3.0 AFFECTED ENVIRONMENT, and EFFECTS

3.1 Introduction

This chapter addresses the existing condition and alternative effects for each resource. It explains why there is a need for these actions, and what the effects will be. The Interdisciplinary Team developed detailed existing and desired condition statements for each resource area. Those statements were developed for each allotment to provide specificity when describing conditions and needs. The differences between the existing and desired conditions are what reinforce the need for change. Because of the extensive length of those existing/desired condition statements, they are posted in Appendix 3 to this EA for reference.

This chapter will start with a general discussion of project area history and conditions. Then it will address each resource area of interest in turn. The summaries of the analysis work are contained in this chapter. The full discussion for each resource area is in the specialist report included in the Project Analysis File. The specialist reports for botany, financial analysis, fisheries, heritage resources, hydrology, range, recreation, soils, and wildlife are all incorporated by reference.

3.2 Affected Environment

Range Management History and Condition

Domestic livestock have grazed the Salida and Leadville project area since before the National Forest was established. In the early 1900's, 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 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. Fences were constructed 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.

Seven of the allotments in the SLPA were closed for varying periods of time to livestock grazing from 1936-1976 for the purpose of watershed and rangeland restoration. After allotments re-opened, many were re-designed to be run as multiple-pasture, rotational system where the same or very similar pasture sequences are followed every year. Current management systems vary from continuous, season-long management to rotational systems with up to 15 individual pastures.

Drought conditions existed over most of the project area from 2000-2005, and on portions of the SLPA in early 2006. Allotments in the project area were grazed at voluntarily reduced stocking levels (partial to full non-use for resource protection) from 2000-2007. Rangeland analysis and inventories were conducted on approximately half of the allotments within the project area during 2004, with data collected on the remainder of the allotments in 2005. 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.

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, mining, 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 12 individual open allotments on both the Salida and Leadville Ranger Districts. The 13th allotment, Fooses Creek C&H will be administratively closed. Of the total 277,463 acres within the analysis area, approximately one-half (155,494 acres or 56 percent) is considered capable 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. 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 to use all 277,463 acres within the project area, almost ½ of the acreage is not grazed by livestock due to steep slopes, rock outcrops, dense forests or other factors. See Appendix 5 for a more complete discussion of capable and suitable rangeland.

Arkansas C&H (Salida RD)

The Arkansas C&H allotment is located on the east side of Mount Shavano within the Sawatch Mountain Range. The allotment includes 10,167 acres of National Forest lands of which 7,221 acres are considered capable rangeland (71 percent). Slopes are gentle to rolling throughout the allotment. Forest types include aspen, ponderosa pine, Douglas-fir, and some lodgepole and spruce/fir at higher elevations. Grass and shrub communities are dominated by Arizona fescue, mountain mahogany and sagebrush. The allotment is permitted for 90 cattle (cow/calf) for a 120-day grazing season, from June 1 – September 30. Since 1965, the allotment has been run on a 4-pasture rotational system. In 1950, the allotment was temporarily closed due to poor watershed conditions and for range recovery. Records show that at that time, 204 pairs were run by several permittees for a grazing season of May 1 – October 31. Portions of the allotment were re-opened in 1955 and 1960. The grazing permit for this allotment was issued to a new permittee in 2000. During the recent drought, the allotment was stocked at 70 percent for 4 weeks in 2002, the allotment was rested in 2003, and the allotment was stocked at normal levels from 2004 to present.

The allotment is bordered by several sub-divisions and BLM lands on the east and south, and by Browns Creek on the north. Heavy recreation use occurs year-round. The Colorado Trail bisects the allotment from north to south. The trailhead located at Blank's Cabin is a popular recreation facility that recreationists use to access Mt Shavano, a 14,000 foot peak. In 2005, a new trailhead and parking lot was constructed ¼ mile away from Blank's Cabin site. A five-acre

enclosure was also constructed at the old site for rehabilitation of the area. In the past 8 years, mountain pine beetles have infested many of the ponderosa pines in the allotment as shown in the photograph below.

Photo 3.1 - Arkansas C&H, Lower Pasture, September 9, 2005 (T50N, R7E, Sec 23)

Photo 3.2 - Arkansas C&H Allotment, Lower Pasture. Increase in forage production following the opening of the forest canopy by mountain pine beetle infestation. October 6, 2004. (T50N, R7E, Sec23)

The Ranger District has been actively implementing timber management activities to salvage this

mortality throughout the allotment for the past 8 years. Prescribed burning is planned to occur in the next 3-5 years following the timber harvesting. The management activities have resulted in opening the forest canopy and improving forage production and range conditions. Better cattle distribution and utilization has resulted.

As a result of the beetle-kill trees, fence damage has occurred from wind thrown trees. The permittee has been active in maintaining these range improvements despite this set-back. Their efforts in riding and salting have improved distribution of the cattle in the past several seasons. Although water is available for the permitted numbers, it is limited to the drainages on the allotment. Through this analysis, both the permittee and Forest Service have identified several opportunities for development of water sources in the allotment. These developments would improve livestock distribution by creating water sources in the underutilized uplands and allow us to limit use in the drainages and riparian bottoms where livestock currently water. This will help reduce the need to clean existing stock ponds and will provide cleaner water to both cattle and wildlife. An undeveloped spring in the Blank's Cabin enclosure could provide several watering sites up to one mile away if developed.

In 2005 and 2007, the Forest Service installed two cattle guards on FDR 252 that accesses Blank's Cabin trailhead at the pasture fenceline. Prior to this, cattle were breaching the old cattle guards and gates were being left open. As a result of these new cattle guards, the ability to keep cattle in the proper pastures has greatly improved. See the allotment range improvement map in Appendix 1 for the location of all existing and proposed improvements. See Appendix 4 for a list of proposed improvements.

Arkansas S&G (Leadville RD)

The Arkansas S&G allotment is located on the Leadville Ranger District, north of Leadville, Colorado. The allotment includes 17,249 acres of National Forest lands of which 6,008 acres are considered capable rangeland (35 percent). Slopes are steep throughout the allotment. Forest types include aspen, lodgepole pine and spruce/fir. Riparian sites are sedge, willow and marsh marigold; basin sites are tufted hairgrass, oatgrass and sedge; and ridge sites are alpine avens, sedge, and cinquefoil. The allotment has been vacant since 1998. Prior to that time, the allotment was permitted for 940 sheep pair (ewe/lamb) for a 75-day grazing season, primarily from July 5 – September 20. Records show that in 1990, rangeland was in satisfactory condition. At the time the allotment was last grazed by domestic sheep, potential interaction between native bighorn sheep and domestic sheep had been identified. See the allotment map in Appendix 1 for a display of the existing improvements. There are no proposed improvements since this allotment will remain open and vacant.

Aspen Ridge C&H (Salida RD)

The Aspen Ridge C&H allotment is located on the east side of the Arkansas River between Salida and Buena Vista, Colorado. The allotment includes 16,366 acres of National Forest lands of which 14,470 acres are considered capable rangelands (88 percent). Slopes are gentle to rolling throughout the allotment. Forest types include aspen, ponderosa pine, Douglas-fir, and some lodgepole and spruce/fir at higher elevations. Grassland communities are dominated by Arizona fescue, mountain muhly, and Thurber fescue/Parry's oatgrass. The allotment is

permitted for 255 pairs for a 110-day grazing season from June 10 – September 30. The allotment is currently run by one permittee as a 7-pasture rest-rotational grazing system. Historically, this allotment was closed in 1936-1938 for range restoration. During the 1950's and 1960's, light restocking occurred. Use increased in the 1970's due to improved range conditions. Yearly stocking increases were made in 1981-1983 to graze the Coons Park pasture due to extra forage production during the wet years.

Cattle have historically concentrated their use and watering primarily in the riparian. Within some of the pastures, there are areas of bank instability, headcutting, hummocking and pedestaling. In 2002, permit non-compliance resulted in a 25 percent suspension for the 2003 and 2004 grazing seasons. Also, due to drought conditions, the permittee took partial non-use in 2003 and 2004. Since 2004, extra effort by the permittee to maintain improvements, install cattle guards, and ride and salt have resulted in permit compliance, better distribution of the cattle on the pastures, and better utilization of the upland forage. Although water is adequate for the permitted numbers, it is limited to the drainages on the allotment. Through this analysis, both the permittee and Forest Service have identified numerous opportunities for development of the existing water. These developments would improve livestock distribution by creating water sources in the underutilized uplands and aid us to limit use in the drainages and riparian bottoms where livestock currently water. This will help reduce the need to clean existing stock ponds and will provide cleaner water to both cattle and wildlife.

In the past 5 years, mountain pine beetles have attacked many of the ponderosa pines in the allotment. The local District is actively implementing timber management activities to salvage this mortality throughout the allotment. Several sales are planned for 2008 and 2009. Following these activities, prescribed burning is planned on the allotment in the next 3-5 years. These activities should result in opening the forest canopy, improving forage production and improving range conditions. Better cattle distribution and utilization would also result. Appendix 1 has a map showing the location of existing and proposed range improvements. Appendix 4 has a list of proposed improvements.

Bassam C&H (Salida RD)

The Bassam C&H allotment is located on the east side of the Arkansas River between Salida and Buena Vista, Colorado. The allotment is south of Highway 285 at Trout Creek Pass. The allotment includes 35,230 acres of National Forest land of which 28,745 acres are considered capable rangeland (82 percent). Slopes are gentle to rolling throughout the allotment. Forest types include aspen, ponderosa pine, and Douglas-fir. Grassland communities are dominated by Arizona fescue, mountain muhly, and Thurber fescue/Parry's oatgrass. The allotment is currently permitted for 270 cattle (cow/calf) for a 120-day grazing season from June 1 – October 31. Since 1992, the allotment has been run by one permittee as a 14-pasture, rest-rotation grazing system. Historically, this allotment was heavily stocked and portions of the allotment were closed from 1934-1942. The entire allotment was closed for range recovery due to poor watershed conditions in 1950. The Civilian Conservation Corps conducted extensive restoration work in the Trout Creek area during the 1930's and 1940's building thousands (50,000+) of log and rock check dams; planting ponderosa pine seedlings, shrubs, and willows; terracing, contouring, and smoothing gullies. Positive results of these conservation efforts can be seen today. Restocking of the allotment began in 1953. A rotational grazing system was established

in 1959. A rest-rotational system was implemented in 1968.

Photo 3.3 - Bassam Allotment, Kaufman Pasture, Cook's Spring. Conditions prior to development of water source and fencing. August, 2003.

Photo 3.4 - Bassam Allotment, Kaufman Pasture, Cook's Spring. Conditions after redevelopment of spring, piping water to an upland tank, and fencing out the water source. July 2007.

During the recent drought, the permittee stocked the allotment at reduced numbers for resource

protection from 2002-2006. Overall, the allotment is managed well. Fences are maintained, standards are met and the permittee is proactive in his management. Although water is available for the permitted numbers, it is limited to drainages and isolated springs on the allotment. Through this analysis, both the permittee and Forest Service have identified numerous opportunities for development of existing water sources. Water would be developed using a collection device/infiltrator and be piped out of drainages to tanks located in the uplands. This will help reduce the need to clean existing stock ponds, provide cleaner water to both cattle and wildlife, and improve cattle distribution over the allotment.

The permittee has been developing springs and water sources that can be piped to upland tanks. In 2006, a major watershed improvement project and spring development was completed by the permittee and the Forest Service in the Kaufman pasture. Historically, two undeveloped springs provided the only water source for the cattle in this pasture. Livestock and wildlife traveled through and watered in a boggy mesic meadow creating soil and vegetative disturbance. This watershed improvement project included developing one spring with infiltrators, shut-off valves and piping water ½ mile to a tank outside of the newly fenced riparian area. Willow cuttings were planted in the spring of 2007. Rehabilitation of the riparian has rapidly occurred and sufficient, clean water is now being provided on an upland site for livestock and wildlife from this spring. Appendix 1 has a map showing the location of existing and proposed range improvements. Appendix 4 has a list of proposed improvements.

