area. The intermittent seasonally impacted area would probably be about 30-40 acres, which is insignificant and discountable when compared to the size of the elk summer range in the area.

The Proposed Action should improve areas that currently have undesirable downward trends caused by the current grazing management due to the implementation of the adaptive management options and design criteria. Areas with static or improving trends should improve or continue to improve overtime. Over time, range conditions would improve in all allotments

and annual monitoring would indicate whether grazing management needs to be altered to continue improvements. Elk would benefit from proper grazing while vegetative conversion to less desirable/palatable species and or bare ground would be avoided. Habitat would be able to support the state's elk population objectives and the chance of large-scale winter mortality would be reduced. The greatest differences between the Proposed Action and Alternative A (No Grazing) is the continued risk for noxious weed spread by domestic livestock in the Proposed Action and the reduced forage available to wildlife. This alternative; however, is not expected to negatively impact the elk population, while there is a slight increased potential of negative impacts to elk from Alternative B due to lack of adaptive management options available to address any degraded areas not recovering as quickly as desired.

Cumulative Effects to Elk

The past, present, and reasonably forseeable future activities that can or are contributing to cumulative effects for elk are listed above under the Cumulative Effects section for Abert's Squirrel, and incorporated here by reference. As a result of the those activities (primarily, the loss of fires on the landscape) there has been changes in forest species composition and stand structure, increased understory vegetation densities, large woody material buildup (in some instances), loss of early seral habitat conditions, increased road densities, increases in insect and disease densities, increased disturbance events and durations, increased conifer encroachment to meadows/openings/aspen stands, increased habitat fragmentation, and reduced levels of forage availability. These activities have cumulatively limited some aspects of elk production; primarily due to reductions in available elk winter and summer foraging (and potentially human avoidance-type distributional patterns) compared to what was historically present when the landscape had natural fire regimes and less anthropogenic impacts on the landscape at the planning (Pike-San Isabel NFs) level. In spite of increased anthropogenic stressors on elk and their habitat, elk numbers have generally increased over the last few decades. This phenomenon is likely due to the fact that elk are an adaptive "generalist" species and can exploit a variety of habitat types.

In summary, elk numbers are overall doing very well at the local and state level and there is no viability concern for them at the Forest or planning level. The cumulative effects present are not significant enough to have viability concerns for elk.

3.5 FISHERIES TES SPECIES

SPECIES CONSIDERED AND EVALUATED

Only those federally threatened, endangered, proposed/candidate and FS sensitive aquatic species with potential to occur (i.e., habitat is present) within the Analysis Area or be affected by the proposed alternatives are addressed hereafter in this assessment. Aquatic species meeting the following criteria are addressed:

1. known to occur on the Forest based on confirmed sightings;
2. may occur on the Forest based on unconfirmed sightings;
3. potential habitat exists for the species on the Forest; or
4. potential effects may occur to these species

Three aquatic species were identified for further analysis.

1. Greenback cutthroat trout (*Oncorhynchus clarki stomias*)
2. Rocky Mountain capshell snail (*Acroloxidae coloradensis*)
3. Caddis fly (*Ochrotrichia susanae*)

EVALUATED SPECIES INFORMATION

Federally Listed Species

Greenback Cutthroat Trout

Federally threatened greenback cutthroat trout have been documented from seven locations across the PSICC, none within the Analysis Area. Greenback populations declined rapidly following immigration and settlement of the Front Range of Colorado in the mid- to late 1800's. Mining pollution, stream dewatering for agriculture, commercial harvest and introduction of non-native salmonids decimated populations. Greenbacks readily hybridize with rainbow trout (*Oncorhynchus mykiss*) and cannot persist in sympatry with brook trout (*Salvelinus fontinalis*) or brown trout (*Salmo trutta*). Introductions and invasions by non-native trout eliminated greenback cutthroat trout from most of their historical range (Young and Harig 2001). Their decline occurred so rapidly that their distribution was not well known (U.S. Fish and Wildlife Service 1998). Greenback cutthroat trout were federally listed under the Endangered Species Act as "endangered" in 1973 and later down listed to "threatened" in 1978.

Photo 3-18; Greenback Cutthroat Trout.

The presence of greenback cutthroat trout in the Analysis Area is doubtful. However, many streams have not been surveyed and may never be surveyed. Suitable habitat exists and therefore we assume presence of greenbacks within the Analysis Area. Greenback cutthroat trout will be carried forward in our analysis.

Forest Service Sensitive Species

Rocky Mountain Capshell Snail

The known range of Rocky Mountain capshell snail is from isolated populations in Canada, one site in Montana and six sites in north-central Colorado. The known Colorado populations occur on the Routt and Roosevelt National Forests, in Rocky Mountain National Park, and in a

privately-owned location in Boulder County (Anderson, 2005). The nearest documented populations are located approximately 300 kilometers north of the Analysis Area. Most populations exist in Canada and the Boulder population is the furthest south of those documented. It's possible that the Boulder population is at the southern extent of its distribution. Project specific surveys for individuals or potential habitat were not conducted for this project but some generalizations can be made. The Analysis Area is likely outside the geographic range of Rocky Mountain capshell. Known occurrences are documented much further north. Most allotments occur in the Wet Mountains and can be excluded due to lack of suitable habitat. The Wet Mountains are very different ecologically from mountain ranges further north where snails have been documented. Only one allotment (Pantleon) exists where suitable habitat may be found (Sangre De Cristo Mountains) and it has no perennial water source. Therefore, Rocky Mountain capshell snail is excluded from further analysis.

Caddis Fly

O. susanae is only known from two locations worldwide, one from Trout Creek Spring on the Salida Ranger District and one population 34 km north at High Creek Fen. *O. susanae* is only known from this habitat "type" (large springs with a very narrow temperature range - Flint and Herrmann, 1976) and extensive surveys have been conducted (USDA R2 Sensitive species evaluation form, 2007b) to document other populations but none have been found. Because the habitat type is very limited and not known to occur within grazing allotments addressed in this assessment, we exclude *O. susanae* from further analysis.

Field Reconnaissance

Project specific fish surveys were conducted in 2007 to assess the fish assemblages in and near grazing allotments. Surveys were conducted on streams within active grazing allotments; inactive (vacant) allotments and in ungrazed areas downstream of allotments to provide contrast between grazed and ungrazed areas.

Eighteen fish bearing streams were identified in or near grazing allotments. To determine if greenback cutthroat trout were present in allotments, 12 streams (67%) were selected for fish surveys. However, we feel that because the data is simple presence/absence data, and combined with the large proportion of streams that were surveyed; the generalization of results from sampled to unsampled streams is valid. Fish were collected using a Smith-Root Model LR-24 back-pack electrofisher and standard multi-pass depletion/removal techniques.

Table 3-26.— Summary of stream survey history.

Allotment	Stream	Surveying agency	Year of survey 1997	2001	2003	2005	2006	2007
Greenhorn	Greenhorn Cr.	CDOW, FS	X		X			X
	Turkey Cr.	CDOW, FS					X	X
	Cisneros Cr.	FS						X
West Peak	Upper Cucharas R.	CDOW, FS		X	X			X
	Lower Cucharas R.	FS						X
Williams	St. Charles R.	CDOW, FS				X	X	X
	Beaver Cr.	CDOW, FS				X	X	X
	Amethyst Cr.	CDOW					X	
Ophir	Ophir Cr.	CDOW, FS	X			X	X	X
Beulah	Squirrel Cr.	FS						X
Rye	Little St. Charles R.	FS						X
Indian Cr.	Indian Cr.	FS						X
East Peak	Wahatoya	FS						X

Williams Creek/Greenhorn Cattle and Horse Allotment: The allotment contains approximately 200 miles of intermittent and 30 miles of perennial streams according to the Forest GIS database. Eight perennial streams were identified during site visits. Of these, five streams are fish-bearing.

Turkey and Cisneros Creeks were each surveyed within the allotment just above their common confluence. These are high elevation headwater streams characterized by low discharge volumes (app. 1.0 cfs), steep gradients and large substrate particle size (primarily boulders). These habitats do not support large fisheries, but brook trout were observed and captured. For both Turkey and Cisneros Creeks, no evidence of livestock grazing was observed and these streams likely receive little grazing pressure due to the denseness of the spruce/fir forest along the stream corridors.

Greenhorn Creek was sampled in 2007 by FS staff approximately 1.3 miles downstream of the allotment boundary. Measured water quality parameters (D.O., pH, water temp) were within the appropriate range and macro-invertebrates were abundant. No evidence of livestock grazing was observed at the survey site.

Amethyst Creek was sampled by the CDOW in 2006 (CDOW 2006) approximately ¼ mile downstream of the allotment boundary. The fish assemblage was comprised of 100 % brook trout.

Beaver Creek was sampled in 2005, 2006 and 2007 by FS staff approximately 1 mile downstream of the allotment boundary. The fish assemblage averaged 89% brook trout and 11% brown trout, but ranged from 4% to 16% brown trout. Measured water quality parameters (D.O., pH, water temp) were within the appropriate range and macro-invertebrates were abundant. No evidence of livestock grazing was observed at the survey site.

The Saint Charles River was sampled in 2006 and 2007 by Forest Service staff approximately 1 mile below the allotment boundary. The fish assemblage averaged 61% brown trout and 36% brook trout. Multiple age classes were observed representing a naturally reproducing, self-sustaining population. Measured water quality parameters (D.O., pH, water temp) were within the appropriate range and macro-invertebrates were abundant. No evidence of livestock grazing was observed at the survey site.

No fish were observed or collected in lower Williams Creek. Bear and Custer Creeks were not large enough to support self-sustaining fisheries.

Ophir Creek Cattle and Horse Allotment: The allotment contains approximately 32 miles of intermittent and 3 miles of perennial streams according to the Forest GIS database. Two perennial, fish-bearing streams were identified during site visits.

Ophir Creek was surveyed in 2005, 2006 and 2007 within the allotment by FS staff. Ophir Creek supports a small brook trout population. Measured water quality parameters (D.O., pH, water temp) were within the appropriate range and macro-invertebrates were abundant. Ophir Creek is small and lacks large substrate particle size (cobble > 6", boulder > 14") needed to provide habitat complexity at the level necessary to support more biomass. Contributing to the small substrate particle size is the close proximity of Ophir Creek to FSR 360. Where Ophir Creek is not adjacent to the road, the stream is much narrower and riparian vegetation appears lush and vigorous. No impacts from livestock grazing were observed.

Middle Creek, tributary to Ophir Creek, was not sampled due to its' close proximity to the Ophir Creek survey location. We conducted a visual search of the creek and did note the presence of small brook trout. Middle Creek likely supports a very similar fishery as Ophir Creek.

Indian Creek Cattle and Horse Allotment – The allotment contains approximately 63 miles of intermittent and 4 miles of perennial streams according to the Forest GIS database. Indian Creek was the only perennial, fish-bearing stream identified within the allotment.

Indian Creek is a small headwater stream that supports a low density brook trout population. The stream was sampled by FS staff within the allotment in 2007. Indian Creek is similar to many small, headwater streams that lack the substrate particle size needed to provide habitat complexity at the level necessary to support larger fish and more biomass. Over much of its course, FSR 421 is within 10 meters of the stream and crosses it many times. Small sediments from the road undoubtedly enter the stream during snow melt and rain events. Moreover, the proximity of the road to the stream minimizes the size of the riparian buffer and its ability to protect the stream from erosive disturbances. The road crosses Indian Creek in many locations. Culverts at these road crossings reduce fish passage and fragment stream habitat. The stream banks were, however, well vegetated and the riparian zone was characterized by abundant large woody species. Measured water quality parameters (D.O., pH, water temp) were within the appropriate range and macro-invertebrates were abundant.

Pantleon Cattle and Horse Allotment – no fish bearing streams.

Newlin Cattle and Horse Allotment – The allotment contains approximately 32 miles of intermittent and 2 miles of perennial streams according to the Forest GIS database.

Newlin Creek does not support a fishery within the allotment due to the presence of a natural barrier to fish migration approximately one-half mile below the allotment boundary. Within the allotment, Newlin Creek is small (< 1.0 cfs) and lacks the habitat complexity and pool depth necessary for over-winter survival or support a self sustaining fish population. The stream banks were well vegetated and stable. However, there was some evidence of stream bank disturbance in isolated locations. Because the allotment had not been stocked with livestock in some time, this was likely due to Elk.

West Peak Cattle and Horse Allotment – The allotment contains approximately 42 miles of intermittent and 10 miles of perennial streams according to the Forest GIS database.