Bear Creek C&H (Salida RD)

The Bear Creek allotment is located north of the Sangre de Cristo Wilderness Area near Simmons Peak. Bear Creek is the western boundary and BLM lands border the north and east portions of this allotment. The allotment includes 7,011 acres of National Forest lands of which 1,274 acres are considered capable rangelands (18 percent). Slopes are rolling to moderately steep throughout the allotment. Forest types include aspen, ponderosa pine, and Douglas-fir, with some lodgepole and spruce/fir at higher elevations. Grass and shrub communities are dominated by Arizona fescue/mountain muhly, Thurber fescue/Parry oatgrass, mountain mahogany, and oakbrush. Recreation use is moderate in the Bear Gulch area and hiking and mountain biking occurs on the Rainbow Trail that crosses through the allotment. The area is heavily used by elk and deer and thus a popular area for big game hunting. The allotment is permitted for 15 cattle (cow/calf) for a 60-day grazing season from July 1 – August 31, but has been granted a temporary permit for a total of 50 cow/calf pairs during this period for the last two seasons. Since 2004, the allotment has been run in conjunction with the adjacent BLM allotment. Administration has been a cooperative effort between the BLM and Forest Service.

Historically, the Bear Creek allotment was one pasture of the now-closed Poncha allotment. It is currently managed under deferred rotation with three pastures separated by drift fences and topography. The Poncha allotment was grazed by approximately 250 cow/calf pair from 1929-1944 for a season of May 1 – October 31. Reduction of numbers took place from 1944-1951. The allotment was temporarily closed at the end of the 1951 grazing season for resource concerns. The Bear Creek allotment was restocked in 1976 with 10 cow/calf pair. In 2000, the current permittee was authorized for 15 cow/calf pair, from July 1-August 31. Overall, the allotment is managed well. In the past 5 years, the permittee has cooperatively developed 4

springs to move livestock and wildlife watering out of the riparian area. Distribution of the cattle is managed by riding and salting. For a number of years the permittee has monitored using 'Land EKG' transects and photo points. Several new drift fences have been cooperatively constructed in the past 3 years with mountain bike "friendly" cattle guards installed on the Rainbow Trail.

In 2005, *Neoparrya lithophila,* Bill's Neoparrya, a Regional Forester sensitive species, was found as a result of a botanical survey on the eastern boundary of the allotment. Since little is known of the effects ungulate grazing may have on Bill's Neoparrya, a 5-acre exclosure was constructed in 2006 to protect part of this site. Part of the population was left outside the exclosure, and available for livestock grazing. Monitoring is ongoing to determine what effect livestock grazing may have, if any, on this species. Appendix 1 has a map showing the location of existing and proposed range improvements. Appendix 4 has a list of proposed improvements.

Browns Creek C&H (Salida RD)

The Browns Creek C&H allotment is located on the south and east sides of Mount Antero within the Sawatch Mountain Range. The allotment includes 13,265 acres of National Forest lands of which 6,618 acres are considered capable rangelands (50 percent). The allotment has three pastures.

Photo 3.5 - Browns Creek Allotment. Upper Pasture July 18, 2001. This shows the extent of the alpine zone within this pasture.

Photo 3.6 - Browns Creek Allotment. Lower Pasture. Typical vegetation type in the lower unit. February 13, 2002. Drought conditions.

Upper Browns pasture is located near and around Brown Lake in Little Browns Creek drainage; Lower Browns pasture is east of Brown's Lake in Little Browns Creek drainage, and the Fourmile pasture is on the ponderosa pine flats west of Mesa Antero subdivision. Slopes are gentle to rolling on the Fourmile pasture and much steeper in Upper Browns pasture. Forest types include aspen, ponderosa pine, and Douglas-fir, with lodgepole and spruce/fir at the higher elevations. Grass and shrub communities are dominated by Arizona fescue/mountain muhly, and mountain mahogany in the Fourmile and Lower Browns pastures. Sedges, tufted hairgrass, bluebunch wheatgrass, willows and cinquefoil dominate the upper Browns pasture. The allotment is permitted for 80 cattle for a 105-day grazing season, from June 16 - September 30. Portions of the allotment were rested for a period of years between 1949-1979. Since approximately 1985, the allotment has been run by 2 permittees with a total of 80 cow/calf pairs. From 2003-2006, the permittees took total non-use and partial non-use in 2007 for resource protection. Mesa Antero subdivision and other private lands border the eastern boundary of the allotment. Heavy recreation use occurs year round and the Colorado Trail bisects the allotment from north to south in the Fourmile Pasture. In the past 8 years, mountain pine beetles have infested many of the ponderosa pines in the Lower pasture of the allotment. The Salida District has actively implemented numerous timber management and prescribed burning projects within the Lower Pasture of the allotment. These activities have resulted in opening of the forest canopy and burning has improved forage production and range conditions in these areas. Better cattle distribution and utilization has resulted. Appendix 1 has a map showing the location of existing and proposed range improvements. Appendix 4 has a list of proposed improvements.

Cameron C&H (Salida RD)

The Cameron C & H allotment is located on the east side of the Arkansas River between Salida

and Buena Vista, Colorado. The allotment includes 64,295 acres of National Forest lands of which 26,742 acres are considered capable rangelands (42 percent). Slopes are gentle to rolling throughout the allotment. Forest types include aspen, ponderosa pine, and Douglas-fir. Grassland communities are dominated by Arizona fescue, mountain muhly, and Thurber fescue/Parry's oatgrass. The allotment is permitted for 291 pair for a 5-month grazing season, from June 1 – October 31. This allotment was heavily stocked prior to being acquired by the Forest Service in 1934. Reductions in numbers from 1043 cattle and horses to 416 cow/calves occurred from 1934-152. In 1989, the allotment was setup as a 15 pasture rest-rotation grazing system combining the Permittee's land with the Forest Service and run as an on/off permit. The rest rotational system is not currently functioning as designed. This is due to the lack of fencing, condition of old fence, and location of water tanks and stock ponds in drainages and bottom lands which are mainly on private.

Cattle have concentrated their use and watering primarily in the riparian areas. Within some pastures, there is bank instability, headcutting, hummocking and pedestals, and lack of willows. Due to drought conditions, the permittee took partial non-use in 2003 and 2004. Since 2004, extra effort by the permittee on improvements maintenance, installation of several cattle guards, riding, and salting has resulted in permit compliance, better distribution of the cattle on the pastures, and better utilization of upland forage. Although water is adequate for the permitted numbers, it is limited to the drainages on the allotment. Through this analysis, the permittee and Forest Service has identified numerous opportunities for better placement of existing water. This would include piping the water into upland tanks. This will help reduce the need to clean existing stock ponds, provide cleaner water to both cattle and wildlife, and improve cattle distribution over the allotment.

In the past 5 years, mountain pine beetles have attacked many of the ponderosa pines stands within the allotment. The Salida District is actively planning future timber management and prescribed burning activities to salvage this mortality throughout the allotment. Following the salvage activities, prescribed burning will occur on the allotment in the next 5-10 years. These activities will result in opening the forest canopy, improving forage production and improving range conditions. Better cattle distribution and utilization should also result. Appendix 1 has a map showing the location of existing and proposed range improvements. Appendix 4 has a list of proposed improvements.

Chalk Creek C&H (Salida RD)

The Chalk Creek allotment is located on the east side of Mount Antero within the Sawatch Mountain Range. The allotment includes 9,646 acres of National Forest lands of which 4,765 acres are considered capable rangelands (50 Percent). Slopes are gentle to rolling throughout the allotment. Forest types include aspen, ponderosa pine, and Douglas-fir. Grass and shrub communities are dominated by Arizona fescue/mountain muhly, blue grama, mountain mahogany rabbitbrush, and fringed sage. The allotment is permitted for 200 cattle for a 30-day grazing season from May 15-June 15. Mesa Antero subdivision and BLM lands make up the eastern boundary of the allotment and private lands are to the north at Chalk Creek. Heavy recreation use occurs year round. The Colorado Trail bisects the allotment from north to south. In the past 8 years, mountain pine beetles have attacked many of the ponderosa pines in the allotment. The local District has actively implemented timber management activities and

prescribed burning throughout.

Photo 3.7 - Chalk Creek allotment, just west of Forest Boundary along Forest Road 272. (T51N,R7E, NE ¼, Sec 12). October 6, 2004. Thinning of trees followed by prescribed fire.

These activities have resulted in opening of the forest canopy and the burning has improved forage production and range conditions. Better cattle distribution and utilization has resulted.

The permittee has been active in maintaining range improvements. The Permittee's efforts riding and salting, have improved distribution of the cattle. Season of use has historically been in the fall after frost when grasses have gone dormant. In the fall of 2006, the permittee took non-use and used the residual forage the following spring. In the spring of 2007, the season of use was changed to May 15- June 15. This change resulted is less pressure and utilization near the eastern boundary fence (private/BLM lands) which has been a problem spot. Appendix 1 has a map showing the location of existing and proposed range improvements. Appendix 4 has a list of proposed improvements.

Chubb Park C&H (Salida RD)

The Chubb Park C&H allotment is located on the north side of State Highway 285 near the summit of Trout Creek Pass. The allotment includes 9,480 acres of National Forest lands of which 8,343 acres are considered capable for grazing (88 percent). The capable range is primarily Arizona fescue/Mountain muhly under a ponderosa pine and mixed conifer forest. Slopes are rolling throughout the primary suitable range with steeper slopes on the western boundary of the allotment. The allotment is permitted for 33 cattle for a 150-day grazing season from June 1 – October 31. The current permittee leases surrounding Colorado State Land Board lands (3,640 acres) and private property for grazing in combination with this allotment.

In the past 8 years, mountain pine beetles have infested many of the ponderosa pines in the

allotment, especially on the east side of Chubb Park. As these beetle-killed trees fall, cattle movement is restricted and limits the utilization of the forage that has increased in these areas that have had the forest canopy opened to sunlight. The Salida District is actively implementing timber management activities with salvage timber sales that will be followed by prescribed burning throughout the allotment. This management area is included in the North Trout Creek Forest Health Vegetation Management Plan.

Photo 3.8 - Chubb Park. Looking south towards Highway 285. October 7, 2005 (T13S, R77W, Sec21) Colorado State lands in center of photo, Forest Service lands surrounding Chubb Park. Note beetle-killed pines.

During the recent drought, the permittee has taken non-use for resource protection for the past 5 years. Water sources are primarily located in the bottom lands of Chubb Park (State land) resulting in livestock concentration in the riparian areas on the State lands. In 2004, the permittee initiated a partnership with the Colorado State Land Board, Forest Service, Colorado Division of Wildlife, and Rocky Mountain Elk Foundation that jointly designed and funded a water system to provide water for both livestock and wildlife in order to implement a rotational grazing system that would draw use from bottom lands to underutilized uplands. The project included drilling a well and installing a 38,000 gallon storage tank with over 6 miles of pipeline feeding 7 stock tanks. In 2006 the permittee was given the Colorado State Land Board Landowner Award for his outstanding management of Chubb Park and in 2007 he received the "Excellence in Range Conservation Award" from the Society of Range Management. Appendix 1 has a map showing the location of existing and proposed range improvements. Appendix 4 has a list of proposed improvements.

Fooses Creek C&H (Salida RD)

The Fooses Creek C& H allotment is located on the south side of State Highway 50 west of Poncha Springs, Colorado within the Fooses Creek drainage. The allotment includes 9,653 acres

of National Forest lands of which 4,069 acres are considered capable for grazing (42 percent). The suitable range is primarily Arizona fescue/mountain muhly under lodgepole pine and spruce-fir forest. Slopes are steep and the primary suitable range is located within the drainage bottoms and under the existing power line corridor. The allotment has been vacant since 1999. At that time, it was permitted for 50 cow/calf pairs for a 60-day grazing season from July 1 – August 31. Current plans are to close the allotment. Appendix 1 has a map showing the location of existing range improvements.