The West Peak allotment contains three fish bearing streams, the Cucharas River, White Creek and Chaparral Creek. Chaparral Creek was not sampled due to lack of accessibility. White Creek could not be sampled effectively due to the denseness of woody cover along its banks. Brown trout and rainbow trout were observed, however, just above the White Creek confluence with the Cucharas River. The Cucharas River was sampled in two locations, one in the southern portion of the allotment and one in the northern portion of the allotment. The fish assemblage at the southern survey site consisted of brook and brown trout. The stream was well armored with boulders and riparian vegetation consisted primarily of dense willow. The low density fish population at the survey site may be due to high stream gradient and associated high water velocity. Measured water quality parameters (D.O., pH, water temp) were within the appropriate range and macro-invertebrates were abundant. In contrast to the low density fishery in the southern portion of the allotment was a high density fishery in the northern portion of the allotment. At the northern survey location the fish population was composed of primarily brown and rainbow trout. Two white suckers were observed but not collected. The stream was large and appeared to have had some restoration work conducted (e.g., added pools). The stream channel was well armored, contained abundant large woody debris and the stream banks were well vegetated with willow and cottonwood. Measured water quality parameters (D.O., pH, water temp) were within the appropriate range and macro-invertebrates were abundant. No negative impacts from livestock grazing were observed at either survey site on the Cucharas River.

Devils Hole Cattle and Horse Allotment- The allotment does not contain any perennial or fish bearing streams.

Summary

In summary, 12 of eighteen fish bearing streams were surveyed for greenback cutthroat trout. No greenbacks were observed. More importantly, brook and/or brown trout were documented in all streams surveyed (Table 6). Variability in fish biomass estimates was very high within and among streams. Therefore, it is difficult if not impossible to say with any certainty that significant differences in fish biomass between grazed, ungrazed and vacant allotments exist.

Admittedly, some of the lowest estimates of fish biomass came from streams in active grazing allotments (e.g., Cisneros Creek, Turkey Creek, upper Cucharas River, Indian Creek and Ophir Creek etc). In all cases, however, there were obvious limiting factors to biomass outside of grazing impacts. For example, Cisneros and Turkey Creeks at the survey locations are very small, headwater streams that lack the habitat complexity to support more biomass. This is common among high elevation, headwater streams. No impacts from livestock grazing were observed at either location. The upper Cucharas River, while much larger and providing more habitat complexity than many of the streams sampled, was very steep in gradient at the survey location, leading to high water velocities. Steep gradients and high water velocities likely limit biomass at the survey location. Lastly, Indian Creek and Ophir Creek, while being small and lacking habitat complexity as other streams did, are largely affected by the proximity of a Forest System Road, limiting the riparian buffer protecting the streams from excess sedimentation, and further reducing habitat complexity. Moreover, these roads allow the public greater access to dispersed camping opportunities in riparian areas which reduces the riparian buffer even more. Healthy intact riparian buffers are key to high-productivity, self-sustaining fish populations.

Most fish assemblages within livestock grazing allotments evaluated in this assessment were dominated by brook and/or brown trout. Estimated biomass was highly variable within and among survey locations but consistent with biomass estimates from not only streams in ungrazed areas of the Forest, but streams within livestock grazing allotments on other Ranger Districts within the Planning Area.

Greenback cutthroat trout were not collected from any stream surveyed and are likely absent from the Analysis Area.

GENERAL EFFECTS TO EVALUATED SPECIES

Direct, Indirect and Cumulative Effects of Livestock Grazing on Greenback Cutthroat Trout

Because livestock have very few direct effects on fish, we evaluated the direct effect of livestock grazing on fish habitat from habitat modification. Healthy, intact riparian zones along stream corridors provide high quality fish habitat and are directly linked to fish productivity.

We focus on riparian resources rather than upland resources; because historic and current upland monitoring data indicates that the upland vegetation (percent cover, species composition, percent bare ground, etc) in most allotments is meeting or moving towards the desired condition (see Range Analysis Report). Moreover, healthy, properly functioning riparian systems should protect aquatic resources from low to moderate disturbances, such as grazing, in the uplands. Lastly, we would expect the upward trend in rangeland condition to continue under all Alternatives.

Effects of Rangeland Developments

Because this analysis only addresses aquatic species, we limit our discussion of the effects of range developments to those developments that involve water resources.

Hydrologic analyses of the springs proposed for development have not been conducted and the cumulative effect of these depletions is unknown. It's possible the proposed depletions could result in a loss of aquatic habitat downstream of proposed water developments. However, we feel the potential loss in aquatic habitat would be small relative to the benefit gained through better distribution of livestock across allotments and specifically, out of riparian areas. As previously mentioned, Dobkin et al. (1998) found that in a four-year period following livestock removal from an area, the water table rose expanding the hyporheic zone laterally from the channel. Furthermore, water continued to flow in the stream for weeks longer even during dry years. The proposed development of springs will better distribute livestock to the uplands, away from riparian areas, improving water relations and allowing quicker recovery of impacted riparian areas.

The potential impact of these depletions will be greatly minimized through use of the following design criteria:

- Water developments will have shut-off valves or disconnects placed near the spring box.
- The valve or disconnect will be closed or disconnected immediately following the grazing event, unless wildlife needs are identified.
- Overflow devices will be installed to prevent tank overflow or spillage.
- In addition overflow returns will be installed in case of malfunction and return the water to the drainage of origin and to a point as near to the original removal point as practicable.
- All springs will be developed in such a manner as to protect the hydrologic function (chemical, biological and physical integrity) of the spring and the surrounding aquatic and terrestrial habitat supported by the spring.
- Spring sources used for new developments should be fenced (enclosed) as long as the development is maintained and in service.

Under these design criteria, the amount of water that is depleted from a spring for a water development is no greater than the amount of water the livestock drink and a small amount from evaporation at the tank. Also, under no alternative are we proposing to increase stocking rates over the currently permitted Animal Unit Months. Therefore the consumption of water by livestock will not increase over what is currently permitted. Moreover, short-duration (20-25 days on average) grazing of pastures will reduce the need for water on a temporal scale. Given average precipitation annually, it's likely the loss of ground water from these depletions will not be greater than the aquifer recharge rate, and should not result in a ground water deficit. Ecologically the impact of livestock grazing and watering in riparian areas is much greater than the impact of livestock in uplands watering at a tank in a designated location away from sensitive areas.

SPECIES EVALUATIONS AND POPULATION TRENDS

Greenback cutthroat trout

Greenbacks are native to the South Platte and Arkansas River basins in central Colorado, and perhaps southeastern Wyoming (U.S. Fish and Wildlife Service 1998). They are similar ecologically to other cutthroat trout species inhabiting streams of the western United States. Greenbacks favor relatively clear, cold waters, preying primarily on aquatic and terrestrial invertebrates. Existing greenback populations are restricted to small, remote, high elevation streams and lakes where populations often have been protected by natural and man-made fish migration barriers. Many of these habitats are colder, less productive and undergo significant flow fluctuations, leading to small, slow-growing trout populations.

It appears at this date that only four pure greenback cutthroat trout populations exist within their native range, inhabiting approximately 12 kilometers of stream habitat. Three of these populations occur on the PSICC. None of these populations are in the planning area.

Brook trout

Brook trout are not native to the Rocky Mountains of Colorado but have adapted to these habitats exceptionally well. They require clean, cold, well oxygenated water. On the PSICC, they typically inhabit mid- to high elevation streams and rivers. At lower elevations, brook trout are not as plentiful, likely because of competition with brown trout. Life history characteristics of brook trout are similar to those of other salmonids of the western United States. Brook trout spawn in the fall and spawning generally lasts 4-5 weeks. Brook trout prey items include aquatic invertebrates such as diptera, ephemeroptera, trichoptera, coleoptera, but can include terrestrial invertebrates as well.

Brook trout were present in all but five streams sampled. The streams where brook trout were not found, in general, shared several common characteristics. They were larger than most streams surveyed. They were lower in elevation. And lastly, they were dominated by high density/biomass brown trout fisheries. As is widely known and accepted, brook trout flourish in the higher elevation streams where brown trout are not as competitive. At lower elevations, brown trout out-compete brook trout for necessary resources.

The San Isabel National Forest conducts annual monitoring of brook trout and greenback cutthroat trout to establish population trend for MIS. Survey data demonstrates moderate to high variability temporally within and among sampling locations, likely resulting from natural population variability and sampling error. This variability makes it difficult to determine the population trend for brook trout, but the author believes it is likely static. Competition between multiple species in fish assemblages is likely responsible for significant variability in density and biomass estimates. No clear trends are observed.

Alternative *A* (no grazing)

Under the No Action/No Grazing alternative, no livestock grazing would be permitted on any of the allotments. Existing permits would not be renewed following the current expiration date. The effect of this alternative would improve the few, isolated riparian areas where livestock

grazing has had negative impacts. However, other forest activities (e.g., dispersed camping, roads, timber harvest, prescribed burning, etc) would continue to impact/degrade many riparian areas, limiting overall riparian recovery. Riparian areas would move toward the desired condition from a livestock grazing standpoint, but may never reach it because of the continued impact from the suite of other activities. As these isolated areas improve, the quantity of suitable habitat for greenback cutthroat trout and brook trout would increase marginally. With improvements in fish habitat, greater fish production and increased stability of existing populations may be expected across the Analysis Area.

The primary difference in cumulative effects between Alternative A and Alternatives B and C is the absence of livestock grazing under Alternative A. All other factors would remain at similar levels of impact. This alternative would not add to the direct, indirect or cumulative effects to greenbacks or brook trout due to livestock grazing. Therefore, we have no viability concerns within the Analysis Area or across the Planning Area for greenback cutthroat trout or brook trout.

***Alternative B* (*current grazing management*)**
Any impacts to brook trout or federally protected greenback populations from Alternative B would likely be indirect rather than direct. It's possible that individual fish or spawning redds could be trampled or disturbed by livestock wading and watering in streams and lakes, but the greater impact would be from livestock grazing in riparian areas and degrading aquatic habitat, thereby, indirectly impacting fish populations. The direct effects of livestock grazing on *riparian systems* are of primary concern.

Many other forest activities, as previously mentioned (e.g., dispersed camping, roads, timber harvest, prescribed burning, etc), also affect fish habitat similarly. Therefore, it would be difficult, if not impossible, to isolate and quantify the effects to fish populations that are solely related to livestock grazing. Because of the confounding nature of impacts from this suite of activities, we chose to evaluate the impact of livestock grazing on riparian systems as an index of fish production. For this analysis to accurately reflect impacts to fish, we assume that the quantity and quality of riparian systems is directly related to fish production.

Under current management, some impacted riparian areas are not moving toward the desired condition in an acceptable manner or time frame. Implementation of Alternative B will allow livestock grazing to continue under current management strategies. We would expect these isolated riparian areas would likely remain that way and new areas could become impacted. Negative effects to fish habitat from these isolated areas would also continue, perhaps limiting production. The effect of these areas, however, on greenback and brook trout habitat is minor if not insignificant for two primary reasons. First, for greenbacks it's important to note that the likelihood of their presence in the Analysis Area is very small if not discountable. This fact in itself would reduce the effect on the greenback population overall. Secondly, any negative effect from these impacted areas would only impact greenbacks present in the stream near proximity to the impacted area. There is only one know population that could be affected from livestock grazing (Newlin Creek). However, this population does not exist on the grazing allotment, rather it is located downstream of the allotment on state lands. A natural barrier to fish migration prevents members of this population from accessing Newlin Creek within the allotment.

Moreover, Newlin Creek within the allotment is too small to support a self-sustaining greenback population. Newlin Creek is important nevertheless because it supplies freshwater, macro-invertebrates, nutrients and etc. to lower sections of the creek where greenbacks are located. Because isolated hotspots where riparian degradation has occurred are few and minor in nature, we believe that full execution of the LRMP standards and guidelines will continue to protect the majority of riparian vegetation and fish habitat.

The effect to brook trout would be individually greater than that to greenbacks because of their presence in most fish bearing streams within grazing allotments. However, because of their great abundance across the Planning Area, the overall effect on the brook trout population is minimal because the scope of this project is small in comparison. Furthermore, results from fish survey data across the Planning Area indicate that fish populations in streams on grazing allotments are within the natural variability and sampling error of streams from ungrazed lands.

Cumulative effects to fish habitat from implementation of Alternative B would be greater than those from Alternative A, but would not add appreciably to the environmental baseline. Cumulative effects will be very limited for the same reasons as just described for direct and indirect effects. In other words, greenbacks are not likely present in the Analysis Area; if they are it is in very small numbers which will limit any detrimental impact to the overall population. Brook trout are abundant and widespread across the Analysis and Planning Areas, minimizing any overall impact. And lastly, isolated hotspots are few and would have very minimal impact to fish habitat where greenbacks or brook trout may occur. Therefore, we have no viability concerns within the Analysis or Planning Areas for greenback cutthroat trout or brook trout.

Alternative C (Proposed Action)

Impacts to riparian systems and fish habitat from implementation of Alternative C will be very similar in scope to those of Alternative B, but the magnitude of these impacts will be less severe for several reasons. First, specific design criteria will more effectively reduce the grazing impact in riparian areas by limiting the amount of time livestock spend in these areas and the amount of riparian forage consumed than Alternative B. Secondly, Alternative C provides an intensive riparian Monitoring Plan developed by an interdisciplinary team of resource professionals will be used to quantify grazing effects in uplands and riparian areas. Increased monitoring of riparian attributes will provide decision makers with greater information to base the decisions on. Thirdly, the adaptive management discussion will help guide decision makers on the appropriate responses to monitoring data. And lastly and most importantly, proposed range developments (water developments, permanent fencing, etc) will better distribute livestock to the uplands across the allotment and prevent congregation of livestock in riparian areas. Isolated riparian areas that have been negatively impacted in the past will recover.

The cumulative effects from implementation of Alternative C will be less than those under Alternative B and greater than those under Alternative A. The effects from implementation of Alternative C are not expected to interact with any other past, present or foreseeable future actions within the project area in a manner that would produce a collectively significant effect on fish. Therefore, we have no viability concerns within the Analysis or Planning Areas for greenback cutthroat trout or brook trout.

Land and Resource Management Plan MIS Objectives

Long term impacts from implementation Alternative C will be beneficial to greenback cutthroat trout and brook trout population trend and viability by improving riparian areas and fish habitat.

3.6 PLANT TES SPECIES

ANALYSIS OF EFFECTS – FEDERALLY LISTED AND PROPOSED SPECIES

The FWS has identified no federally listed plant species as having parts of their range on the San Isabel National Forest. Threatened and endangered species habitats within the project area were identified using the state heritage database records, Forest Service vegetation data, and field reconnaissance.

There are no known occurrences of federally listed threatened, endangered, or proposed plant species in the proposed project area. There is also no known habitat, including proposed or designated critical habitat, for no federally listed plant species in the proposed project area. For these reasons, there will be no effect to any federally listed threatened, endangered, or proposed plant species. The action will not destroy or adversely modify any proposed or designated critical habitat.

DETERMINATION

Because there are no known occurrences of, and no habitat for, any federally listed plant species in the project area, the proposed project will have no effect (direct, indirect, or cumulative) on them.

SENSITIVE Species Considered IN THE ANALYSIS

Table 3 includes Regional Forester's Sensitive Species (RFSS), or their habitats, that are located on the Pike and San Isabel National Forests, or that are located adjacent to or downstream of the project and could potentially be affected by the proposed project. A pre-field review was conducted of available information to assemble occurrence records, describe habitat needs and ecological requirements, and determine whether field reconnaissance is needed to complete the analysis.

Only those RFSS with the potential to occur within the Analysis Area or be affected by the proposed alternatives are addressed in this assessment. Species shown in Table 3 as excluded will not be analyzed further based on the rationale provided. The proposed alternatives will have no impact to those species. If suitable but unoccupied habitat is present, then potential effects are evaluated.

Existing Conditions

Due to the size of the Analysis Area and the number of RFSS plant species with potential habitat within the Analysis Area, RFSS species are grouped into plant-habitat associations or "guilds". The term "guild" is used in ecology to mean a group of species that use similar resources in a similar way. For each guild, the direct and indirect effects of livestock grazing under each

alternative are discussed. Each species within the guild is then addressed, noting any effects not previously discussed as well as species-specific cumulative effects. Species are grouped into the following habitat guilds to reduce repetitive discussions of impacts to species: alpine, grassland, pinyon-juniper woodlands, cool mixed conifer, warm mixed conifer, and riparian areas.

Alpine – Alpine and barren habitat types account for about four percent of the total acreage within the analyzed allotments (Table 2). The West Peak Allotment has the greatest percentage of this habitat (mostly barren) among the analyzed allotments – about 8.7 percent. White Creek has about 12 percent, while Ophir and Williams Creek/Greenhorn have less than one percent in alpine vegetation. Devils Hole and Newlin allotments have trace amounts of barren habitat.

> **Gray's draba** [*Draba grayana* (Rydb.) C.L. Hitchc.] is a perennial herb in the mustard family (Brassicaceae). It flowers from June to August, then fruits from August to September (Ladyman 2004). This plant may be threatened by stochastic events (Ladyman 2004). Livestock grazing is not among listed threats to this species. The West Peak, White Creek, and Williams Creek/Greenhorn allotments are the most likely portion of the analysis area to have habitat for Gray's draba. The Pantleon Allotment is nearest to known sites for this species, but would have marginal habitat near the low extreme of the plants elevational range. Others are unlikely to have this species because of the species known range and habitat parameters.

Grassland – Grasses, forbs, and subshrubs dominated habitats account for about 16 percent of the analysis area (Table 2). About 45 percent of the Devils Hole Allotment is in grassland vegetation. The others vary from 6 to 16 percent grassland.

> **Hall's fescue** [*Festuca hallii* (Vasey) Piper] is a long-lived perennial herb in the grass family (Poaceae). Hall's fescue has short rhizomes (Anderson 2006). Taxonomic distinctions within this group of closely related species are not well defined. Flowering and fruiting occurs from May to August. Hall's fescue may be in a range-wide decline with a low potential for recovery. It may be threatened by livestock grazing and invasive species. This species is within the West Peak Allotment. There is some potential for it to occur in other allotments in the Sangres. Allotments in the Wet Mountains are generally at lower elevations than habitats in the Sangres, so would be less likely to occur in these allotments.
>
> **Degener's beardtongue** (*Penstemon degeneri* Crosswhite) is a perennial herb in the figwort family (Scrophulariaceae). It flowers from June to mid July, and fruiting in late July (Beatty *et al*. 2004). Degener's beardtongue is endemic to central CO, and is known to occur at 15 sites within its range from Sunset City to Canon City and south in the Wet Mountain from Phantom Canyon. Five of the sites are on the San Carlos Ranger District (Colorado Natural Heritage Program 2007). Most other populations are on BLM managed lands (Beatty *et al*. 2004). Threats to Degener's beardtongue include invasive species and succession. Livestock grazing is not listed as a direct threat. It may need fire to maintain open site conditions. Herbivory has been observed in some populations. This species' seeds may be long-lived in the seedbank (Beatty *et al*. 2004). Degener's beardtongue populations are being monitored in the Newlin Allotment. It is unlikely to occur in any

other allotments because this is a local endemic species with a very limited geographic range.

Pinyon – juniper woodlands – These woodlands account for about nine percent of the analysis area (Table 2). About 27 percent of the Devils Hole Allotment is mapped as pinyon – juniper woodlands. The Williams Creek/Greenhorn Allotment is about five percent, while Indian Creek/Lakes and Newlin have less than one percent in this vegetation type.

Degener's beardtongue (*Penstemon degeneri* Crosswhite) See species discussion under Grasslands. This species has not been observed in pinyon – juniper stands in the Newlin Allotment. Other allotments are outside the known range of the species.

Cool mixed conifer – Mixed conifer stands on cool, moist sites account for about nine percent of the analysis area (Table 2). These habitats are most prevalent in allotments in the Sangres, but it is also found on the north slopes of the Wet Mountains in the Newlin Allotment.

Lesser yellow lady's-slipper [*Cypripedium parviflorum* Salisb.] is a perennial herb in the orchid family (Orchidaceae). It flowers from May to July. Fruiting occurs from June to August (Spackman *et al*. 1997). There are sites for lesser yellow lady's-slipper within the Sangre de Cristo Range and Wet Mountains (McNab *et al*. 2007). There are in the Apishapa River Headwaters and Upper St. Charles River watersheds. Threats include livestock grazing, invasive species, and habitat conversion. Lesser yellow-lady's-slipper may also respond favorably to light disturbances. There is marginal habitat in the Newlin Allotment, but this is above the typical elevational range of the species. Allotments in the Sangres are outside the known range of the species.

Selkirk's violet (*Viola selkirkii* Pursh ex Goldie) is a perennial herb in the violet family (Violaceae), flowering in May and June. Sites for Selkirk's violet have been recorded in the Newlin Creek watershed below the Newlin Allotment. Habitat may be threatened by unregulated motorized recreation. Livestock grazing is not a threat to this species or its habitat. There is marginal habitat in the Newlin Allotment, but this is above the typical elevational range of the species. Allotments in the Sangres are outside the known range of the species.

Warm mixed conifer – Mixed conifer stands on warm, dry sites account for about four percent of the analysis area (Table 2). These habitats are most prevalent in allotments in the Sangres, but it is also found on the north slopes of the Wet Mountains in the Newlin Allotment.

Smith's draba (*Draba smithii* Gilg ex. O.E. Schulz) is a perennial herb in the mustard family (Brassicaceae). It flowers from May to August, and fruits from June through August (Ladyman 2004). The known site for Smith's draba is in the Upper Grape Creek watershed. Smith's draba may be threatened by unregulated recreation and road improvements within its habitat (Ladyman 2004). Livestock grazing is not listed as a threat to this plant. The Pantleon Allotment is the most likely area to have habitat for Smith's draba. Others are unlikely to have this species because of the species known range and habitat parameters. There may be some potential for this plant in other allotments within the Sangre de Cristo Range.

Riparian areas **-** Riparian areas and wetlands account for about six percent of the analysis area (Table 2). The Williams Creek/Greenhorn Allotment has about 12 percent riparian areas. Other allotments have less than four percent, some with only trace amounts.

Whitebristle cottongrass (*Eriophorum altaicum* Mienshasen var. *neogaeum* Raymond) is a perennial rhizomatous herb in the sedge family (Cyperaceae). Taxonomic distinctions among this group of sedges are not well defined. The Flora of North America Editorial Committee (1997) merges *E.altaicum* var. *neogaeum* into *E.chamissonis*.
Flowering in whitebristle cottongrass begins in late spring and fruiting continues into August (Ladyman 2004). It occurs in an uncommon habitat which may be vulnerable to altered hydrology and livestock grazing (Ladyman 2004).

Slender cottongrass (*Eriophorum gracile* W.D.J. Koch) is a perennial, rhizomatous, herb in the sedge family (Cyperaceae). It flowers and fruits beginning in mid June and continues through August (Decker *et al*. 2006).
Slender cottongrass occurs in fens and subalpine wet meadows, with saturated soils (Decker *et al*. 2006. This plant has been documented in Las Animas County. It occurs in an uncommon habitat which may be vulnerable to altered hydrology and livestock grazing (Decker *et al*. 2006). There are no fens within any of the analyzed allotments where the cottongrasses are most likely to grow. Willow carrs in most allotments are small, therefore less likely to have these species which occur most often in large, open wetlands. One large wet meadow complex is in the Williams Creek/Greenhorn Allotment which could provide marginal habitat for these species, but there are no records of these rare cottongrasses in the Wet Mountains.

Arizona Willow (*Salix arizonica* Dorn) is a deciduous shrub in the willow family (Salicaceae). Catkins may appear from April to July (Decker 2006).
Arizona willow habitat consists of subalpine wet meadows, streamsides, and ciengas (Decker 2006). It is most often found along edges of spruce stands or in drier meadow sites with subsurface flows. Arizona willow is known only from the "Four Corners" region, with most records in New Mexico. Arizona willow has been found on the Rio Grande National Forest (Conejos County) confirming its' occurrence in Colorado. Suitable habitat may occur within the southern portion of the San Carlos Ranger District. Arizona willow habitat may be present in the southern Sangre de Cristo in Colorado. It is rare because of its narrow geographic range and fragile habitat. Threats to Arizona willow include altered hydrology and livestock grazing (Decker 2006). Arizona willow is known from the western slope of the Sangre de Cristo Range in northern New Mexico. Longer, shallow slopes are present there forming areas suitable for willow carr development. The eastern slopes of the Sangres, where several of the analyzed allotments are found, have steep slopes that are inappropriate for willow carr development. As a result, it is unlikely for Arizona willow to occur in the analysis area.