Fourmile C&H (Salida RD)

The Fourmile C&H allotment is located on the north side of State Highway 285 east of Buena Vista, Colorado. The allotment includes 30,007 acres of National Forest lands of which 18,227 acres are considered capable for grazing (61 percent). The suitable range is primarily Arizona fescue/Mountain muhly, and blue grama under ponderosa pine and mixed conifer forest. Slopes are rolling throughout the capable range with steeper slopes on the northern boundary of the allotment. The allotment is permitted for 50 cow/calf pairs for a 3 ½ month grazing season from June 1 – September 15. The entire allotment was closed in 1949 for range recovery due to poor watershed conditions. The Civilian Conservation Corps restored the McGee Gulch and Shields Gulch drainages during the 1930s and 1940s by building hundreds of check dams and planting ponderosa pine seedlings and shrubs. Restocking of the allotment began in 1958. The current allotment boundaries and rotational system were established in 1983.

Photo 3.9 - Fourmile Allotment, west of Goddard Pass, Forest Road 311 (T13S, R78W, Sec 13 & 24). This view is within the Fourmile OHV Travel Management area.

The current permittee took non-use for resource protection in 1992-1994, 2000-2001, and 2003-2007. In the winter/spring of 2001/2002, the permittee grazed the allotment from November 15 to March 31 with his adjoining BLM permit. Although water is a limiting factor on the

allotment, winter use produced positive results. Adequate water exists within the allotment for the permitted numbers, but the location of the water is predominately in drainages. Several springs have been identified through this assessment for development. This will help decrease grazing pressure on the riparian areas and get better utilization of the uplands.

In the past 8 years, mountain pine beetles have infested many of the ponderosa pines in the allotment, especially near Goddard Pass, the Little Annie mine and in McGee Gulch. As these beetle-killed trees fall, cattle movement is restricted and limits the utilization of the forage that has increased in these areas that have had the forest canopy opened to sunlight. The Salida District is actively implementing timber management activities with salvage timber sales that will be followed by prescribed burning throughout the allotment. This is included in the North Trout Creek Forest Health Vegetation Management Plan. Recreation use is high throughout the allotment especially in the spring through fall seasons. Dispersed camping and motorized recreation use has resulted in conflicts with cattle use. Travel management efforts are being implemented to resolve many of these issues and are directed through the Fourmile Travel Management Plan. Appendix 1 has an allotment map showing existing and proposed range improvements. Appendix 4 has a list of the proposed improvements.

Little Cochetopa C&H (Salida RD)

The Little Cochetopa C&H allotment is located southwest of Poncha Springs, Colorado. It is bordered on the east by State Highway 285 to Poncha Pass, on the south by the Rio Grande National Forest, on the west by Marshall Pass and the Gunnison National Forest, and on the north by Pass Creek and BLM. The allotment is located in both Chaffee and Saguache Counties. The allotment includes 42,144 acres of National Forest lands of which 22,693 acres are considered capable for grazing (54 percent). A full range of forested communities exist on this allotment. At lower elevations, grasses include Arizona Fescue/mountain muhly, prairie junegrass, and squirreltail; shrubs include mountain mahogany, rabbitbrush, and sagebrush; riparian areas include, willows, sedges, tufted hairgrass and cottonwood; forest communities include aspen, ponderosa pine, mixed conifer of ponderosa pine and Douglas-fir, lodgepole pine, spruce-fir and alpine forest. Slopes are gentler at lower elevations, with steeper slopes throughout the majority of the units. This results in the majority of use being in the drainages.

The allotment is currently permitted for 99 pair for a 3 ½ month grazing season, primarily from June 16 – September 30. It is operated by two permittees on a 5-pasture rotation system. From 1948-1976, the allotment was temporarily closed due to poor watershed conditions. Records show that prior to 1948, 726 cattle were run on the allotment by several permittees for a grazing season of June 1 – October 31. One pasture was lightly restocked in 1976 with 24 pair. In 1982, an eight-pasture rest rotation system was designed to permit 80-100 cow/calf pair for a June 16-September 30 season. Fencing and topographic features are used to separate the pastures; however, these features are not proving to be totally effective in keeping cattle in assigned pastures. This requires frequent riding by the permittees to gather and move livestock. In the past 5 years, two cattle guards have been installed in Poncha Creek and on Marshall Pass road. The fenceline (July fence) between these cattle guards was reconstructed by the permittees. This has helped keep cattle off the Marshall Pass pasture, but some leakage is still occurring throughout the summer. Some of this is the result of recreationists leaving the gates next to the cattle guards open.

Photo 3.10 - June 26, 2003. Murphy's Hole – Little Cochetopa Allotment - drought conditions

Photo 3.11 - September 20, 2006 - Murphy's Hole, Little Cochetopa Allotment - post drought condition

Several subdivisions are in Silver and Little Cochetopa drainages. BLM land borders the northern portion of the allotment. Heavy recreation use occurs year round with dispersed camping in Silver and Poncha Creek drainages, outfitting and guiding use, and motorized ATV use.

O'Haver Lake is located in the center of the allotment and is a very popular and highly used campground. Conflicts with cattle in the campground have occurred in the last 8-10 years. In 2005, a Forest Service Youth Conservation Corps project installed a cattle guard and fenced the perimeter of this campground to exclude permitted livestock. Marshall Pass road, the historical railroad grade, is a very popular and scenic summer and winter (snowmobile) route from Poncha Springs to Sargents on the Gunnison National Forest.

In the past 8 years, mountain pine beetles have attacked many of the ponderosa pines in the allotment. The Salida District is actively implementing timber management activities to salvage this mortality throughout the allotment. Vegetation treatment projects are occurring and planned in the next several years around O'Haver Lake, in Silver Creek, Spruce Creek, Dry Lake, and Poncha Loop. Following these activities, prescribed burning is also planned to occur. These activities will result in opening of the forest canopy and improving forage production and range conditions. Better cattle distribution and utilization should result.

A power-line corridor bisects the Dry Lake pasture. Although good forage exists in this pasture, the availability of water limits utilization. Dry Lake, located on Colorado State lands provides some water for livestock and wildlife, but is not dependable for primary water. This was evident during the recent drought, as the lake dried up. The permittees cooperatively developed one spring and tank on this pasture and have identified several other opportunities for water developments. This pasture also provides important winter range for elk and deer. Appendix 1 has an allotment map showing existing and proposed range improvements. Appendix 4 has a list of the proposed improvements.

Union C&H (Leadville RD)

The Union C&H allotment is located on the east side of State Highway 24 south of Leadville, Colorado. The allotment includes 12,950 acres of National Forest lands of which 6,319 acres are considered capable for grazing (49 percent). Slopes are gentle to rolling at the lower elevations and much steeper on the Upper pasture. Forest types include aspen, lodgepole pine, and spruce/fir. Grass and shrub communities are dominated by Arizona fescue/mountain muhly and sagebrush at lower elevations and sedges, willows, cinquefoil, Thurber fescue, timber oatgrass and spike trisetum at higher elevations.

The allotment is permitted for 111 cow/calf pairs for a 3-month grazing season from July 10 – October 10. From 1934-1964, the allotment was grazed season-long by 292 cow/calf pairs belonging to several permittees. In 1964, a deferred rotation grazing system was set up. Records show that this system was not effective due to the lack of fences, water developments, poor salting and riding, and lack of cooperation by the permittee. Since 1982, the allotment has been operated by a single permittee.

Photo 3.12 - Union Allotment. Empire Gulch. Riparian areas on private land. (T10S, R79W, Sec 5) July 3, 2003. Drought year

Photo 3.13 - Union Allotment. Upper Pasture, Empire Lake. (T10S, R79W, Sec 9) June 2007. This photo shows some of the alpine ecotype that makes up much of this pasture.

A large portion of the allotment is privately owned, much by the permittee and by other owners of patented mining claims. Many of these in-holdings are not fenced and are being used for new summer homes. Within the middle portion of the allotment, a major subdivision (Beaver Lakes Estates) of year-round residences exists. Conflicts between the homeowners and the permittee exist over water rights, road access, and fencing, all of which affect the grazing management on this allotment. The allotment is also heavily used by elk, especially in the lower pastures during the winter months.

The permittee is working with the Colorado Division of Wildlife on conservation easements and fencing projects to minimize some of the wildlife/livestock issues on the allotment. During the grazing season, most of the concentrated livestock use occurs on the private lands in Empire Gulch. Since 2001, the permittee has constructed new fences between private land and National Forest, installed several gates and cross fences on National Forest lands, has made more efforts to implement the rotation. They are working with homeowners to settle their disputes.

Pockets of mountain pine beetle still exist in the lodgepole pine near the Beaver Lakes subdivision. Some isolated vegetation management activities of thinning, aspen regeneration cuts, and prescribed fire have occurred in the middle pasture of the allotment in the past 10 years. Appendix 1 has an allotment map showing existing and proposed range improvements. Appendix 4 has a list of the proposed improvements.

Table 3-1: Summary of Current Management for the Salida-Leadville Range Allotments.

Allotment	Permitted Number	Permitted HMs	Total Acres	Capable Acres **	Percent Capable	Season	Management
Arkansas C&H	90 c/c	361	10,167	7,221	71	6/1- 9/30	Deferred rotation
Arkansas S&G	(940 sheep)*	(2444)*	17,249	6,008	35	7/5 – 9/20	Vacant
Aspen Ridge C&H	255 c/c	886	16,366	14,470	88	6/10 - 9/30	Rest rotation
Bassam C&H	270 c/c	1157	35,230	28,745	82	6/1 - 10/31	Rest rotation
Bear Creek C&H	15 c/c	31	7,011	1,274	18	7/1 – 8/31	Deferred rotation
Browns Creek &H	80 c/c	282	13,265	6,618	50	6/16 – 9/30	Deferred rotation
Cameron C&H	291 c/c	1203	64,295	26,742	42	6/1 – 10/31	Rest rotation
Chalk Creek C&H	200 cows	204	9,646	4,765	49	9/30 – 10/30	One pasture
Chubb C&H	33 c/c	166	9,480	8,343	88	6/1 – 10/31	Rest rotation
Fooses C&H	(50 c/c)*	(103)*	9,653	4,069	42	7/1 – 8/31	Vacant
Fourmile C&H	50 c/c	178	30,007	18,227	61	6/1 – 9/15	Deferred rotation
Little Cochetopa C&H	99 c/c	353	42,144	22,693	54	6/16 – 9/30	Rest rotation
Union C&H	111 c/c	344	12,950	6,319	49	7/10 – 10/10	Deferred rotation
Totals active only	**1,494 c/c**	**5,160**	**277,463**	**155,494**	56		

***** Numbers in parentheses are those that were permitted for the allotment when it was last active, but are not included in the total active count.

** Capable acres are the potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity. Capability depends upon current resource conditions and site conditions such as climate, slope, landform, soils, and geology, as well as the application of management practices, such as silviculture or protection form fire, insects, and disease. Capable acres were determined through a GIS exercese including road, soil, stream, and slope data by following the Regional Desk Guide, Rangeland Suitability For Livestock Grazing, available on the R2 Rangeland Management website.

Range Improvements

Permittees are responsible for the maintenance of most range improvements on the allotments. Improvements for which the Forest Service or other governmental agencies currently have the maintenance responsibility include fences around administrative sites, fences creating riparian and range enclosures, and cattle guards.

Construction of new range improvements and the maintenance of existing improvements is an on-going effort on each allotment. In the past decade, many permittees have initiated innovative and creative changes on their allotments resulting in new water systems, changes is livestock distribution patterns, changes in season of use, and the development of partnerships. These efforts have minimized conflicts with other forest users, provided cleaner water for livestock and wildlife, utilized upland forage, and resulted in improvement to riparian resources. In addition, many permittees now have a desire to continue implementing additional range developments that have been jointly designed by them and the Forest Service in this analysis effort.

3.3 Rangeland Resources

Alternative A: No Action – No Livestock Grazing

Direct and Indirect Effects

Alternative A would eliminate permitted livestock grazing from National Forest lands in the SLPA. All term grazing permits would be cancelled. No new permits would be issued for any of the affected allotments. This could negatively impact local agricultural stability and lead to private lands, that are currently open space, being sold to developers. There would no longer be combined management of private and Forest Service lands and any influence to encourage positive private land management would be gone. There would be no direct effects to soils or vegetation from the cattle grazing and trailing that currently occurs on an annual basis. There would be no direct impact from livestock on streambanks in those areas accessible to cattle nor would there be any grazing of riparian shrubs (mainly willow) by cattle. Conflicts between livestock and other uses on the National Forest would not occur.