ANALYSIS OF EFFECTS – Sensitive Species

Activities associated with livestock grazing have a wide range of effects on plants and their habitats. The degree of the effects is also quite variable. The R2 Sensitive Plant Species Effects

Matrix supplies definitions of degrees of effects and the effects on most RFSS for the Rocky Mountain Region. For example, soil/ground disturbance can occur due to cattle grazing, spring and water developments, and fence construction. Livestock grazing across the landscape generally causes only slight ground disturbance, but where there is a development that concentrates use by livestock, moderate to heavy use may occur. Parallel patterns are seen in soil removal, soil compaction, and biomass removal of herbaceous and woody plants. Altered hydrology due to livestock use can increase sedimentation in local areas and both increase or decrease soil moisture depending on the original site conditions. Non-native invasive plant species may be brought in with livestock, and the degree of invasion may depend on the degree of use of a given site. Seeding of disturbed sites may be necessary with site-appropriate native plants, helping to off-set detrimental effects of livestock.

Direct, Indirect, and Cumulative Effects

Direct and Indirect Effects Common to All Species Guilds

Alternative A – No Action / No Livestock Grazing

Under Alternative A, no livestock grazing would occur within any of the analyzed allotments. Ground disturbance would be reduced to that which would occur under natural conditions. Soils would not be compacted, disturbed, or eroded by livestock. Vegetation and soils would not be compacted by livestock use. Herbivory would return to background levels on herbaceous and shrub biomass removal. Plants would not be uprooted by livestock. Loss of canopy cover, both overstory and understory layers, would be no greater than that occurring in other areas not grazed by livestock. Because vegetation would remain in place, no additional sedimentation would occur, which could alter water quality and soil moisture. Hummocking and pedestaling caused by livestock would not increase and may reduce over time leading to stabilized soil moisture content. Shifts in species composition to plants tolerant of disturbance or unpalatable species to livestock would be reduced and may be reversed over time. Noxious weeds would not be introduced which could alter site characteristics, so there would be no need for weed treatments other than for those for existing infestations.

Alternative B – Livestock Grazing Under Current Management

Under Alternative B, livestock grazing would occur within the analyzed allotments. Ground disturbance would be increased above that which would occur under natural conditions. Soils would may be compacted, disturbed, or eroded by livestock in areas where use is concentrated. Herbivory would be greater than background levels on herbaceous and shrubs. Plants may be directly affected by herbivory and trampling. Plants could be uprooted by livestock. Loss of canopy cover, both overstory and understory layers, could be somewhat greater than that occurring in other areas not grazed by livestock. Because not all vegetation would remain in place, some additional sedimentation may occur, which could alter water quality and soil moisture. Shifts in species composition to plants less tolerant of disturbance or less palatable to livestock may increase. Noxious weeds could be introduced which could alter site characteristics.

Alternative C - Proposed Action

The effects of the proposed action would be intermediate between the other two alternatives, although more closely approximating the No Grazing alternative. Adequate, timely, and

frequent effectiveness monitoring would be carried out to ensure that design criteria designed to protect and maintain fragile habitats and known rare plant species locations would be implemented. Ground disturbance and detrimental impacts to the flora would be minimized. Design criteria to protect sites would be fully implemented.

Cumulative Effects Common to All Species Guilds

Wildfire, insect damage, windthrow, and timber harvest have led to a more open canopy in some areas with additional light reaching the forest floor, soil disturbance and compaction, and noxious weed invasion. Changes in forest composition, structure and fire frequency have also taken place.

Fire suppression has led to increased fuel loading and canopy closure. Denser stands are now more homogenous and with higher humidity (altering stand characteristics) and greater soil moisture.

During the mining boom in Colorado, many backcountry locations contained railroads and established towns with year-round human populations. Activities associated with mining include road and railroad development, timber harvest, weed invasion, and revegetation efforts.

Urban development is expected to continue in the Analysis Area on private lands. This may fragment habitat, isolate species populations, and increase the risk of weed invasion and the incidence of catastrophic wildfire.

Recreation is a frequent use of the Forest within the Analysis Area. Motorized touring is prevalent as are hunting, camping, hiking, and horseback riding during certain times of the year. Roads in particular increase soil erosion, increase sedimentation, and facilitate the spread of noxious weeds. Motorized and non-motorized recreational use has led to the development of non-system roads and trails, development of dispersed campsites, erosion, and ground disturbance.

Warmer and drier climate has led to higher levels of heat and water stress. Trees undergoing physiological stress are more susceptible to insects and diseases, and experience higher rates of mortality. This may be associated with decreased decomposer activity.

Direct and Indirect Effects to Habitat Guilds

There are no additional impacts to habitat guilds anticipated beyond those noted for the No Action, Current Management, and the Proposed Action Alternatives. There would be only slight variations in the degree of impacts between current management and the proposed action. Cumulative effects are discussed under Cumulative Effects Common to All Species Guilds. Cumulative effects would remain the same except for altered management of livestock grazing. Undesirable increases in bare ground, decreases in cover, and shifts in species composition will be identified and addressed through monitoring and adaptive management.

Alpine

Alpine habitat occurs in the Ophir, West Peak, White Creek, and Williams Creek/Greenhorn allotments, most in West Peak. Alpine provides habitat for Gray's draba, but no plants have been found within any of the analyzed allotments. Erosion of alpine soils is an intensely negative effect as these soils develop and revegetate slowly. Herbivory and soil disturbance in the alpine zone is of concern as alpine habitats may not have evolved under significant grazing pressure. Infestations of noxious weeds resulting from livestock grazing have not been

documented in the alpine zone. Only incidental use occurs in this habitat because of the sparseness of the vegetation. No improvements are planned for any alpine areas.

Grassland

Grasslands occur in all of the analyzed allotments. Degener's beardtongue is a local endemic that occurs only in the Newlin Allotment where there is a very large population. Other allotments are outside the range of the species. Hall's fescue is a widespread species at the southern extreme of its range in the West Peak Allotment. Locally, it is at high elevations over calcareous sedimentary rocks. As a result its occurrence is not likely in the Wet Mountains allotments, but could be found in the Indian Creek/Lakes and Pantleon allotments. Livestock grazing in these habitats may maintain these areas in a more open condition. Many sites are currently being encroached by trees and shrubs. Since meadows and parks are the most productive montane habitats, livestock grazing is encouraged there through rangeland developments. Salt, water developments, and fences are strategically placed to concentrate utilization in these habitats to take advantage of available forage. Development of ponds in the Newlin Allotment may impact a few individuals of Degener's beardtongue, although none have been observed in the immediate vicinity of the proposed ponds. An existing pond is very near one of the monitored populations of the beardtongue with no apparent ill effects. Fencing at the head of Lion Canyon would not impact this species, nor would the placement of cattleguards in existing roads. The populations of Hall's fescue in the West Peak Allotment are more seriously threatened by its location at the edge of a popular hiking trail. No new developments have been proposed that would impact Hall's fescue in this area. More thorough surveys of allotments in the Sangres should be conducted for potential presence of additional populations of this grass.

Pinyon – Juniper Woodlands

Pinyon – juniper woodlands occur in Devils Hole, Indian Creek/Lakes, Newlin, and Williams Creek/Greenhorn allotments. Degener's beardtongue occurs only within the Newlin Allotment, but the species has not been observed within pinyon - juniper stands there. Other allotments are outside the known range of the species. No developments have been proposed within the pinyon - juniper stands in this allotment. Ground disturbance by livestock could accelerate erosion and degrade habitat quality, but the low productivity of these sites and poor access make them unlikely to be grazed by livestock more than incidentally.

Cool Mixed Conifer

Cool mixed conifer forest occurs in all of the analyzed allotments. Two RFSS plants may be found in this habitat in the Wet Mountains, but they are much less likely to be found in the Sangre de Cristo Range. Lesser yellow lady's-slipper and Selkirk's violet both occur at elevations lower than most of the allotments. There is small potential for downstream impacts from the allotments. No developments have been proposed on sites that may have these species. If concentrated use occurs upstream from habitat of these plants, there could be some sedimentation that impacts them, but monitoring of activities would minimize any effects.

Warm Mixed Conifer

Warm mixed conifer forest occurs in all of the analyzed allotments. Smith's draba may occur in allotments in the Sangres, but is unlikely to be found in the Wet Mountains because of the underlying geology. No new developments have been proposed within these stands that would be likely to affect Smith's draba. More thorough surveys of allotments in the Sangres should be conducted for potential presence of additional populations of this species.

Riparian Areas
Riparian areas occur in all of the analyzed allotments except Newlin. By far the largest area is within the Williams Creek/Greenhorn Allotment. Cottongrasses are known within this allotment, but neither of the species on the RFSS list has been found here. Those species appear to prefer calcareous conditions which are absent in the Wet Mountains. Willow carrs on calcareous substrates are found in the Sangres, but these are typically small, not providing the large wetlands complexes where these plants usually occur. Arizona willow is known from the west side of the Sangres in northern New Mexico, but seems unlikely to occur on the east slope because of the strikingly different topography.

Livestock grazing may shift riparian communities from mid- or late-seral stages to earlier seral stages. Livestock grazing may lead to the reduction of willows and dominance by low shrubs, graminoids or forbs, weedy invasive plant species, or bare ground. Shifting to earlier seral stages is not necessarily a negative impact.

Another potential change in riparian zones attributed to livestock grazing is replacement of riparian species with more xeric species. As a riparian zone or wet meadow is downcut or drained, the quantity and quality of wetted soils is decreased. As these soils dry, upland species adapted to more xeric conditions may invade the riparian zone. Monitoring and adaptive management avoids such detrimental effects.

Inundated wetland habitats may escape some direct impacts from livestock grazing due to livestock preference. Cattle tend to avoid wet or boggy habitats, so herbivory and trampling may be less pronounced in such areas. Margins of wet habitats, however, may be impacted from livestock seeking water, especially if these areas are the only water sources in the pasture. Trailing in wet habitats by cattle may produce channels, draining water that would otherwise be present as overland or sheet flow.

Determination of Effects and Rationale

Alternative A

A determination of "beneficial impact" made for all RFSS known to be present or having habitat within the analysis area is based on the previous discussion and following rationale:

Cessation of livestock grazing would remove the risk of ground disturbance, soil compaction, and grazing of RFSS.

Negative indirect impacts such as altering of sedimentation and hydrologic alteration would be minimized.

The risk of introducing and spreading noxious weeds would be lessened.

Alternative B

A determination of "may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" made for Gray's draba is based on the previous discussion and following rationale:

> Gray's draba is not known to occur within any of the analyzed allotments. Plants are short-statured growing in areas of low plant cover that would likely receive little utilization from cattle. No developments are proposed in its habitat.
>
> Relatively small acreages of unsurveyed potential habitat exist within the Ophir, West Peak, White Creek, and Williams Creek/Greenhorn allotments. Although livestock grazing may be detrimental to Gray's draba due to impacts from herbivory and ground disturbance, this species is mostly scattered in its habitat and at least some populations would escape impacts.

A determination of "may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" made for Degener's beardtongue is based on the previous discussion and following rationale:

> Degener's beardtongue is known to occur within the Newlin Allotment, the only allotment within the range of the species. Large populations there continue to grow despite the long history of livestock grazing within the allotment. No new developments are proposed in this area that would significantly change conditions for the plants.

A determination of "may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" made for Hall's fescue is based on the previous discussion and following rationale:

> Hall's fescue is known within the West Peak Allotment and additional habitat may be present in other allotments in the Sangre de Cristo Range. The known population has persisted with livestock grazing under current management for decades. No developments are proposed that would alter conditions or management at this site.

A determination of "may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" made for lesser yellow lady's- slipper and Selkirk's violet is based on the previous discussion and following rationale:

> Neither lesser yellow lady's-slipper nor Selkirk's violet are known within any analyzed allotments, but populations have been found in valleys below them. Current management would not directly impact these plants or their habitat, but sedimentation from activities could cause small downstream effects.

A determination of "may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" made for Smith's draba is based on the previous discussion and following rationale:

> Habitat for Smith's draba is present in allotments in the Sangres, although no populations are known in these allotments. Current management has little more than incidental impacts in this habitat because of sparse understory plant growth and typically closed canopy conditions. Any undiscovered individuals could be damaged by incidental livestock grazing or soil disturbances.

A determination of "may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" made for whitebristle and slender cottongrasses and Arizona willow is based on the previous discussion and following rationale:

> Whitebristle and slender cottongrasses and Arizona willow are unknown in any of the analyzed allotments. Any undiscovered individuals could be damaged by incidental livestock grazing or soil disturbances. Livestock use in the habitat is infrequent because of the tendency for livestock to avoid areas with saturated soils.

Alternative C

A determination of "may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" made for Gray's draba is based on the previous discussion and following rationale:

> Gray's draba is not known to occur within any of the analyzed allotments. Plants are short-statured growing in areas of low plant cover that would likely receive little utilization from cattle. No developments are proposed in its habitat.
> Relatively small acreages of unsurveyed potential habitat exist within the Ophir, West Peak, White Creek, and Williams Creek/Greenhorn allotments.
> Although livestock grazing may be detrimental to Gray's draba due to impacts from herbivory and ground disturbance, monitoring and adaptive management would reduce the magnitude of potential impacts.

A determination of "may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" made for Degener's beardtongue is based on the previous discussion and following rationale:

> Degener's beardtongue is known to occur within the Newlin Allotment, the only allotment within the range of the species. Large populations there continue to grow despite the long history of livestock grazing within the allotment. No new developments are proposed in this area that would significantly change conditions for the plants. Monitoring and adaptive management would reduce the magnitude of potential impacts.

A determination of "may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" made for Hall's fescue is based on the previous discussion and following rationale:

> Hall's fescue is known within the West Peak Allotment and additional habitat may be present in other allotments in the Sangre de Cristo Range. The known population has persisted with livestock grazing under current management for decades. No developments are proposed that would alter conditions or management at this site. Monitoring and adaptive management would reduce the magnitude of potential impacts.

A determination of "no impact" made for lesser yellow lady's- slipper and Selkirk's violet is based on the previous discussion and following rationale:

> Neither lesser yellow lady's-slipper nor Selkirk's violet are known within any analyzed allotments, but populations have been found in valleys below them. Current management would not directly impact these plants or their habitat. Monitoring and adaptive management would reduce the magnitude of potential impacts.

A determination of "may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" made for Smith's draba is based on the previous discussion and following rationale:

> Habitat for Smith's draba is present in allotments in the Sangres, although no populations are known in these allotments. Current management has little more than incidental impacts in this habitat because of sparse understory plant growth and typically closed canopy conditions. Any undiscovered individuals could be damaged by incidental livestock grazing or soil disturbances. Monitoring and adaptive management would reduce the magnitude of potential impacts.

A determination of "may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing" made for whitebristle and slender cottongrasses and Arizona willow is based on the previous discussion and following rationale:

> Whitebristle and slender cottongrasses and Arizona willow are unknown in any of the analyzed allotments. Any undiscovered individuals could be damaged by incidental livestock grazing or soil disturbances. Livestock use in the habitat is infrequent because of the tendency for livestock to avoid areas with saturated soils. Monitoring and adaptive management would reduce the magnitude of potential impacts.

3.7 SOILS

Existing and Desired Conditions

Although the degree of soil impacts is varied across the analysis area, with respect to regional and forest soil quality standards, the requirements for soil cover, erosion and disturbance or detrimentally impacted soil areas are, generally, within regional guidelines at the allotment scale. In some site specific areas that are heavily used such as trail corridors, water developments, salting locations, springs and seeps, and stream corridors and their associated riparian areas tended to show more bare ground and compaction than less utilized areas. These areas are particularly sensitive to disturbance during the early portion of the grazing season when soils are typically wet or moist, while some areas may remain wet or moist throughout the year. Areas that are currently in an unacceptable condition are discontinuous and comprise small portions of the allotments. In some locations of the project area there is a slow progression of deposition in the channels. An increase in riparian vegetation within and adjacent to the channels will allow for additional sediment to be captured. Maintenance, improvement, and protection of the soil resources will allow more natural patterns to develop over time.

Desired Resource Conditions

The desired condition for the soil resource in these allotments is to maintain or enhance soil quality to sustain the physical, chemical and biological function of the soil (1984 Forest Plan). Soil quality is the capacity of the soil resource to function within ecosystem boundaries to

sustain biological productivity, maintain environmental quality and promote plant and animal health. Soil condition is an evaluation of soil quality based on an interpretation of soil properties that affect vital soil functions.

Long term soil quality is maintained by limiting detrimental soil impacts such as compaction, erosion and displacement. This is achieved by application of watershed conservation practices from the Watershed Conservation Practices Handbook (FSH 2509.25). Watershed conservation practices either prevent or mitigate detrimental soil impacts.

Effects Common to All Alternatives

The effects common to all alternatives include a general susceptibility of soil loss due to grazing use. The magnitude of the potential losses varies between alternatives. The allotments with greater grazing intensity or with higher proportions of easily eroded soils have greater potential to experience direct and indirect effects. The cumulative effects are also similar for each alternative. However, much like the direct and indirect effects, the magnitude of cumulative effects also varies by alternative. Management practices, constraints, and mitigation measures for soil, water, and riparian improvement should be considered under all action alternatives. These mitigation measures include improvements such as riparian vegetation restoration, bank stabilization, road maintenance, and use of fencing, salting, and water improvements. All of the current alternatives affect the potential for riparian vegetation establishment, soil loss, and sediment yield.

Past, present and reasonably foreseeable future activities that affect riparian and water resources in the project area include: timber treatments; prescribed fires and wildfires; mining activities; permitted and public recreational activities; livestock grazing practices; wildlife populations and movements; noxious weed control; road and trail developments; human population and social dynamics; water diversions, rights and developments; watershed improvement projects and reforestation and firewood salvage sales. The affected watersheds support many multiple uses. Grazing impacts uplands, riparian corridors and streams within the project area.
Wildfires and extreme storms often drive the episodic erosion events that dominate long-term sediment yield in mountain aquatic ecosystems. Therefore, human and land management activities that alter the risk or the size of catastrophic erosion events have the greatest impact on sediment yield.

Alternative A: No Action – No Livestock Grazing

Direct and Indirect Effects

Under this alternative overall soil erosion losses would be reduced. The effects of discontinuing grazing in the allotments would be a more rapid recovery of impacted areas. Areas that have been impacted by livestock grazing are expected to stabilize two to five years after grazing livestock are removed. Compacted areas created by trailing or intensively grazed areas by livestock may never fully recover from compaction, but improvements to the soil hydrologic function, soil quality and soil productivity are expected to improve over the next decade(s) resulting from an interaction that will occur between several factors, that include but are not

limited to:

- increased biomass and root-stabilizing vegetation (willows, cottonwoods, and sedges)
- increased plant nutrient availability through decomposition of biomass by microbes (Ehrenfeld 2003)
- less compaction by grazing livestock
- presence of late-seral vegetation along the North Fork that will provide stability to the streambank
- expanding root systems will likely spread to areas with bare soils and provide vegetative cover that will help to retain soil moisture and prevent wind and water erosion of topsoils.
- microbial activity, necessary for making many nutrients available to plants, is also expected to increase with increased root biomass.

These losses would decline over time with increases in plant density, plant vigor, and a shift in species diversity towards more desirable perennial grasses and forbs. Damage to streambanks would gradually decrease as vegetation is re-established. Damage to willows and other riparian vegetation would be reduced, although elk would continue to exert some impacts on the vegetation.

Long-term soil productivity would increase due to a lessening of soil compaction and decreases in sheet and rill erosion. Soils would be allowed to develop and recover at a more optimum rate, without additional pressures from livestock grazing. With a reduction in soil compaction, soil bulk density at impacted sites would gradually decrease. A gradual reduction in soil bulk density would increase infiltration and percolation rates, and help contribute to greater vegetative biomass production. Microbial activity, necessary for making many nutrients available to plants, is also expected to increase with increased root biomass. With an increase in vegetative biomass, litter, organic matter, and organic carbon would also increase. Expanding root systems will likely spread to areas with bare soils and provide vegetative cover that will help to retain soil moisture and prevent wind and water erosion of topsoils. Increases in surface litter, organic matter, and soil organic carbon would assist in stabilizing soils, decreasing erosion rates and subsequent sediment yields within the analysis area, and contributing to the development of more productive soils. Herbage production levels would increase.

Cumulative Effects

The no grazing alternative would slightly decrease the cumulative effects in the analysis area. Areas that are currently showing no sign of impacts from management activities would stay the same. The results of reducing cumulative impacts to the soil resources are similar to the indirect effects above. Generally, trends towards recovery would be upward and that recovery would be realized more rapidly than with either of the grazing alternatives, with timeframes varying, depending upon the location.

Over the next few decades, as improvements to the overall hydrologic function of soils occur, representation by all seral (early- mid- and late-) phases is expected to be present, improving progress towards properly functioning riparian conditions. Upland areas currently exhibiting minimal signs of impacts from livestock grazing are also expected to move toward a late-seral

phase with regards to vegetation. Any areas currently experiencing active erosion and gullying are expected to become more stable in a shorter amount of time than either Alternatives 2 or 3, when they are not continually disturbed by traveling livestock. However, if numbers of elk continue to increase in certain areas, i,e., Ophir Allotment, many of these potential gains could be negated.

There would continue to be localized disturbance to soil from wildlife in wetland and riparian areas. Dispersed camping and recreation can lead to very localized areas of bare or compacted soil, making it more susceptible to erosion and affecting nutrient cycling and productivity.

Alternative B- Current Management

Direct and Indirect Effects

Under this alternative grazing management would continue as permitted without additional requirements for protection or improvement of soil and riparian resources.

Levels of use in terms of timing, intensity, and duration/frequency by livestock would remain the same. In areas of low to moderate utilization, (primarily the upland areas) compaction rates and natural recovery are expected to gradually improve, providing precipitation levels do not decrease. In highly utilized areas (such as some valley bottoms and some riparian areas) continued stress and disturbance initiated by reduced precipitation and/or continued livestock grazing could further reduce soil quality through compaction, displacement, and erosion. Effects of continued grazing, without modifying current management practices, would include limited growth for roots and above ground vegetation, and increased runoff and erosion potential. If monitoring shows that Forest Plan or WCPH desired conditions are not being met or satisfactory progress is not in the direction of desired condition, and all administrative actions have been exhausted, limited flexibility remains to make changes without completing a new NEPA analysis This would increase the amount of time needed before a mitigating response could be formulated and applied on the ground. The result would be the direct effect of a continuation or an increase in soil erosion losses in those few riparian areas that are in fair to poor range condition. There would be no emphasis on improvement of current soil and vegetation conditions relative to livestock grazing practices. Riparian areas identified as impaired or at risk would continue to show signs of soil loss and limitations of woody riparian vegetation growth unless they were dealt with under separate programs and practices.

The indirect effects would be a gradual decrease in long term soil productivity on allotments with areas that show compromised or damaged range condition or vegetative cover. The current or an increased level of soil transport and sedimentation would occur. Downstream sediment loads would remain the same or increase. Riparian areas in degraded conditions would continue unnatural bank erosion and require greater time periods for recovery to a properly functioning condition.

Cumulative Effects

Livestock grazing under this alternative would continue and, along with other uses, could

potentially increase any adverse cumulative effects already occurring. Improper livestock grazing along certain riparian areas reduces the riparian vegetation and decreases the plants ability to hold the soil as the stream widens. This effect can be compounded by roads adjacent to the riparian areas, OHV use in riparian areas, and recreational camping in those same riparian areas. Concentrated use by elk can have some of the same effects.

As recreation and private land development continues to increase, so will the associated impacts to watershed health and water quality. Population growth in and around the project area will result in a greater number of forest users. Unauthorized OHV and motorcycle use already impact many of the riparian areas. In addition to livestock grazing, these actions may have an overall negative effect on the integrity of rangeland and riparian ecosystems by weakening the vegetation and creating ruts and unvegetated scars across portions of the riparian zone.

Potential timber and fuel reduction projects are ongoing for the watersheds within the SCPA. Usually, these projects have a short-term negative impact to watershed health; they do provide for long-term benefits to the watershed when implemented properly. Such practices have been shown to improve herbaceous conditions by increasing understory vegetation production and stimulating a variety of herbaceous species. Increased herbaceous vegetation has a positive effect on riparian and water conditions creating favorable habitats for all types of terrestrial and aquatic life. Increased herbaceous vegetation with a strong rooting component has the very important function of protecting the soil resource from erosion, high temperatures, and compaction while also contributing to the fertility of the soil (i.e., increasing soil organic carbon).

Allotment conditions contribute to overall watershed health. Where no improvements are made, watershed conditions would not improve. Riparian areas that are degraded by grazing may be more susceptible to damage from natural events and anthropogenic influences. As a result, cumulative impacts from other sources may be magnified.

Under this alternative the allotments could incur current or increased levels of potential soil losses. Grazing in riparian areas currently show the greatest risk for soil losses in several pastures in the project area. This alternative has the potential to increase soil degredation and soil losses in the area and increase potential negative impacts on the watersheds.

This alternative does not emphasize any additional improvement or grazing alternatives to specifically address issues of soil resource protection.