Most range improvements currently in existence on the allotments would be abandoned or removed as time and budgets allow. Subsequent decisions would need to be made regarding retention of any improvements (such as water developments) for other resource needs and funding would need to be secured for maintaining them. All fences, except Forest Service boundary fences or allotment boundary fences adjacent to other active grazing allotments would be abandoned or removed as time and budgets allow. Several term, private land grazing permits would be cancelled, as well as one on/off permit. If the lease/permit holders of the associated State of Colorado lands, or if private land owners desire to continue grazing the state or private lands, it may be necessary for them to fence the boundaries or to otherwise ensure their livestock did not trespass on National Forest System lands in areas where multiple ownersip lands were previously used together. Spring and other water developments (stock ponds, pits, tanks) would

no longer be maintained by permittees; the Forest Service would need to assume maintainance of the developments for wildlife benefit to retain the water rights or they would need to be removed.

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. This matting and accumulation of dead plant material 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 desireable habitat for a variety of plant and animal species. Alternative A would take away our ability to use livestock as a vegetation management tool to prevent this from occurring. Many invertebrate and wildlife species depend upon productive grasslands, especially for late fall, winter, and spring range.

The removal of cattle grazing would allow riparian areas that are not in desired condition to improve in ecological condition. Riparian species would likely increase in cover and frequency. Streambanks that are damaged would stabilize as riparian graminoids and shrubs 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.

Water would not be provided to wildlife in as many areas as it presently is provided. Wildlife distribution may become more concentrated in some areas because of reduced availability of water in the uplands. If water developments are removed, some springs could become mud holes from wildlife use where the water isn't collected and piped into a tank outside of moist soils. Use of these areas by big game would continue, though distribution may be altered with livestock removal.

In the absence of livestock grazing, loss of plant vigor and decreases in rangeland health over time combined with the accumulation of litter allows fine fuels to build up which increases susceptibility to fire.

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

<u>Alternative B: No Change-Livestock Grazing with Current Management.</u>

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 recreation/livestock conflicts or environmental challenges. In situations with water developments, many earthen stock tanks were placed in mesic meadow or riparian areas. Current livestock and wildlife distribution and annual pattern of use in some pastures is often characterized by congregation directly around or in the vicinity of these poorly located or poorly designed existing water developments. This scenario can have negative impacts on vegetation, soil, and hydrologic function and is not successful in achieving uniform utilization of the entire forage resource. The result is that in less productive years, livestock may end up heavily utilizing certain areas of a pasture, and in more productive years, the cattle may not be providing enough evenly distributed utilization to maintain healthy and vigorous vegetative communities throughout the capable rangelands in each allotment.

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 as needed 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 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 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.

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 (stimulating growth), and that individually grazed plants will be grazed fewer times during the growing season, providing opportunity for more vigorous plant 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 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 positive rating, which will maintain and increase plant vigor and health.

Alternative C has identified additional structural range improvements to be installed or constructed. 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 may be placed completely outside of areas with potential for riparian vegetation. Many stock ponds and pits may be reconstructed as water holding facilities from

which water would be piped to tanks located in the uplands 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. Greater weight gains are expected and have been documented by cattle drinking from clean water sources. "Willms et al. showed yearling steer performance increased 23% when supplied with an alternate water source rather than watering in a dugout." (Surber et al)

In situations where allotment fences are constructed or re-constructed, they may be replaced with permanent or let down wire fences, or a pole fence to minimize maintenance needs over the life of the improvement. Additional soil disturbance will 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 may be a barrier (temporary or permanent) to some wildlife species movement if not installed to minimize or prevent this. Permittees may 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 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 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 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. 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 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.

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.

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.

> "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. The following is an example of how this process may potentially take place. In the Aspen Ridge Pasture of the Aspen Ridge allotment, there is a riparian area know as Calf Gulch. Dirt stock ponds dug into the riparian area are responsible for concentrating livestock use and do not encourage distribution into the adjoining uplands. A combination of the current concentrated livestock use, wildlife use, and illegal mud-bogging by recreationists has led to areas along Calf Gulch that do not meet desired conditions. The first step to correcting this issue is to develop a source of water in Calf Gulch and pipe it to a tank in the nearby uplands. This creates an opportunity for livestock and wildlife to have a clean source of water on dry level ground; providing improved footing, reduced physical effort and instability, increased visibility and security and a preferred water temperature (McIver, 2004). Establishing a preferred source of water out of the riparian should attract livestock to the uplands, improve distribution, and eliminate concentrated use areas in the riparian. Combining salting and riding with this water improvement should increase effectiveness. If this scenario solves the issue and monitoring shows that concern areas begin moving toward desired condition, we can stop the improvement implementation process for this pasture. If this is not the case we can take another step and select another option from the management toolbox like combining temporary electric fence with the water improvement, salting, and riding. Once again if we are not successful we may result to permanent fence to reach desired riparian utilization. Any one, or any combination of several, of the items in the management toolbox may be the answer for reaching desired condition.

Cumulative Effects Common to All Allotments

Population growth in and around the project area has lead 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.

Photo 3.14 - Recreation and cattle use in the Poncha Creek drainage, August 2007. (SW1/4 Sec.12, T48N, R7E)

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. Comparing aerial photos from the 1950s to now shows that the extent of non-forested rangeland in the project area has 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. The vegetation is not as healthy or vigorous as it could be.

High numbers of big game animals, especially elk, 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.

These particular actions may have a negative effect on the integrity of rangeland and riparian ecosystems despite the overall positive presence of grazing livestock.

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 watershed. 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 wildlife use 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. 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 projects and prescribed fires are planned for the watersheds within the SLPA. 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

If 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 SLPA of the South Fork South Platte River and Arkansas River basins.

3.4 Wildlife

The biological evaluation (BE) / biological assessment (BA) analyzes the potential effects of the proposed Salida and Leadville Range Allotment Management Plan on the San Isabel National Forest (Forest) on federally listed threatened, endangered, candidate/proposed 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 sensitive species, as identified by the Region 2 Regional Forester (U.S. Forest Service 2005a) will also be assessed as required in the FS Manual (FSM 2670.31-2670.32). These are proposed to occur on the Salida and Leadville Ranger Districts (Districts). Species meeting the following criteria are addressed in this assessment:

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

The following sections from the Wildlife BE/BA only address those species where an adverse affect determination has been made. The whole Wildlife BE/BA is incorporated by reference, but need not be displayed here if the determination of effect is limited to Beneficial Impact (BI), No Impact (NI), No Effect (NE), May Adversely Impact Individuals (MAII) or Not Likely to Adversely Affect (NLAA).

This Biological Evaluation/Assessment and findings are based on the best current data and scientific information available. A revised Biological Evaluation/Assessment must be prepared if: (1) new information reveals affects, which may impact threatened, endangered, and proposed species or their habitats in a manner or to an extent not considered in this assessment; (2) the proposed action is subsequently modified in a manner that causes an affect, which was not considered in this assessment; or (3) a new species is listed or habitat identified, which may be affected by the action.

Informal consultation for the Proposed Action began with a meeting on October 14, 2005 between Leslie Ellwood (FWS Biologist) and Mike Wrigley (FS Biologist). Subsequently, several subsequent telephone conversations, meetings, and field visits with Ms. Ellwood occurred to discuss this project and the effects from grazing on federally listed and proposed species, specifically from the Proposed Action (Alternative C). A BE/BA (dated November 28, 2006) was submitted to the FWS in December 2006 for their review.

Since that time, additional modifications to the previous Proposed Action, design criteria (Appendix 1), changes in the federal species addressed, and the addition of numerous range developments have been added to the Proposed Action (Alternative C), resulting in the need for this revised BE/BA and reinitiation of section 7 consultation under ESA.

3.4.1 - T.E.S. SPECIES EFFECT DETERMINATIONS SUMMARY

For the species addressed in this assessment, the direct and indirect effects, effects from interdependent and interrelated activities, and cumulative effects of the proposed action have been added to the environmental baseline for each species as stated previously. The following table summarizes the effect determinations for each alternative and species evaluated. The rationale for the determinations is discussed in the following sections. No proposed or designated critical habitat is present within the Analysis Area nor will it be affected.

Table 3-2. Effect determinations for each wildlife species addressed in this assessment

[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)
INVERTEBRATES					
Hudsonian emerald dragonfly	*Somatochlora hudsonica*	S	BI	MAII	**MAII**
Uncompahgre fritillary butterfly	*Boloria acrocnema*	E	NLAA-B	LAA	**NLAA**
AMPHIBIANS					
Boreal toad	*Bufo boreas boreas*	S	BI	LRLV	**MAII**
Northern leopard frog	*Rana pipiens*	S	BI	MAII	**MAII**
BIRDS					
Bald eagle	*Haliaeetus leucocephalus*	S	BI	MAII	**MAII**
Black swift	*Cypseloides niger*	S	BI	MAII	**MAII**

Species Name	Scientific Name	Status Code[1]	Determinations of Effect [2]		
			Alternative A	Alternative B	Alternative C (Proposed Action)
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**
Gunnison sage-grouse	*Centrocercus minimus*	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**
Peregrine falcon	*Falco peregrinus anatum*	S	BI	MAII	**MAII**
Purple martin	*Progne subis*	S	BI	MAII	**MAII**
Three-toed woodpecker	*Picoides dorsalis*	S	BI	MAII	**MAII**
White-tailed ptarmigan	*Lagopus leucurus*	S	BI	MAII	**MAII**
Mammals					
American marten	*Martes americana*	S	BI	MAII	**MAII**
Canada lynx	*Lynx canadensis*	T	NLAA-B	LAA	**NLAA**
Common hog-nosed skunk	*Conepatus leuconotus*	S	BI	MAII	**MAII**
Fringed myotis	*Myotis thysanodes*	S	BI	MAII	**MAII**
Gunnison's prairie dog	*Cynomys gunnisoni*	C S	NLJCE MAII	NLJCE MAII	**NLJCE** **MAII**
North American wolverine	*Gulo gulo*	S	BI	MAII	**MAII**
Pygmy shrew	*Sorex hoyi*	S	BI	MAII	**MAII**
Rocky Mnt. Bighorn Sheep	*Ovis canadensis canadensis*	S	BI	MAII	**MAII**
Townsend's big-eared bat	*Plecotus townsendii*	S	BI	MAII	**MAII**

MITIGATION

Mitigation measures are not necessary for the species addressed in this assessment. Measures needed to minimize effects to these species and their habitats have been incorporated into the Proposed Action (Alternative C) as design criteria, and in the Monitoring Plan and Implementation Plan, which would be used to achieve the desired condition for these species and their habitats.

FIELD INVENTORIES

The Analysis Area is defined at different scales for the species addressed in this assessment. This area has been analyzed to determine physical and biological characteristics including dominant vegetation types, topography, administrative boundaries, and watershed boundaries. These characteristics and others were validated through field visits by Mike Wrigley (FS Wildlife Biologist) and Matt Comer (FS Wildlife Biologist) from 2004 through 2007. Project specific wildlife surveys were not conducted for species addressed in this assessment specifically for this analysis within any of the allotments; however, under the Proposed Action (Alternative C) protocol boreal toad surveys and UFB surveys would be completed. This assessment assumes these surveys will be completed and the appropriate design criteria implemented in the effect analysis for that alternative. However, both site and species specific surveys have been conducted in some areas within the Analysis Area, in conjunction with other project level work, or other purposes for some species. Many of these species have been documented within the Analysis Area (District Files, CNHP, and Breeding Bird Atlas [Kingery 1998]). However, only limited field surveys or inventories have been conducted within the Analysis Area for many of the species addressed in this assessment, therefore presence is assumed within their suitable habitats until adequate surveys are completed.

Summary of General Effects of Grazing

This section is a summary of the BE/BA discussion of some of the more important general impacts from livestock grazing has on wildlife, their habitats, and ecological processes.