Alternative C - Proposed Management

The proposed Adaptive Management Alternative directly addresses several recommended management measures listed in the Watershed Conservation Practices Handbook (FSM 2509.18). These measures (listed below), which have been incorporated into the adaptive action strategies proposed in this alternative, help the Forest Service and the permittee to comply with laws and regulations concerning the protection of soil resources.

- No more than 15% of an activity area will be left in a detrimentally compacted, displaced, puddled, severely burned, and/or eroded condition. (*FSH 2509.18 - SOIL*

MANAGEMENT HANDBOOK)

- Retain stabilizing vegetation on unstable soils. Avoid new roads or heavy equipment use on unstable or highly erodible soils. (WCPH, 1999)

- Establish effective ground cover on disturbed sites to prevent accelerated on-site soil loss and sediment delivery to streams. Restore ground cover using certified native plants as practicable to meet revegetation objectives. Avoid persistent or invasive exotic plants. (WCPH, 1999)

- Maintain or improve long-term levels of organic matter and nutrients on all lands.

Permitted grazing within allowable levels based on current range analysis data and implementation of more intensive standards and guidelines on all allotments and specific utilization standards would be implemented in riparian areas and pastures.

Direct and Indirect Effects

If properly implemented, this alternative could result in improved watershed condition of the upland and riparian areas. The effect of adaptive management on these allotments would be to increase residual vegetation where needed, reduce litter accumulations, lessen amounts of bare ground where excessive, and increase the overall vigor of plants through better distribution of cattle across the allotments. Increasing beneficial vegetation and improving its vigor ensures that plenty of material is available for trapping sediment in runoff and overland flow events. Additionally, adequate litter (not excessive) insulates plant crowns and over wintering buds, protects and covers soil, holds moisture in the ground and allows the plants to continue photosynthesis for carbohydrate production and storage. Greater carbohydrate storage results in more roots being produced by each plant. This increases the erosion defensibility and moisture-holding capability of soils. It also provides a buffer to plants in times of stress (such as drought). Chemical water quality parameters such as nutrients, fecal coliforms, and pH could improve. With the upward trend in riparian condition, there would be increased thermal cover, reducing temperatures in the summer, improved stream stability, reduced sediment, increased ability to handle floods, and increased riparian areas and wetlands.

Changing season of use (spring, summer, fall, winter), constructing permanent fencing to control livestock distribution patterns, constructing new livestock water developments, enhancing riparian shrub regeneration by planting native shrubs, stabilizing active headcuts, and creating livestock driveways could be added to alloment management. Effectiveness monitoring and a feedback loop that would provide for further adjustments in grazing management where identified is implied and integral to successful implementation of this alternative.
In general, creating new, developed watering sites in the uplands should improve distribution across the allotments and relieve pressure on the localized and adjacent riparian area. The difficulty comes in achieving this on allotments where animal behavior is adapted to spending much of their time in riparian areas. Thus more intensive management will be required by the permittee and Forest Service specialists to achieve desired conditions in these locations. Additionally, overall maintenance will increase with the addition of each system.

Because of the changes in management (timing, intensity, frequency, adjusting of seasons), this alternative provides more management flexibility (key issue) to choose the best way to consistently meet the allowable use standards and move toward desired future conditions of the rangelands and riparian areas on the allotments.

Vegetative cover should be improved on all upland and riparian areas. Soil retention on sites should be improved. Potential soil erosion and compaction losses would be reduced from current levels in selected riparian and upland areas that are shown to be in poor condition. The restoration of riparian soils and vegetation would be emphasized. Implementation of rangeland improvements and fencing construction may include minor disturbance to surface and subsurface soils. Minor amounts of soil loss are probable during construction of range improvements if such construction involves heavy equipment. This is likely to be very limited. This could cause short-term sediment transport and changes to vegetation to areas where the surface soil is disturbed.

The indirect effects include an improvement of downstream water quality, reduction of sediment transport, enhancement of riparian vegetation, and improvement of long-term soil productivity on selected areas. Forage production would increase in areas identified as having poor condition. Riparian vegetation diversity would increase.

Cumulative Effects

Under this alternative the health of the watersheds should improve. The changes to the grazing management would improve conditions of the areas outside of the National Forest boundary by lessening the total potential soil losses and sediment transport within a watershed.

Factors in Alternative C that contribute toward range soil improvements over the long term would include:

- vegetation would be expected to display all seral phases (early- mid- and late-), contributing to stream bank stability.
- soils now exposed (bare) are expected to be covered with vegetation as a result of expanding root systems, and seed dispersal via natural events or by livestock.
- reducing compaction and displacement in effected areas by encouraging livestock to graze elsewhere (i.e. through riding/herding, salt and supplements placed at low-use livestock grazing areas, construction of new ponds, etc.)
- retention of soil moisture by insuring biomass does not fall below established minimum stubble heights throughout a grazing period.

If implemented properly, the proposed adaptive grazing management strategies could help to stabilize and improve riparian soil conditions and upland soil conditions resulting in overall positive cumulative effects across the project area. Aquatic resources and water quality could also improve. Streams may be healthier and might be able to better withstand the effects from other activities in the watershed.

Current and future fuels management projects will reduce the risk of catastrophic fires and thus reduce the potential for catastrophic sediment delivery over the long-term. Past and on-going restoration efforts within the burn areas, such as closing roads, mulching, and seeding should also reduce erosion and sediment. These efforts combined with managing livestock grazing to improve riparian and stream habitat conditions and maintain upland grassland areas under the proposed action would have cumulative benefits to the affected aquatic ecosystems within the SCPA of the Arkansas, Huerfano, and Purgatorie River basins.

Effects Summary

Alternative A, No Grazing, would allow for soil quality to improve at a much faster timeframe (possibly achieving late-seral vegetation within 15 years) than either of the other Alternatives. As with Alternative B, compaction created by decades of livestock grazing may never recover to a pre-grazing state. However, as with Alternative A, above and below ground biomass are expected to increase to the point that microbial activity, plant available nutrients made possible by decomposition, and improved soil characteristics are noticeable within three to five years following the removal of grazing livestock.

3.8 FINANCIAL ANALYSIS

Forest Service Manual 2210.2, Range Management Planning, directs us to "Integrate rangeland resources with other resources to achieve Multiple-Use, Sustained-yield in an environmentally sound and Cost-effective manner." Cost effectiveness is measured by Present Net Value (PNV) of the costs and benefits displayed by alternative. The following table shows Forest Service value for all of the active permits in this analysis for each year over a 10 year projected permit period. Permittee values are not shown due to the large number of variables and the subjective nature of ranch business management.

Table 3-27: Present Value – Forest Service

	Alternative A	Alternative B	Alternative C
PV-Benefits	**$3,037.05**	**$25,618.52**	**$25,618.52**
PV-Costs	**-$2,300.00**	**-$17,465.40**	**-$27,664.75**
PNV-Net Value	**$1,037.05**	**$8,153.05**	**-$2,046.22**

Benefits are primarily derived from grazing fees paid by the permittees. Intangible benefits not included here are things like improved range condition. Costs include items like permit administration, allotment inspections, range improvement development and materials, monitoring, and meeting expenses. These costs and benefits were projected out over the 10 year life of a typical range permit. Alternative A is the no grazing alternative, but it was assumed that permitted livestock grazing would continue for one more year under a term permit before the allotments were shut down. Alternative B includes very few range improvements, but does include all maintenance for existing facilities. Alternative C includes a number of range improvements programmed out over the life of the permits. These improvements are identified as adaptive options in the alternative description in Chapter 2. For this analysis we assumed that

some of the options would be implemented to improve resource conditions in the pastures. We did not assume that all of them would be done.

At first glance it appears that Alternative C is not the best choice financially. But what this alternative includes that the others do not aggressively deal with, is active resource problem management. With that management come the twin benefits of continued livestock grazing and improved range condition. This will lead to improved riparian and wetland health, improved botanical sustainability, improved wildlife habitat, improved recreation and visual quality, and better protection for the soils and cultural resources. Alternative A brings improved range conditions, but at the cost of no grazing. Alternative B allows the livestock grazing to continue, but does little to aggressively improve resource conditions to move them toward the desired condition. As a land management agency, the Forest Service must consider the intangible benefits along with the tangible ones in the decision-making process. The cost-efficiency table is therefore only a guide to inform the Deciding Official about the financial costs and benefits tied to selecting any of the alternatives analyzed in this document.

3.9 RECREATION

Affected Environment

The San Carlos Ranger District provides a diverse range of recreational opportunities in the Sangre de Cristo Mountains, Wet Mountains and the Spanish Peaks. The degree of use varies considerably across the district. There are some minor conflicts between recreation and livestock grazing. As the population becomes more urban and less connected with agricultural, there is less tolerance for livestock grazing and less understanding of the needs associated with grazing on the National Forest. In general, and where possible, conflicts between recreationists and livestock need to be reduced. This is especially true in high use recreation areas, developed sites and trailheads inside allotments.

Many recreation users are unaware that grazing is an acceptable practice in Wilderness areas that forbid most forms of resource extraction. Three wilderness areas occur on the district: the Sangre de Cristo, Greenhorn and Spanish Peaks. Portions of range allotments occur on all three wilderness areas. Grazing occurred in all three areas before they were designated wilderness. In the adaptive management alternative, grazing would remain in those portions of the Sangre de Cristo and Spanish Peaks Wilderness Areas and be excluded from the portion currently in the Greenhorn Wilderness Area.

Most operators of motorized vehicles are not familiar with the concept of open range grazing. Illegal motorized use can be responsible for moving livestock to areas where they do not belong or for significant damage to vegetation, soil and water. This directly affects the range resource. Education and enforcement will help reduce this resource damage.

Visitor knowledge of grazing activities is important in defining recreation expectations. Some people may have expectations of a recreation experience with no encounters with domestic livestock. Conflicts can arise when those people do encounter livestock and their expectations are not met. However, the Forest Plan allows livestock grazing as an appropriate and authorized use within the Analysis Area. Therefore, recreation visitors should expect to encounter domestic

livestock at times as part of their experience in these settings. If visitors have knowledge about livestock grazing activities within the Analysis Area before they encounter livestock, they can make their plans accordingly or they can go to areas where they will not encounter livestock.

Pantleon C&H
Recreation opportunities in this area are limited due to very little public access. The area is non-motorized and the north part of the allotment is in the Sangre de Cristo Wilderness. Big game hunting is the main activity, with one outfitter/guide permitted in the area. Illegal OHV use occurs during the hunting seasons.

Devils Hole C&H
There are a number of Forest Service roads in the area. No trails or trailheads are present. Big game hunting is the main activity with some limited dispersed camping and OHV opportunities. Illegal OHV use occurs during the hunting seasons. Pinon nut gathering is an important activity in years that produce a crop. Fuel wood gathering also occurs in the area on a limited basis.

Indian Creek/Lakes C&H
Forest Service roads 410 and 421 are present in the allotment. The Indian Creek Trailhead and portions of the Indian Creek trail (#1300) are in the allotment. Dispersed camping and OHV use is increasing in the area. Hunting seasons have an increase in use when they occur. Conflicts between recreational users and livestock occur at the Indian Creek TH and along the Indian Creek Trail. Some illegal motorized use occurs off of the adjoining private land to the west. The Indian Creek trail has resource damage from OHVs where it crosses Bonnet Creek.

Ophir C&H
There are numerous Forest Service roads inside the allotment boundary. Dispersed camping, hunting and OHV use are heavy in the area. There are no developed trails or TH's in the allotment. The Ophir Creek snowmobile area covers the allotment. Illegal motorized use occurs in a number of areas. Dispersed camping and roads have created impacts on the Middle Creek, Ophir Creek and Elmer Canyon riparian corridors.

West Peak C&H
Cordova Pass Road is the only road in the allotment. The Wade, Schafer and West Peak trails are in the allotment as well as the developed Cordova Pass TH. White Creek has a well defined user created trail. Hiking, picnicking, dispersed and developed camping, climbing and hunting are all present activities and are centered around the Cordova Pass TH. Part of the allotment is in the Spanish Peaks Wilderness Area. Conflicts between livestock and recreation have not been a problem.

Williams Creek/Greenhorn C&H
Numerous roads and trails are present on the allotment. Recreation use is very high. Five trailheads and six trails are within the allotment boundary. Dispersed camping, OHV use, hiking, hunting, and mushrooming all occur in the area. The Ophir Creek snowmobile area is within the allotment boundaries. The allotment currently includes part of the Greenhorn Wilderness area. Illegal motorized use has been a problem in certain areas. Conflicts between

livestock and recreation have occurred on a limited basis. Recreational users have vandalized range improvements in the past.

Newlin C&H
The Newlin C&H contains FSR 274 and the Lion Canyon trail (#329). Recreation use is generally light except during big game hunting seasons. Dispersed recreation, OHV use and hunting are the primary recreational opportunities in the area. Some illegal OHV use does occur. Livestock and recreation conflicts have not historically occurred.

Alternative A: No Livestock Grazing

Direct Effects**:**
Under this Alternative there would be no recreation visitor and livestock interactions. The possibility of negative interactions between permitted livestock and recreation visitors would be eliminated. Without livestock grazing; fencing, gates and other range improvements, recreation users may have a less restrictive experience if these improvements were removed. The loss of some of these improvements that the public uses could negatively affect their experiences. Water developments and trail clearing that permittees provide may be lost. Elimination of livestock grazing would not be expected to change recreation use sufficiently to affect recreational use patterns.

Indirect Effects:
People could lose the connection of grazing on federal lands as a part of our history and culture. By not having the permittee presence on the ground, illegal OHV use reporting and additional information on recreational use patterns may be lost.

Alternative B: Current Management

Direct Effects:
Conflicts may arise between recreation users and livestock grazing because of fencing, gates and cattle guards. The public will remain uneducated about the role and needs of livestock grazing on National Forest lands. Recreational users will continue to harass livestock and potentially move them to areas they are not permitted. Livestock grazing can also have an adverse impact on dispersed campsites. The existing wilderness condition which includes grazing would continue. Alternative B has the least amount of management flexibility to reduce the effects of livestock grazing to recreation.

Indirect Effects:
There may be a historic sense of place with the role of grazing clearly visible.

Alternative C: Adaptive Management

Direct Effects:
By improving fencing, gates, and cattle guards and adjusting the timing and placement of cattle there may be fewer conflicts with recreation users. By educating the public they may expect to

see grazing on National Forest Lands and they may better understand the role of grazing on public lands. Water developments that occur have a tendency to draw big game off of adjacent private lands onto Forest Service Lands. This may increase the opportunity for the public during hunting seasons. The livestock effects to recreation would also be minimized by the application of the Project Design Criteria for this Alternative. The existing wilderness condition which includes grazing would continue. No livestock structural improvements would occur within the wilderness areas.

Indirect Effects:
Recreation users may have a sense of place with the historic role of grazing clearly visible and more likely to be viewed in a positive way. Grazing impacts have not impaired the wilderness character or diminished the opportunity for future use as wilderness.

Cumulative Effects – All Alternatives
As recreation use increases there may be more interaction between the two uses. Recreation and road use that occurs near riparian corridors may cause greater impacts to those areas in the future. Cumulatively, there are no known future proposed actions in the foreseeable future that would significantly change recreation use or patterns.

3.10 HERITAGE RESOURCES

At the time of this analysis, the Pike and San Isabel National Forests cultural resources staff and various contractors and partners have conducted 14 cultural resource inventories within the total area for all San Carlos grazing allotments under study. As a result of these investigations, 214 cultural properties (termed “prehistoric sites” or “historic sites”) have been identified and recorded. After the files search, an initial field survey of the 28 sampling units selected specifically for the San Carlos grazing allotment analysis was done. As a result of this work, 23 previously unknown cultural sites were identified and recorded. The additional surveys of areas likely to contain both cultural properties and high cattle use resulted in a further 2 unknown cultural properties being located and recorded; these 25 new sites and the 214 previously known sites yields a total of 239 cultural properties within the analysis area for the San Carlos allotments. These cultural properties (or sites) exhibit both historic and prehistoric uses. “Historic” refers to sites with materials and items common to European immigrant cultures of the Western Frontier, and the use of such sites usually dates after AD 1860 in the Pike and San Isabel National Forests. “Prehistoric” refers to sites with materials and items common to American Indian cultures of Colorado, and the use of these sites usually dates before AD 1860, and may be much earlier (even several thousand years ago).

Currently Known Cultural Resources within the San Carlos RAMPS

The cultural resources within the San Carlos grazing allotments constitute an ample and rich record of prehistoric and historic human habitation and use of this portion of Colorado; the Wet Mountains, The Wet Mountain Valley and the Sangre de Cristo Mountains. The significance of individual cultural resources within the allotments is a function of their associations with important events and peoples, their historic architectural styles (if buildings exist), or their

potential to provide scientific information about the prehistory or history of the area. The sites determined historically significant through the application of these criteria are considered eligible for listing within the National Register of Historic Places; some of the most significant sites have been officially listed on the National Register or on the Colorado State Register of Historic Places. Of the 214 total cultural properties, 89 are listed in or are potentially eligible for listing in the National Register of Historic Places; the remaining 125 properties are not significant ("not eligible") in terms of the Register.

Prehistoric Sites.

Most of the recorded prehistoric sites are characterized generally as surface areas of stone tools, stone tool manufacturing debris, and in some cases, fire-cracked rock. Concentrations of finished tools and manufacturing debris were noted at many of the sites; such concentrations may represent the remnants of temporary dwellings or outdoor activity areas. Total quantities of material items on the surfaces of prehistoric sites within the San Carlos allotments range from less than ten to several hundred; prehistoric sites with these manifestations are usually interpreted as camps, or as resource collecting and processing areas. Thus, most of the prehistoric sites recorded during previous investigations or during the recently completed grazing allotments sampling inventory probably represent locations where small prehistoric social groups resided for several weeks or several months while harvesting and consuming local resources and engaging in small group social activities. Some of the smaller sites may be areas where collected resources were processed and prepared for transport to the larger camps. Some of the larger sites (those with several hundred surface items) may have been larger camps used by several families. At some of these prehistoric properties, the cultural phenomena were limited to or included conifer trees with scars reflecting healed bark peels. These trees are usually mature ponderosa pines that are more than three hundred years old. The scars themselves are over 130 – 200 years old and reflect the bark harvesting activities of late period (A.D. 1750 – 1870) Indian groups; at least two sites within the Sangre de Cristo Range are estimated to have been harvested as early as the mid 1700's (Music Creek Peeled Tree groves 5CR.493 and 5CR.520); the inner bark is palatable and was harvested as a diet supplement during the spring season. The bark strips may also have been used for medicinal purposes. Other types of prehistoric sites known within the San Carlos allotments include tool stone (lithic) quarries where materials for lithic tools where gathered. In addition to these local materials lithics found on sites included materials from the Trout Creek Quarry (within the adjacent Salida Ranger District) this quarry served as a focal point for groups residing in the Arkansas Hills and the Upper Arkansas in general.

Based on the apparent late depositional context of most archeological items and the presence of the peeled trees, it is thought that most of the known prehistoric sites in the San Carlos allotments contain materials and archeological deposits dating to the Late Prehistoric Period (A.D. 1500-1870). However, many projectile points recovered from these sites are assigned to types that date much earlier; a few, based on their morphology, may have been manufactured more than 5000 years ago. It cannot be determined from the available information whether these are items salvaged from early archeological contexts and used by later groups, or whether they actually reflect the early use of the San Carlos allotments area. It may be that some of the sites contain a mixture of deposits and materials representing the Late Prehistoric period and the remnants of earlier use. Test excavations at one prehistoric camp located on the eastern slope of

the Sawatch Range support this last theory – there was a late post A.D. 1500 occupation superimposed on an early site use dating 1000 years earlier.

Numerous prehistoric properties are eligible to the National Register of Historic Places and others may be eligible based on the results of further research. These properties contain preserved archeological deposits that are storehouses of archeological and cultural information. The deposits are potential sources for addressing research problems in Colorado Mountain archeology, for example, calculating the time span of prehistoric occupation in the southern Rocky Mountains, or reconstructing the subsistence patterns and other life ways of indigent social groups. Some of the sites may be important as traditional areas to the modern descendants of the American Indians peoples who previously inhabited the eastern part of the Colorado mountains area. Tribes with possible traditional ties to the area, and those tribes that have indicated prior interest in the area, were contacted regarding the renewal of the San Carlos grazing permits and their concerns or interests regarding locations important to their culture or tribal history. None of the contacted authorities communicated any particular concern or interest regarding the proposed renewals

Historic Sites.

The recorded historic sites reflect a variety of activities and uses that are typically common to National Forest system lands and in some cases particular to the San Carlos allotments. Common themes reflected in the content and context of the known historic sites are mountain homesteading and settlement, ranching, logging, mining, railroad development, and other means of historic transportation. Other historic themes such as the Public Works Era which include; Civilian Conservation Corps (CCC) and Depression life ways of the 1930s, Forest Service history and management, and the development of Colorado's water resources, are represented by only a few such sites. Mining related sites are the most common historic resources. These include lode mines with typical mining sites such as shafts, adits, head frames and shaft houses, placer mines, prospecting complexes, quarries and mining camps. There are also numerous isolated prospecting excavations which are very common in some portions of the allotments. This part of the San Isabel National Forest was a big player in the late 19th Century Colorado High Country Mining Boom and mining camps mushroomed up across the area. Blanca Mill site is one such camp with historic significance. The logging related sites include sawmills and logging camps with cabins or tent sites used by harvesting crews or sawmill laborers. The saws at many sawmills were powered with steam engines which confirms they were in operation in the late 19th or very early 20th century - Herrick Sawmill (although never brought into service) in the Newlin grazing allotment is representative of such sawmills . Ranching and settlement related sites include homesteads, line camps and corrals. The Slide Mountain and Huerfano allotments boarder the northern edge of the Sangre de Cristo Grant it is therefore not surprising the demographics of these sites represent both Euro American and Hispanic settlement and include both cattle and sheep ranching sites. The two southernmost allotments (West Peak, Indian Creek/ Lakes) also have a number of sites such as rock walls, more typically associated with sheep ranching than cattle.

Railroad and other transportation related sites include railroad grades, construction features such as cuts, trestles locations and sidings, railroad stations, construction camps, wagon roads, and

mountain passes and trails. Historically important railroad sites in the vicinity of the San Carlos allotments include portions of the Oak Creek Railroad grade.

Other significant historic sites include several late 19th century ranch irrigation ditches which are important in the context of water development and historic ranching. Sites associated with Public Works projects and the Depression Era include the surviving project improvements of CCC water control dams; a good example of which is located in the Devils Hole allotment and consists of a series of water control dams. As is discussed earlier Forest Service history and management, and the development of Colorado's water resources are represented by only a few such sites, therefore, these types of sites are historically important through their association with the CCC of the late 1930s and its conservation efforts. Numerous sites representing the historic themes listed above have been determined eligible for listing in the National Register, but have not been officially listed, other sites still need a determination of eligibility; the remaining historic sites are not eligible for listing in the National Register.

Current Condition of Cultural Resources by Allotment

An allotment by allotment assessment of significant historic properties within the San Carlos RAMPS area of analysis is presented below.

Devils Hole Allotment
There are numerous historic and prehistoric sites previously recorded in this area during the Cultural Resources Investigation for the Black Mountain Fuels Project CRR# 12-1813. A total of 181 properties were recorded, 34 of these were isolated finds and ineligible for inclusion in the NRHP, 147 were recorded as sites. Of the 147 sites 75 are recommended eligible for inclusion to the NRHP. Of the 75 sites deemed eligible approximately 10% are likely to impacted by cattle activity and include; 5HF2273 – a prehistoric site – which shows some disturbance due to cattle grazing and bedding activity.

Greenhorn/ Williams Creek
There a number of historic and prehistoric sites. Of the prehistoric sites there are two probable structures located within the saddle between the two peaks of the Greenhorn. There are also a number of late prehistoric sites within Greenhorn which need evaluation. As the Jicarilla Apache have claimed cultural affiliation to these they are considered to be a traditional cultural property and therefore protected. In addition there is one culturally peeled tree, which needs recording, within the allotment – this would be most at risk to impacts from cattle by rubbing activity. Most of these sites are outside suitable grazing areas and are therefore unlikely to be impacted by cattle.

Indian Creek/Lakes Allotments
There are a number of prehistoric sites here. Two of the historic properties within the areas likely to be impacted by cattle activity are rock alignments, including a habitation area related to sheep herding these do not show significant disturbance. One eligible prehistoric site – 5HF2263 is located close to a stock pond and shows disturbance from cattle activity. Site # 5HF2264 has

poor site integrity due to cattle activity and was recommended not eligible. One possible rock shelter was located and need further evaluation.

Newlin Allotment
There are mixtures of both prehistoric and historic cultural properties here. Of the prehistoric properties three are recommended eligible for inclusion to the NRHP. FN.2359 is two possible culturally altered trees which need further evaluation, 5FN.2370 is one possible aboriginal tree which needs further evaluation and 5FN.2371 is also a possible aboriginal tree which needs further evaluation. All of these trees should be evaluated to determine if the distortions to the limbs are cultural in nature or due to animal activity or other natural causes. There is one eligible historic property 5FN.1099 – Newlin Creek Sawmill; this is in an area of thick growth and at this time unlikely to be impacted by cattle.