- Removal of vegetative cover (e.g., plants – grasses, forbs, shrubs and trees), can directly negatively affect habitat structure and prey availability, and quality of wildlife habitats.
- Livestock grazing can adversely affect ecological systems including wildlife habitat composition, function, and structure by: 1) altering species composition of communities (decreases in density and biomass, reduction of species richness, and changing community organization); 2) disrupting ecosystem (habitat) functioning (interference in nutrient cycling and ecological succession, reducing soil stability, disrupting willow and cottonwood communities); and 3) altering ecosystem (habitat) structure (changing vegetation stratification, contributing to soil erosion, and decreasing availability of water to biotic communities).
- Livestock can influence species' habitat by modifying: 1) plant biomass; 2) structural components such as plant height and cover; and 3) plant species composition among others. As a result, livestock grazing under this alternative could cause changes in habitat that alter species abundances and composition in avian, other wildlife, or their prey depending on the grazing pressure/utilization. Changes in plant composition to an increase in less palatable species, reduction of species that are palatable, and change in vegetative structure. The degree to which grazing affects habitat, depends on several factors including: 1) number of animals grazing in an area; 2) the time of grazing; and 3) grazing system used.
- Some wildlife species can benefit from vegetation changes and amount of bare ground caused by livestock grazing while others are adversely impacted.

- Indirect or delayed effects include altered species composition (grasses, forbs, shrubs, and trees), reduced vigor of plants, increased trampling of soils, increased bare soil, a decline in infiltration rates, and accelerated soil erosion among others, adversely affecting species/habitats.
- Changes in species composition and habitat type lead to many detrimental effects to the species addressed directly, indirectly, and cumulatively, including: 1) a reduction in biodiversity; 2) population reductions; 3) reduced carrying capacity for wildlife and livestock; 4) reduced habitat quality for many wildlife species; and 5) increasing susceptibility of the land to invasion by non-native species.
- Grazing can indirectly affect forest habitats/species by influencing forest density and fire regimes.
- Grazing can contribute to substantial short-term (one year or less), long-term (multiple years), and permanent changes such as vegetation composition shifts to non-native or undesirable species, down cutting or erosion of streams, and changes/lowering of the water table.
- Precipitation levels, grazing intensity, livestock numbers, timing, and duration are all important factors in how grazing affects wildlife habitats.
- Timing of grazing has differential impacts on species' habitat: spring grazing generally has fewer impacts on riparian hardwoods (e.g., willows) with increased utilization of shrubs and trees in the late summer/fall, thus adversely impacting these habitats more. Livestock use is less concentrated in riparian areas in the spring, and increases as the summer proceeds – resulting in increased impacts to species' habitats. Hot summer is generally considered most injurious to riparian zones (habitats).
- Livestock grazing can negatively affect four general components of riparian systems and wildlife habitats: 1) streamside vegetation; 2) stream channel morphology; 3) shape and quality of water column; and 4) structure of streambank soil. Negative impacts include changing, reducing, or eliminating vegetation, degraded water quality, increased water temperatures from reduced streambank cover, and impacting riparian zones through channel widening, channel aggrading, or lowering of the water table. In addition, changes in plant species composition, reduced structural complexity, reduced understory, and replacement native species with nonnative species. *Salix* (willow) in riparian ecosystems and other riparian hardwoods can be reduced or eliminated – particularly regeneration. Each of these adversely impacts species' habitats.
- Riparian habitats are the most limited habitat present within these allotments (3% of total), but current livestock use is concentrated in riparian habitats and has led to degraded habitat conditions in many areas. These habitats are overall the most habitat type for the species assessed, used directly and/or indirectly (e.g., prey) as primary and/or secondary habitats by each of these species.
- Livestock show a strong preference and use of riparian areas compared to uplands and other habitats, particularly where water is limited. Other factors include shade, topography, seasonality, and forage availability affect preference in these areas.
- Preferences within herds and within breeds (certain individual animals) can affect use and distribution.
- Grazing can cause a 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 invade the riparian zone which adversely affects habitats.

- Degraded riparian zones would generally improve under the Proposed Action, through the use of monitoring and adaptive management options by encouraging livestock use outside of riparian concentration areas to upland areas that are currently not used or used very little, compared to Alternative B, but not as much as Alternative A.
- Concentrated livestock use in riparian zones may cause or accelerate the development of hummocks or pedestals which may change hydraulic function, patterns, and thus vegetation species composition and structure within riparian habitats. Degraded water quality from increased fecal contamination and increased sedimentation can occur from concentrated use in riparian areas which degrades habitats.
- Reduced litter cover from grazing causes faster overland flow of water, decreased infiltration rates, less nutrient and organic matter for soils, less cover for wildlife species and nesting habitat for many species dependant on litter.
- Elimination or a reduction of riparian vegetation has negative impacts on many birds/habitats. Mushroom-shaped shrubs and trees that are widely spaced shrubs/trees reduce cover and habitat values.
- Grazing can adversely impact riparian bird species willow habitats, birds nesting on the ground/low cup, and various foraging habitats. Adverse impacts to ground nesting birds and small mammals whose young depend on succulent herbaceous material for food and cover may be impacted directly or if they are prey species for other species.
- Grazing during the spring and early summer can also directly decrease the reproductive success of some breeding birds and other wildlife through destruction or disturbance of nests or dens on the ground or in low shrubs. Grazing during other seasons can indirectly affect bird and other wildlife species through habitat changes. High grazing intensity (high stocking rates and/or utilization levels) and grazing during the critical breeding season are perhaps the most significant management practices that alter avian habitats in riparian and upland habitats.
- The density and diversity of small mammals can be reduced by grazing – depending on the magnitude of livestock use. Impacts from grazing can decrease avian reproductive success, lower food availability, increase predation on nests and adults, lower avian density and species diversity, and cause shifts in foraging techniques, distribution, and habitat use.
- Water developments tend to congregate cattle and can lead to compaction, loss of ground cover, pedestaling, trampled banks, etc. In addition, each development controls the flow of the water, the amount of water stored, and the disposition of the unconsumed portion.
- Under the Proposed Action, there is a potential for 120 newly developed/redeveloped watering sites. The proposed development of springs are intended to better distribute livestock to the uplands, away from riparian areas, improving water relations and allowing quicker recovery of impacted riparian areas and reducing concentrated use and impacts to these habitats. .
- New, stock water improvement does not necessarily translate into improved range conditions. For example, Aspen Ridge has 56 existing, stock water developments of which many are in the riparian area; a significant portion of that riparian is not at desired conditions (Hydrologist Report).

- Water development impacts riparian areas and seeps and springs in many ways, but primarily through altering water relations and reducing the extent, intensity, or duration of wetted soils. In addition, downstream impacts of dewatering seeps, springs, and creeks can result in a reduction in the physical, suitable habitat available for many aquatic organisms from a lowering of water volume. Alterations in water chemistry and water temperatures also can occur with reduced water volume in streams. These can adversely impact wildlife species and their habitats. However, the potential loss in wildlife/aquatic habitat would likely be small relative to the benefit gained through better distribution of livestock across allotments and specifically, out of riparian areas (Proposed Action).
- Existing and new livestock water developments can benefit bird communities because they provide water for drinking and bathing and emerging insects to feed upon if constructed and placed properly. However, they may also have negative affects (including mortality) on birds and bats, for example, if they are not.
- Alternative C (Proposed Action) includes 11 new permanent fences and relocation of FSR 181 out of a riparian corridor
- Livestock can act as substantial vectors for seeds for invasive/noxious weeds, disturb the soil, and reduce composition and reproductive capability of native species and increase the likelihood of spread of invasive and noxious weed which can substantially impact species habitats (e.g., fire ecology, habitat structure and composition, etc.). Exotic weeds have been able to displace native species in part because native grasses are less able to compete with some invasives under certain conditions. Populations of native species have been depleted by livestock, allowing more grazing-tolerant weedy species to invade which has resulted in species composition shifts and adversely affected wildlife habitats and reducing biodiversity.
- Nest parasitism (cowbirds) may increase with livestock grazing, directly adversely many bird species and indirectly predators that prey on these species.

Discontinuing livestock grazing under Alternative A would allow for recovery of degraded habitats where they exist in these allotments. High concentrated use areas would no longer receive repetitive use by cattle thereby eliminating additional compaction, trampling, and hoof shearing. Water quality and riparian health would start to improve as degraded areas recover from the effects of livestock grazing.

Under each of the Action Alternatives (B and C), livestock grazing in general could contribute to substantial short-term (one year or less), long-term (multiple years), and permanent changes such as vegetation composition shifts to non-native or undesirable species, down-cutting or erosion of streams, and changes/lowering of the water table. These impacts and others discussed in this assessment indirectly, directly, and cumulatively affect the species addressed below. This is especially true under Alternative B (Current Management). However, the Proposed Action, through effective and timely monitoring and the implementation of appropriate adaptive management options that are implemented using the design criteria could facilitate riparian and other habitats recovery and improved conditions overtime where possible. Thus, the Proposed Action would have substantially less impacts compared to Alternative B, although these impacts would not be eliminated. Under Alternative A (No Grazing), the lack of grazing would allow degraded habitat conditions to improve and recover (where possible) more fully and at a higher rate than the Action Alternatives. Each of these factors would contribute to increased and/or

improved habitat conditions for these species, compared to the baseline condition.

Uncompahgre Fritillary Butterfly (UFB)

Even though this species occurs at the upper elevational limits that livestock grazing occurs, limited livestock use has been documented and the possibility exists that potential effects may occur from these activities; therefore, this species is addressed here in this assessment. UFB have not been confirmed within the Analysis Area; however, a purported sighting was made in the Little Cochetopa Allotment in the 1980s (District Files). Other large areas of suitable habitat (alpine areas) within the Sawatch Range (containing some of the allotments in this analysis) consisting of their primary habitat have in some cases been surveyed to varying intensities, while others have not. Limited surveys have been conducted by the FWS and others in some of the areas within suitable habitat, although not all areas have been surveyed (District Files).

Alternative A (No Grazing) – Uncompahgre Fritillary Butterfly

Direct, Indirect, and Cumulative Effects
A large, well-developed understory of snow willow is critical for the UFB, since females deposit their eggs on snow willow, and the larvae feed on it exclusively. There would be no removal or trampling of snow willow by livestock grazing under this alternative resulting in no effects to this species. Species composition, the number of species in the understory including snow willow, and the volume of the understory would remain unchanged or improve. The abundance, composition, and richness of this species' habitat would remain unchanged or improve. The presence and abundance of a dense cover of snow willow, necessary for UFB would remain or increase. No new range developments (fences, salt, and water sources) would be placed in alpine habitats to encourage livestock use that could degrade these areas, as would under Alternative C. Existing habitat conditions would not be deteriorated from the lack of livestock grazing, and degraded habitats would likely improve where possible. The exclusion of livestock grazing in general from these areas can have substantial short-term (one year or less), long-term (multiple years), and permanent improvements such as vegetation species composition shifts back to more native species if possible, increased cover, and structural diversity. These changes in vegetative communities from the lack of livestock grazing indirectly, directly, and cumulatively would benefit this species.

This alternative would not add to the cumulative effects to this species. Other non-federal, future reasonably certain to occur state, private, and other activities include mining, livestock grazing, fire suppression, road construction and maintenance, motorized and non-motorized recreation, and water developments.

Determination for Uncompahgre Fritillary Butterfly – Alternative A (No Grazing)
Based on the above rationale, this alternative would have wholly beneficial effects to this species; therefore, it "may affect, not likely to adversely affect" the Uncompahgre fritillary butterfly.

Alternative B (Current Management)

Direct, Indirect, and Cumulative Effects

This alternative would have no design criteria to minimize adverse affects, as opposed to the Proposed Action. As stated previously, livestock use in alpine habitats are limited. These areas are extremely fragile and the potential of substantial adverse effects to their habitat are great. As discussed above, livestock influence wildlife habitat by modifying: 1) plant biomass; 2) structural components such as plant height and cover; and 3) plant species composition (Kie and Loft 1990). As a result, livestock grazing can cause changes in habitat that alter species abundances and composition in wildlife communities (Block and Finch 1997). Under this alternative, current management has, and would continue to allow livestock grazing to alter some plant communities, both directly and indirectly, lengthen the recovery time and/or prohibit recovery in some areas. Primarily where use is/has been concentrated, livestock would continue to browse grasses, forbs, and woody species, trample them, decrease seed sources, and cause soil compaction, among other impacts in varying degrees and intensities. This could result in a continued degraded habitat condition for this species. Livestock grazing may also reduce plant density, structural complexity (particularly low horizontal and vertical vegetative cover), biomass, vigor, and regeneration. This could alter the relative composition and structure of grass, forbs, and woody species. As a result, adverse impacts could occur to this species and habitats. The time of year these areas are grazed can also have varying impacts to these habitats – affecting the intensity and area of impact, depending upon the season of use by livestock.

Large, well-developed understory of snow willow is critical for the UFB as mentioned above because females deposit their eggs on, and larvae feed on snow willows exclusively. This plant is critical for the development and survival of the UFB for their two-year development – from egg, to larvae, into adult. Removal or trampling of snow willow by livestock grazing could have substantial adverse effects to this species. Livestock grazing could alter vegetative species composition, structure, reduce the number of species, and decrease the volume of the understory snow willow and herbaceous species. Changes in the abundance, composition, and richness of this species' habitat could likely occur in grazed areas. Such changes may involve a decrease in abundance or the disappearance of a dense cover of snow willow. As a result, suitable habitats could be substantially degraded and adversely affected. No new range developments (fences, salt, and water sources) would be placed in alpine habitats to encourage livestock use that could degrade these areas, as would occur under Alternative C.

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

This alternative would add to the cumulative effects of other activities. Other non-federal, future reasonably certain to occur state, private, and other activities include mining, livestock grazing, fire suppression, road construction and maintenance, motorized and non-motorized recreation, and water developments. Those activities have, and would continue to negatively affect populations (if they are present) and habitats by removal, fragmentation, disturbance both temporally and spatially.

Determination for Uncompahgre Fritillary Butterfly – Alternative B (Current Management)
Based on the above rationale, this alternative "may affect, likely to adversely affect" the Uncompahgre fritillary butterfly.

Alternative C (Proposed Action)

Direct, Indirect, and Cumulative Effects
Large, well-developed understory of snow willow is critical for the UFB since females deposit their eggs on them and the larvae feed on them exclusively. This plant is critical for the development and survival of the UFB for their two-year development – from egg, to larvae, into an adult. Removal or trampling of snow willow by livestock grazing could have substantial adverse effects to this species. Livestock grazing if it were to occur in these habitats could alter vegetative species composition, reduce the number of herbaceous species in the understory, reduce the amount of snow willow, and decrease the volume of the understory. Changes in the abundance, composition, and richness of this species' habitat could likely occur in grazed areas. Such changes may involve a decrease in abundance or the disappearance of a dense cover of snow willow, needed by UFB. The time of year these areas are grazed can also have varying impacts to these habitats – affecting the intensity and area of impact, depending upon the season of use by livestock.

The following is a summary of the rational presented above used to support the below effect determination for UFB under this alternative.

- Livestock use in alpine habitats (UFB habitat) is limited, but it has and is likely to occur in the future, at least to some degree. These areas are extremely fragile and the potential of substantial adverse effects to their habitat from livestock grazing is great.
- Large, well-developed understory of snow willow is critical for the UFB since females deposit their eggs on them and the larvae feed on them exclusively. This plant is critical for the development and survival of the UFB – from egg, to larvae, into an adult. Any removal or trampling of snow willow by livestock grazing could have substantial adverse effects to this species. Livestock grazing if it were to occur in these habitats could alter vegetative species composition, reduce the number of herbaceous species in the understory including snow willow, and decrease the volume of the understory. Changes in the abundance, composition, and richness of this species' habitat could likely occur in grazed areas. Such changes may involve a decrease in abundance or the disappearance of a dense cover of snow willow, which is necessary for UFB.
- The time of year these areas are grazed can also have varying impacts to these habitats – affecting the intensity and area of impact, depending upon the season of use by livestock.
- To reduce the potential impacts of additional concentrated livestock use in snow willow habitats, salting and water developments would not be placed in these areas. Utilization of snow willow would be limited (no more than 20%).
- Any new ground disturbance activities in potential UFB habitat would be surveyed prior to occurring.
- Under this Proposed Action, the above design criteria for the UFB and those applicable to all allotments/habitat types (Appendix 1) would likely ensure that the desired conditions

(Appendix 2) would be achieved through effective and timely monitoring the Implementation Plan and Monitoring Plan (Appendices 4 and 3).

- Some effects from the potential placement and use of range developments (e.g., fences, salting, water sources) would occur in alpine areas, causing livestock use and potential direct and indirect habitat degradation of secondary habitats where it currently is not occurring; however, use would not be encouraged within snow willow (primary habitats).
- Adverse impacts from grazing, in combination with cumulative effects of other current and future activities include direct and indirect mortality, fragmentation of habitats, and habitat degradation from: recreation activities (camping, hiking, OHV/vehicles, etc.), roads, vegetation treatments, mining, etc.

Determination for Uncompahgre Fritillary Butterfly – Alternative C (Proposed Action)
Based on the above rationale, this alternative "may affect, but not likely to adversely affect" the Uncompahgre fritillary butterfly.

Mexican Spotted Owl (MSO)

Protocol surveys have been completed in suitable habitats within portions of the Cameron, Bassam, and Fourmile allotments in 1995 and 1996, no MSO were located. There was an unconfirmed report from a non-Forest Service individual (a former wildlife biologist with experience surveying for MSO) of a four-note hoot possibly from a MSO within the Cameron Allotment in 2005. Limited non-protocol surveys of this area did not locate any MSOs in 2006. The closest known MSO site is on the BLM lands, approximately 43 miles to the east of this potential detection. The last time owls were documented at this BLM site was in 2000. Eleven documented MSO sites, and nine sites on the Pike NF are located approximately 40-75 miles to the east and southeast in the Front Range Region in Colorado. No proposed or designated critical habitat is within the SLPA, nor would any be affected by the alternatives considered here.

No Protected Activity Centers (PACs) are located within the SLPA – the closest is approximately 40 miles to the east and southeast on the Pike and San Isabel NF and BLM lands. Potential nesting roosting, foraging, dispersal habitat, and replacement owl habitat (Protected Habitat and Restricted Habitat) are present within portions of the allotments within the Analysis Area. In addition, Target Restricted Habitat has been identified by the Forest Service in coordination with the FWS in the Fourmile, Bassam, Aspen Ridge, and Cameron allotments.

Alternative A (No Grazing) – Mexican Spotted Owl

Direct, Indirect, and Cumulative Effects
With the exclusion of grazing, prey species abundance, composition, and distribution would likely increase or improve above current levels due to improved habitat conditions for these species that would ultimately benefit MSO. There would be no change in nesting habitat conditions. Cover and prey habitat necessary for movement of MSO would likely improve from the lack of grazing by cattle due to greater grass, forb, shrub, and tree cover and recruitment. The lack of grazing in of itself would not increase the density of seedling and smaller trees, or change the presence of light ground fuels such as grasses and forbs that contribute to dense overstocking of ladder fuels. However, due to the degraded and unnaturally high fuel loading

conditions currently present within many of these allotments, existing dense understories would likely continue to develop.

Until other treatments including but not limited to thinning of the understory and use of prescribed fire to reduce ground and ladder fuels, these unnaturally high fuel conditions would continue to pose a threat of higher intensity fires than would occur otherwise. The establishment or increase of densely overstocked forests or affects to the forest structure and composition that could degrade MSO and prey habitats would not occur from this alternative. The risk of stand replacing fires from this alternative in of itself would be unchanged from this alternative. Furthermore, the lack of grazing would eventually allow degraded areas in riparian and upland habitats to move towards an upward trend and a more natural plant community as native trees, shrubs, forbs, and grasses recolonize former pastures, although this could take many decades, if possible. Each of these factors would result in generally improved habitat conditions for MSO compared to the baseline condition.

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.

This alternative would not add to the cumulative effects to this species. Other non-federal, future reasonably certain to occur 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 – particularly on private lands. As stated above, the Colorado Recovery Unit contains only 1.8% of the known owl sites. The Recovery Plan identified that the greatest risk to the owl is from catastrophic fire and the continued use of even-aged timber management. Hazardous fuels reduction treatments have been completed and are being planned on state, private, and public lands within the ponderosa pine/Douglas-fir zone along the Front Range and elsewhere, to reduce the risk of large-scale crown fires. Direct and indirect short-term (one year or less), long-term (multiple years), and permanent effects to MSO from each of these activities would continue to occur.

Determination for Mexican Spotted Owl – Alternative A (No Grazing)
Based on the above rationale, this alternative 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, Indirect, and Cumulative Effects
Under this alternative, current management has, and would continue to allow livestock grazing to

alter some plant communities, both directly and indirectly, lengthen the recovery time, and/or prohibit recovery in some areas. No design criteria would be implemented to minimize livestock effects to MSO habitat. Primarily where use is/has been concentrated, livestock would continue to browse grasses, forbs, and woody species, trample them, decrease seed sources, and cause soil compaction, among other impacts in varying degrees and intensities. This could result in a continued degraded habitat condition for these species. Livestock grazing may also reduce plant density, structural complexity, biomass, vigor, and regeneration. These impacts could alter the relative composition and structure of grass, forb, shrub, and tree components of MSO habitat. A large number of conifer seedlings could continue to be established because of reduced competition for water and nutrients. The establishment of these dense seedling and smaller trees could contribute to the overstocking of ladder fuels within forested areas. This dense overstocking could contribute to the degradation of forest structure and composition and degrade MSO and prey habitats while increasing the risks of stand replacing fires.

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 both Action Alternatives.

The Recovery Plan identifies four primary influences livestock grazing can have on the MSO by altering 1) prey availability, 2) susceptibility of their habitat to increased fire, 3) health and condition of riparian communities, and 4) development of habitats.

Prey availability – Prey availability is determined by distribution, abundance, and diversity of prey, and by the owl's ability to capture it. In addition, a diverse prey base can provide a more predicable food resource for owls over time. A well-developed mosaic understory of grass, forbs, shrubs, and smaller/younger trees is critical for a variety of numerous wildlife species including MSO, particularly for their prey. In a variety of different habitats, there is a positive relationship between volume and structure diversity of vegetation and density of birds (Bull and Skovlin 1982, Karr 1968, and many others) and other wildlife. For example, some species or their prey are only found in areas with dense understory of grass and forb vegetation. If this understory is reduced, many species could be impacted. Since grazing can alter vegetative species composition, structure, reduce the amount of herbaceous understory (grasses and forbs), and decrease its volume, changes in the abundance, composition, and richness of some prey species could occur in grazed areas, as cattle selectively forage on grasses, forbs, and hardwoods.

Such changes may decrease the abundance, or cause the disappearance of some prey species preferring dense herbaceous vegetation. However, species that prefer a more open understory may colonize the area or increase abundance (Block and Finch 1997). Many avian and mammalian species forage, at least in part, on the ground. As more bare ground becomes available due to a reduction in the grasses and other understory vegetation due to livestock grazing, foraging may become more efficient for some ground feeders, although conversely, there may be less to forage on (Block and Finch 1997). In the short-term, owls may be more successful in hunting; however, long-term the loss or changes in grasses, forbs, and shrub cover may promote tree growth and cover that could decrease prey abundance.

Conversely, because of the reduced competition of grasses and forbs being consumed by livestock, coniferous tree regeneration and some less palatable shrubs may increase – resulting in more dense stands of trees that might affect prey species composition/habitat and the availability to spotted owls to be able to capture their prey. The time of year these areas are grazed can also have varying impacts to these habitats – affecting the intensity and area of impact, depending upon the season of use by livestock. Riparian areas may have the greatest potential of potential effects from grazing and MSO prey base. Livestock grazing under this alternative may cause adverse effects to these habitats.

Increased fire –Livestock grazing under this alternative could reduce herbaceous ground cover (fewer fine fuels) and increase the potential for shrubs and small tree growth that could result in a shift in fewer beneficial low-intensity ground fires to more higher-intensity vertical fires. In addition, due to the degraded and unnaturally high fuel loading conditions present within many of these allotments, existing dense understories could likely continue to develop. As with the other alternatives, not until treatments including, but not limited to, thinning of the understory and prescribed fire to reduce ground and ladder fuels, these unnaturally high fuel conditions could continue to pose a threat of higher intensity fires. The risk of stand replacing fires could increase with this alternative because of increases in shrub and seedling understories and ladder fuels from current grazing intensities. This increase in higher-intensity fire risk could contribute to a higher likelihood of more frequent stand replacement fires that could significantly change the landscape and habitat conditions for MSO and their prey by eliminating or reducing foraging, wintering, dispersal, roosting, and nesting habitat components.