Ophir Allotment
There have been five previous cultural resources surveys conducted within this allotment. These surveys revealed a mixture of both prehistoric and historic cultural resources however; none of these sites are recommended eligible for inclusion to the NRHP. As these surveys represent a sampling of the entire allotment; it could be expected that there are more cultural resources here – some of which might be eligible.

Pantleon Allotment
Surveys conducted within the allotment revealed a number of both prehistoric and historic sites. All of these were recorded as isolated fines and therefore not eligible for inclusion to the NRHP. As this represents a sampling area of the allotment it could be expected that there may be further undiscovered cultural resources within the allotment – some of which may be eligible for inclusion to the NRHP.

West Peak Allotment/ White Creek Allotment
Surveys conducted within the West Peak and White Creek allotments revealed a mixture of both prehistoric and historic cultural resources however; none of these sites are recommended eligible for inclusion to the NRHP. As these surveys represent a sampling of the entire allotment; it could be expected that there are more cultural resources here – some of which might be eligible.

Environmental Effects

Alternative A

Direct Effects

There would be no direct effects on archeological or historical sites if Alternative A were implemented. If grazing was curtailed, then the direct effects described for Alternative A would cease. If grazing improvements such as fences and stock ponds were removed, the removal process should be designed so that impacts on significant historic properties during the physical removal are minimal. The difference in direct effects between Alternative A and B is measurable because the “moderate” effects estimated for the implementation of Alternative B would cease. There would be no livestock trailing, trampling, or bedding/congregating if

Alternative A was implemented. Also, if grazing improvements were removed, the damage to archeological soils at prehistoric sites adjacent to the locations of the former improvements would cease.

Indirect Effects

Implementation of Alternative A would have an indirect beneficial effect on archeological and historical sites by increasing vegetative cover and height through no use of the allotments for livestock grazing. Improvement of vegetative cover will result in less soil erosion and decrease the sizes of bare areas vulnerable to collecting and erosion. The channeling common to some livestock trails should cease to be a factor. However, the comparative benefit is only slight when compared to Alternative B.

Cumulative Effects

Cumulative effects resulting from the implementation of Alternative A would be similar to those described for Alternative B.

Alternative B

Direct Effects

Direct impacts on historic properties classified as archeological sites can result from the actions of livestock, from the construction and use of range improvements, or from both sources. When considering archeological remains, grazing can affect archeological soils (that is, soils deposited or modified by a prehistoric or historic group or individuals during their use of the site area) and/or the archeological artifacts and materials within such deposits. Other cultural phenomena within the area of the San Carlos allotments that might be directly affected by grazing and grazing management include prehistorically used (scarred) trees, historic standing structures and features, and historic roads and trails.

Some soil types in the San Carlos allotments can be characterized as friable and easily eroded, with fragile plant covers. Thus, the cultural soils integral to archeological sites in these allotments are potentially vulnerable to loss by direct wear and erosion; this type of loss is accelerated in locations where cattle and other stock congregate. Livestock behaviors that contribute to soil wear and damage to artifacts and materials contained in archeological soils are mainly of three types: trampling, trailing and bedding. Trampling, especially in a confined area, will result in breakage, abrasion and other damage to artifacts within archeological soils. Also, these artifacts and materials may be displaced by trampling and the original provenience of the item will be lost. Trailing is a customary behavior of livestock; the animals will established habitually-used travel routes within their range, thus creating trails and associated soil wear. If the trails cross archeological sites, wear and loss of archeological soils is the inevitable result. Bedding at traditional locations also can wear away archeological soils if the beds are located on an archeological site.

Construction of grazing management-related improvements on archeological sites directly destroys archeological soils. Then, after establishment, the construction and use of vehicle roads for access to the improvement, and the creation and use by livestock of trails to and from the improvement will gradually wear away archeological soils. Range management improvements are also locations preferred by livestock for establishment of bedding areas. Areas near range management improvements (like stock ponds) become worn and trampled and thus archeological sites in the near vicinity are more vulnerable. The trampling and soil wear will be exacerbated and more damaging if the soil near the improvement is wet, which is the case for stock ponds, tanks, and improved springs.

Cattle and other stock rub against log cabin walls, corral posts, and other standing wood construction at mining camps, sawmills and other historic sites, thus hastening their deterioration. Livestock may use the interiors of abandoned cabins and the areas adjacent to standing walls common to some historic sites as bedding grounds. These activities might affect historic structures and the archeological deposits in their vicinity through the accretion of wear resulting from rubbing and erosion of foundations through congregation. Also, livestock rub against standing trees, and animals may seek shelter in thick groves of trees during storms; this may result in trampling of the soil in these protected areas. These types of activities may affect culturally scarred trees and the archeological soils in their vicinities.

Historic trails and roads are quite vulnerable to the activities of stock. In addition to direct wear, livestock use may accelerate the destruction of the original trail surface indirectly through channel erosion. Several historic travel routes including one historic wagon road (Newlin Creek Wagon Road) were recorded during the course of the sample inventory done for this analysis and are vulnerable to this effect.

If Alternative B (continuing current grazing management practices) was implemented without mitigation treatments, the direct effects would be a continuation of several grazing-related impacts as described above. The sample cultural site inventory conducted for the analysis of the San Carlos grazing allotments yielded fifteen historic properties with direct impacts. These impacts are affecting archeological soils at prehistoric sites, and the impacts have resulted from several livestock activities including trailing, trampling and bedding/congregating. Hence, continuing current grazing practices would result in a continuing and incremental loss of archeological information for some sites. In total, the current effects are characterized as “moderate”; most trampling and trailing are limited in area and depth, and to date these vectors have not affected archeological deposits to the extent that information loss is significant. However, the effects have been more severe at three sites where bedding is combined with trampling and/or trailing and stock ponds are present.

Alternative B would continue the present use of cow trails and continued trampling on the archeological sites where impacts from these sources has been recorded. Continuing the present use practices might lead to increased erosion from combined stock wear and water erosion, and continued breakage and displacement of materials. Unless treated, the losses from these sources might become both measurable and damaging in terms of their effects on archeological deposits and materials.

Indirect Effects

In general, indirect effects of maintaining current grazing practices include the persistence of thin vegetative covers and related incremental soil wear and erosion in some allotments; these factors may contribute to gradual loss of archeological soils and the displacement of the materials and artifacts therein. Livestock trailing creates conduits for surface runoff; these conduits result in the formation of drainage channels, which can cause soil erosion and can hasten the loss of archeological soils. Bare soil areas or areas with very sparse vegetation cover are susceptible to water and wind erosion and loss of archeological soils if the bare areas are on archeological sites. Such loss will be accelerated if livestock congregate in these locations.

Four archeological sites with these types of indirect effects were identified during the cultural resources sampling survey for the San Carlos allotments analysis; however, the total indirect effects are only slight in their measurable effects. Given the nature of these indirect effects, including their active condition, the potential for future indirect effects with the implementation of Alternative B will continue, and the total effects will be slight or moderate. The effects have the potential to become damaging in the context of significant information loss if mitigation treatments are not implemented on affected sites.

Cumulative Effects

Under current management practices, there is slight to moderate loss of archeological soils and materials, especially in allotment hot spots characterized by fair to poor range conditions. Any related management projects that affect range conditions will also affect the rate of loss of archeological soils and materials. If current management practices were to continue, there will be limited foreseen effects to archeological or historical sites resulting from cumulative effects.

Alternative C

Direct Effects

The direct effects of implementing Alternative C will be similar to Alternative B. Limited grazing in riparian areas, fewer grazing days and more rotations would improve range conditions and decrease erosion including potential soil loss on archeological sites. However, only slight positive effects would occur in comparison with the implementation of Alternative B. Damage to archeological soils caused by livestock trailing, trampling and bedding would continue, albeit at a lesser rate; therefore implementation of Alternative C would be more favorable to cultural resources management when compared to Alternative B. However, there would be more direct effects with the implementation of this alternative when compared with Alternative A.

Indirect Effects

The indirect effects on archeological and historical sites if Alternative C was implemented are greater than those resulting from Alternative A and similar to those predicted for Alternative B. Continued loss of archeological deposits through the indirect effects of water and wind erosion

on exposed soils in stock trails and where stock congregate is a concern with the implementation of either Alternative B or C. However, because this type of indirect damage is currently exhibited at only four archeological sites, the probability of future significant damage from indirect sources is low. Since such effects would cease to be a factor if Alternative A were implemented; this alternative is preferable to Alternative B.

Cumulative Effects

Cumulative effects of implementing Alternative C will be similar to those described for Alternative B.

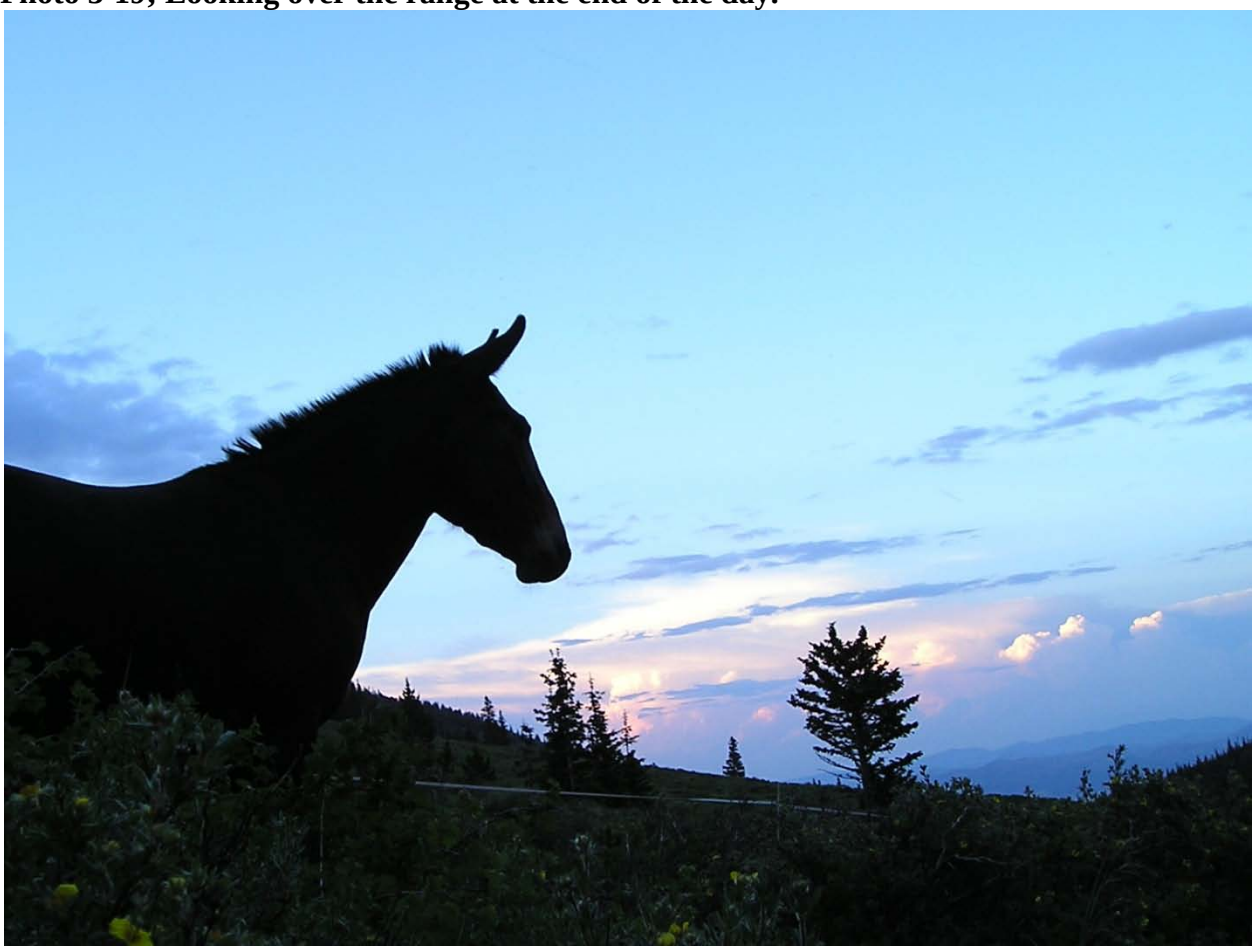



Photo 3-19; Looking over the range at the end of the day.