Riparian communities – Riparian areas have the greatest potential of potential effects from grazing and MSO prey base. Recently collected riparian PFC monitoring shows degraded riparian conditions in several allotments. Grazing under existing management could continue to reduce or eliminate important shrub, tree, forb, and grass cover, all of which in some capacity support MSO or its prey in some areas. In addition, stream channels and banks could continue to be physically damaged. Deterioration in streamside vegetation could cause widening stream channels, increased stream and soil temperatures, lower water tables, and accelerated flood potentials. The time of year these areas are grazed can also have varying impacts to these habitats – affecting the intensity and area of impact, depending upon the season of use by livestock. These changes could indirectly affect microclimates and vegetation development of riparian areas, with potential adverse affects to MSO.

Development of habitat – There are currently degraded habitat conditions – primarily but not limited to livestock heavy concentration areas in riparian areas. However, there is no or very little quantifiable monitoring data available in riparian areas. Riparian areas (habitats for these species) comprise a very small portion of each of these allotments (average 3%), but current livestock use is concentrated in riparian habitats and has led to degraded habitat conditions in many areas. Concentrated grazing, for a long period of time in riparian areas, as is the case for most of the allotments under consideration in this assessment, can inhibit or retard an area's ability to produce or eventually mature into habitat for MSO or its prey. This results in limited and degraded habitat conditions that are exacerbated by the factors discussed above. The time of year these areas are grazed can also have varying impacts to these habitats – affecting the intensity and area of impact. Current use patterns like the concentrated livestock use of riparian

habitats and adjacent areas would likely continue under this alternative.

Bare ground has been observed in many allotments and shifts in plant species composition from desirable species to less or undesirable species have also been observed. Under this alternative, habitat conditions for MSO and their prey could continue to be degraded and trends could continue in their current downward trajectories, perhaps at a higher rate. As a result, substantial adverse effects could occur to this species indirectly and directly to their prey.

Recovery Plan Guidelines

MSO Recovery Plan livestock grazing guidelines within Restricted Areas are as follows:

1. ***Monitor grazing use by livestock and wildlife in key grazing areas (riparian areas, meadows, and oak types).*** Monitoring of grazing use by livestock and wildlife in key grazing areas (riparian areas, meadows, and oak types) would not occur, since most if not all current monitoring areas are in uplands, and important vegetation and habitat components would not be monitored under this alternative.
2. ***Implement and enforce grazing utilization standards that would attain "good" to "excellent" range conditions within key grazing areas.*** As discussed above, this alternative could result in increased bare ground and species composition shifts to more undesirable plant species in both uplands and riparian habitats, affecting MSO and their prey is likely.
3. ***Implement management strategies that will restore "good" range condition to degraded riparian communities as soon as possible.*** Management strategies that would restore "good" range conditions in currently degraded riparian communities as soon as possible would generally not occur, or would be limited and take much longer to occur.

In summary, under this alternative livestock grazing in general could cause short-term (one year or less), long-term (multiple years), and permanent changes such as vegetation species composition shifts to non-native or undesirable species, down-cutting, erosion, or changes/lowering of the water table, and others. These impacts to vegetative communities from livestock grazing discussed above could directly and indirectly adversely affect MSO potential nesting, roosting, foraging, and dispersal habitats.

This alternative would add to the cumulative effects to this species. Other non-federal, future reasonably certain to occur 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 – particularly on private lands. As stated above, the Colorado Recovery Unit contains only 1.8% of the known owl sites. The Recovery Plan identified that the greatest risk to the owl is from catastrophic fire and the continued use of even-aged timber management. Hazardous fuels reduction treatments have been completed and are being planned on state, private, and public lands within the ponderosa pine/Douglas-fir zone along the Front Range and elsewhere to reduce the risk of large-scale crown fires. Direct and indirect short-term (one year or less), long-term (multiple years), and permanent effects to MSO from each of these activities could continue to occur.

Determination for Mexican Spotted Owl – Alternative B (Current Management)
Based on the above rationale, this alternative "***may affect, likely to adversely affect***" the

Mexican spotted owl.

Alternative C (Proposed Action) – Mexican Spotted Owl

Direct, Indirect, and Cumulative Effects
Specific studies as to the effects of livestock grazing on MSO are lacking. As we have done for other species in this assessment, until this information becomes available, 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. Below are some of the design criteria that directly or indirectly reduces/minimizes adverse effects to MSO, their prey, or their habitats.

The effects of this alternative would add to the cumulative effects to this species. Other non-federal, future reasonably certain to occur 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 – particularly on private lands. These activities have, and would continue to affect nesting, foraging, and roosting habitats and their development both directly and directly. The Recovery Plan (FWS 1995) states that the Southern Rocky Mountains – Colorado Recovery Unit (containing the Action Area) contains only 1.8% of the known owl sites. The Recovery Plan indicates that the greatest risk to the owl is from catastrophic fire and the continued use of even-aged timber management. Hazardous fuels reduction treatments have been completed and additional projects are being planned on state, private, and public lands within the ponderosa pine/Douglas-fir zone along the Front Range and elsewhere- to reduce the risk of large-scale crown fires. Direct and indirect short-term (one year or less), long-term (multiple years), and permanent effects to MSO from each of these activities would continue to occur.

Determination for Mexican Spotted Owl – Alternative C (Proposed Action)
Based on the above rationale, the Proposed Action "may affect, not likely to adversely affect" the Mexican spotted owl.

Canada Lynx

Since augmentation efforts were initiated in 1999 by CDOW, they have been monitoring lynx movements and their locations. Over 200 lynx have been released during this period and 50 documented offspring (kittens) produced in Colorado (CDOW 2006). No specific location data is available at this time from the CDOW or elsewhere as to specific areas lynx may be using in relation to any of these allotments; however, for this assessment, we assume lynx use is occurring within the allotments identified. A core area of lynx use and denning has been identified by CDOW (2006) in the Collegiate Peaks Region, in the northern portion of the Analysis Area (portions of Chaffee and Lake Counties). Suitable denning, foraging, winter, and

other lynx habitats are present on portions of several allotments.

Lynx Conservation Assessment Strategy (LCAS)

Ruediger et al. (2000) address livestock grazing and the risks to prey, primarily snowshoe hare, movement and dispersal of lynx, and conservation measures for management activities on National Forest lands. Below is a partial discussion of the effects on lynx from livestock grazing, conservation standards and guidelines recommended in the LCAS, and how the three alternatives address them. The full text is in the Wildlife BE/BA.

Alternative A (No Grazing)

Direct, Indirect, and Cumulative Effects
Under this alternative, no livestock grazing would occur within any of the allotments assessed or within any of the suitable habitats for lynx or their prey. As discussed above, lynx primarily prey on snowshoe hare and to a lesser degree red squirrels, other small mammals, and birds. With the exclusion of grazing, prey species abundance, composition, and distribution would likely increase or be improved above current levels due to improved habitat conditions for these species. This would ultimately benefit lynx. There would be no change in denning habitat conditions since there is little overlap of denning habitat and livestock use. Cover and prey habitat necessary for movement of lynx could likely improve from the lack of grazing by cattle due to greater grass, forb, shrub, and tree cover. The lack of grazing could improve plant regeneration or existing of coniferous trees, snags, or logs. Furthermore, the absence of grazing could eventually allow degraded areas in riparian and upland habitats to move towards an upward trend and a more natural plant community as native trees, shrubs, forbs, and grasses recolonize former pastures, although this could take many decades, where possible. All of these factors would contribute to generally improved habitat for lynx compared to the baseline condition.

This alternative would not add to the cumulative effects to this species. Other non-federal, future reasonably certain to occur 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 – particularly on private lands. Direct and indirect short-term (one year or less), long-term (multiple years), and permanent effects to lynx from each of these activities would continue to occur.

Determination for Canada Lynx – Alternative A (No Grazing)
Based on the above rationale, this alternative would have wholly beneficial effects to this species; therefore, it “may affect, not likely to adversely affect” the Canada lynx.

Alternative B (Current Management)

Direct, Indirect, and Cumulative Effects
The adverse effects under this alternative are incrementally higher than those discussed under the Proposed Action, due to the lack of implementation of the design criteria. Under this alternative, current management has, and would continue to allow livestock grazing to alter some plant

communities, both directly and indirectly, lengthen the recovery time, and/or prohibit recovery in some areas. Primarily where use is/has been concentrated, livestock would continue to browse grasses, forbs, and woody species, trample them, decrease seed sources, and cause soil compaction, among other impacts in varying degrees and intensities, as noted in some allotments. This could result in a continued degraded habitat condition for this species in some areas. Livestock grazing may also reduce plant density, structural complexity (particularly low horizontal and vertical vegetative cover), biomass, vigor, and regeneration. This could alter the relative composition and structure of grass, forbs, and woody species. As a result, adverse impacts could occur to this species and habitats.

Domestic livestock and/or wild ungulates have been identified as a factor that may change the structure and/or composition of native plant communities, thus changing their ability to support lynx and their prey. Shifts in plant species composition and degraded habitat conditions have been observed in many allotments. This would continue in both upland and riparian habitats. Under this alternative, habitat conditions for lynx and their prey would continue to be degraded in some areas. The time of year these areas are grazed can also have varying impacts to these habitats – affecting the intensity and area of impact, depending upon the season of use by livestock.

The LCAS states that grazing should be managed so that it does not inhibit regeneration of aspen clones. Livestock grazing under this alternative would adversely affect short-term (one year or less) and long-term (multiple years) regeneration of these areas, and lower their habitat values in some areas where concentrated livestock use is/would continue to occur. By changing native plant communities, such as aspen and high elevation riparian willow, grazing could further degrade snowshoe hare habitat. Livestock grazing at these current utilization levels in important lynx prey habitats such as riparian areas, aspen stands and high-elevation willow communities may reduce available forage for snowshoe hares. Riparian areas (habitats for these species) comprise a very small portion of each of these allotments (average 3%), but current livestock use is concentrated in riparian habitats and has led, or could lead to degraded habitat conditions in some areas. Current use patterns (concentrated use of riparian habitats and adjacent areas) would likely continue. This would adversely affect lynx and their prey.

Denning habitat would not be affected by continued livestock grazing due to the lack of grazing in these areas. However, suitable habitats for lynx and their prey, particularly within riparian areas, shrubby areas, meadows, and openings in forested areas where livestock tend to concentrate would continue to be grazed under current management, further degrading habitat conditions. Grasses, forbs, shrubs, and trees would lack complex and well-developed vertical and horizontal structure in areas of high utilization. Livestock grazing under this alternative could reduce plant density, structural complexity – particularly low horizontal and vertical vegetative cover, biomass, vigor, and regeneration. A sparser understory would reduce habitat values for prey species, indirectly affecting lynx in some areas. Mushroom-shaped shrubs and trees could become more prevalent in these allotments. As has been observed, this alternative could reduce or eliminate in some areas the regrowth of willows and other woody species, resulting in degraded habitat for riparian shrub-dependant species, directly and indirectly affect lynx.

Very limited monitoring data are available in riparian areas; however, recent riparian PFC monitoring shows degraded riparian conditions in several allotments (Hydrologist Report). Existing habitat conditions are currently degraded in some areas where livestock use is concentrated. In the late 1930's and early 1940's some or parts of many of these allotments were closed due to significantly degraded range conditions. Some or portions of these allotments were reopened years or decades thereafter, as range and watershed conditions improved somewhat. In general, the overall trend is likely up from the 1940's; however, trends (such as PFC) of the past 15-20 years are downward and riparian areas in many allotments are lacking willows and regrowth which has slowed or reversed recovery of these degraded conditions.

Livestock grazing under this alternative could reduce prey populations, potentially leading to lower kitten survival. The impact of non-native invasive plants on biodiversity is a major concern in North America and the effects would be similar to those discussed under the Proposed Action above, although it would be increased. High elevation shrub steppe habitats would generally not maintain or achieve mid seral or higher conditions in some cases. Those areas that are currently in late seral condition could be further degraded, also counter to LCAS guidelines.

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 both Action Alternatives.

In summary, under this alternative suitable habitat conditions would be degraded from the baseline condition in the short-term (one year or less) and long-term (multiple years), reducing their value to lynx and their prey. These areas would still be functional for lynx/prey, although in many cases the quality of these habitats would be substantially diminished.

This alternative would add to the cumulative effects to this species. Other non-federal, future reasonably certain to occur 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 – particularly on private lands. Direct and indirect short-term (one year or less), long-term (multiple years), and permanent effects to lynx from each of these activities would continue to occur.

Determination for Canada Lynx – Alternative B (Current Management) Based on the above rationale, this alternative "*may affect, likely to adversely affect"* the Canada lynx.

Alternative C (Proposed Action) – Canada Lynx

Direct, Indirect, and Cumulative Effects

Under the Proposed Action, the design criteria specifically developed for Canada lynx and wildlife in general would each be implemented which would minimize adverse effects of grazing on lynx and their prey. Timely and effective monitoring as specified in the Monitoring Plan would occur in Benchmarks, Key Areas, and other areas to determine if the desired condition for that allotment has been met or whether a positive trend is occurring. Livestock grazing within these allotments would be subject to the appropriate design criteria to achieve desired conditions. Effective and timely monitoring of range conditions and taking the appropriate management

steps through the application of design criteria and adaptive management are key to the success of achieving desired conditions.

Denning habitat would not be affected by livestock grazing per se due to the lack of grazing in these areas. Suitable habitat within riparian areas, shrubby areas, meadows, and openings in forested areas where livestock tend to concentrate would continue to be grazed; however, the design criteria would be implemented and adaptive management used to minimize adverse effects. Overall, implementation of these criteria in degraded areas would improve to some degree, but less than if livestock grazing ceased (Alternative A). A gradual trend towards a diverse mix of grasses, forbs, shrubs, and trees with more a complex and well-developed vertical and horizontal structure could improve where degraded over time. A wider and thicker corridor of riparian/wetland vegetation, compared to narrower and linear strips which currently exist in many areas could develop, thus benefiting this species. Improved understory vegetation from the use of design criteria would increase the abundance and species composition of insects and other prey that depend on specific plants and structure for food and reproduction. Plant species composition shifts to a more natural array of grasses and forbs is more likely to occur under this alternative, if a potential exists; however, these changes may take decades in seriously degraded areas. Where current shrub and tree distribution is scattered with individual plants that are mushroom-shaped from heavy livestock use, grazing under the Proposed Action would allow filling in, forming thickets that are more continuous with individual plants having crowns extending to or near the ground. This alternative would allow the regrowth of willows and other woody species. This could result in improved habitat for all riparian shrub-dependant species directly or indirectly benefiting Canada lynx.

The LCAS explicitly identifies livestock as 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. In Alaska, use of woody browse ranged from a high of 82% in winter, to 56% in spring, and 25% in summer (Wolff 1978). This pattern is similar to that of southern hares (leporids). 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. The time of year these areas are grazed can also have varying impacts to these habitats – affecting the intensity and area of impact, depending upon the season of use by livestock. There are no studies of dietary overlap between livestock and snowshoe hares, or specific response of snowshoe hares to cattle grazing, although several such studies have been completed for other leporids. Johnson (1979) found the dietary overlap of black-tailed jackrabbits to be 51% with cattle and 56% with domestic sheep, and stated that competition could occur, depending on stocking rates. In southeastern Idaho, MacCracken and Hansen (1984) found that leporids compete directly with livestock for forage. It can therefore be assumed that a dietary overlap exists between livestock and snowshoe hares.

As specified in the LCAS, snowshoe hare densities and over winter 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. The design criteria would minimize the effects from livestock grazing by maintaining an adequate understory.

Determination for Canada Lynx – Alternative C (Proposed Action)
Based on the above rationale, the Proposed Action "may affect, not likely to adversely affect" the Canada lynx.

Boreal Toad

Boreal toads in Colorado are considered the Southern Rocky Mountain Distinct Population Segment (SRM-DPS) by the FWS. The Boreal Toad Recovery Team has identified only two viable populations of boreal toads in Colorado, and one of those is located in the Sawatch Range (Chaffee County) which is also located within the Analysis Area (Keinath and McGee 2005). This species currently exists in only 1% of its historical range (Keinath and McGee 2005). Of increased importance for this assessment is that the Chaffee County population contains one of the highest concentration and number of breeding sites (17 as of 2008). Also, importantly it currently does not have the deadly chytrid fungus *Batrachochytrium dendrobatidis (Bd)* which has seriously affected almost every other boreal toad sub-population in the state (T. Jackson, Boreal Toad Recovery Team Leader and CDOW Herptile Coordinator, pers. comm., 2007). The Chaffee County population of boreal toads contains the most robust and concentrated density of breeding sites that are *Bd* free in the state of Colorado (SRM-DPS). These seventeen known "*Bd* free" breeding sites in Chaffee County are one of the few remaining strongholds for boreal toads in Colorado (SRM-DPS) (Lambert and Vaughan 2008). Fifteen of these sixteen known breeding sites in Chaffee County are found on the San Isabel NF in the Salida and Leadville Districts, and all have been active within the last seven years (Lambert and Vaughan 2008). Within the Chaffee County population, there are four subpopulations, all in the analysis area. They are located in four different sub watersheds of the Arkansas River Basin. Of the four subpopulations in the Analysis Area, two are within the grazing allotments. A fifth nearby subpopulation of boreal toads is outside of the analysis area on the Pike NF (South Park District), resulting in five subpopulations of boreal toads in the vicinity. Of these five know subpopulations, two are within allotments that would be grazed, representing 40 percent of the known subpopulations in the analysis area.

Boreal toads have been documented in alpine and higher, and mid elevation riparian areas within portions of the Fourmile and Brown's Creek Allotments and very near (less than 1 mile) to the adjacent Chalk Creek Allotment. Suitable but unsurveyed habitats are also present in portions of the Arkansas C&H, Arkansas S&G, Chalk Creek, Brown's Creek, Fourmile, Little Cochetopa, and Union allotments. Surveys have been conducted by the Forest Service, CNHP, and CDOW for boreal toads in portions of the Analysis Area (District Files); however, many areas of suitable habitat remain unsurveyed. A comprehensive habitat assessment has not been completed within the Analysis Area. Roughly 8,800 acres with riparian vegetation between approximately 8,000 – 12,000 ft have been identified as potential/suitable boreal toad breeding habitat within the Analysis Area. Suitable summer and wintering habitat (hibernacula) is likely a much larger area extending up to approximately five miles from suitable streams, ponds, and lakes. This encompasses upland forests, wetlands, meadows, and other areas. Limited surveys have been conducted elsewhere within the Analysis Area, both in and outside of allotments. For

management purposes, under FSM 2670 and 2672 we must assume a species is present and analyze expected effects until site-specific inventories (adequate presence/not-detected surveys) are completed.

Alternative A (No Grazing)

Direct, Indirect, and Cumulative Effects
Under this alternative, no livestock grazing would occur within any of the allotments assessed, which could generally improve habitat conditions for these species. Overall, the lack of grazing within riparian, shrubby areas, meadows, and openings in forested areas, where livestock currently tend to concentrate would result in the improvement of the overall habitat conditions from the baseline/current condition. Areas that currently have concentrated livestock use and habitats that are generally in poor or degraded current conditions are expected to improve over time. A shift towards a diverse mix of grasses, forbs, shrubs, and tree species with complex and well-developed vertical and horizontal structure would improve degraded habitats. As a result, wider and thicker riparian/wetland vegetation, compared to more narrower and linear shaped riparian areas would develop, benefiting these species. An improved understory of vegetation from the lack of grazing could increase the abundance and species composition of insects and other prey that depend on specific plants and structure to provide food and reproduction sites. Plant species composition shifts to a more natural array of grasses and forbs is more likely to occur under this alternative; however, these changes may take decades in areas that are seriously degraded. Current shrub and tree distribution is often scattered with individual plants that are mushroom-shaped because of concentrated livestock use. If released from livestock grazing pressure, these plants would fill in and form thickets that would be more continuous with individual plant crowns extending to or near the ground. This alternative would allow the regrowth of willows and other woody species and increase their presence where they are currently lacking or limited. Each of the above scenarios would result in improved riparian habitat, directly or indirectly benefiting this suite of species. Riparian areas that have been degraded by concentrated livestock use in the past have been shown to improve more quickly when livestock are removed. Elimination of grazing could allow riparian areas in poor condition due to concentrated use to reach desired condition more fully and quickly. Riparian plant composition and vigor would increase and move toward becoming a potential natural community. Over time, the accumulation of plant litter would increase, providing greater cover and improving habitat conditions for these species and others that rely on them as prey.

There would be no direct impacts in the form of trampling by livestock (mortality) of boreal toad adults, metamorphs, or eggs in and around the two known toad breeding sites or other unsurveyed habitats. Indirect impacts described under Alternatives B and C would not occur under this alternative, thus 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 this species in both the short and long-term. Based on the above rationale, this alternative would have a wholly "beneficial impact" on these species.

Determination for Boreal Toad – Alternative B (Current Management)
The following is a summary of the rationale used to support the following effect determination for boreal toads under this alternative.

- The status of boreal toad is largely unknown in the state, and region, although they are dramatically declining. This species is limited to only higher elevations above approximately 8,000 ft in Colorado.
- The Chaffee County boreal toad population is a very important population within the Colorado (SRM-DPS). It is one of only two viable populations of boreal toads in the entire state. In addition, this population has one of the highest breeding concentrations (17 breeding sites) in the state, occurring in four watersheds.
- Known populations of toads are extremely limited in the Planning Area. Of the five known boreal toad subpopulations in the Planning Area, two of which (representing 40%) are within two of the allotments assessed here and would be subject to the impacts from grazing. This represents a significant portion of the Planning Area.
- The status of this species is largely unknown on the analysis area. Boreal toad breeding has been documented in two allotments (Brown's Creek and Fourmile), each representing a subpopulation. This represents two of the four subpopulations with known breeding in the Chaffee County population (the Analysis Area).
- Approximately 8,800 acres of unsurveyed potentially suitable habitat is present within six allotments in the Analysis Area (Little Cochetopa C&H, Arkansas C&H, Browns Creek C&H, Chalk Creek C&H, Fourmile C&H, and Union C&H), therefore presence is assumed as per FSM 2670 and 2672. No new surveys would be conducted under this alternative, thus impacts from grazing could also occur to undocumented subpopulations of boreal toads and their habitats.
- There is a high potential of concentrated livestock use in and around two known breeding sites and approximately 8,800 acres of unsurveyed potential habitat that may also have boreal toads. This would directly and indirectly impact toads and their habitats.
- Riparian areas (boreal toad habitats) comprise a very small portion of each of these allotments (average 3%), but current livestock use is concentrated in riparian habitats and has led, or could lead to degraded habitat conditions in many areas.
- Alpine, subalpine, wetlands, and other adjacent habitats are very fragile to and particularly sensitive to many direct and indirect impacts from livestock grazing. Grazing has been identified by many sources as one of the direct and indirect threats to adult toads, eggs, metamorphs, and their habitats (breeding, rearing, foraging, movement, and hibernacula).
- Grazing would occur in these areas at the same time boreal toads are active within these allotments which directly and indirectly could impact toads and their habitats. The time of year these areas are grazed can also have varying adverse impacts to these habitats – affecting the intensity and area of impact, depending upon the season of use by livestock.

- Survival of eggs/tadpoles is extremely low due to a variety of factors including grazing which can cause trampling of individuals and degrade habitats that could increase mortality under this alternative.
- Boreal toad's use of shallow waters and adjacent gentle banks which overlaps substantially with areas livestock frequently use/prefer. This can increase the potential of trampling and habitat degradation and can degrade water quality, having substantial potential impacts to this species.
- Direct mortality of boreal toads and similar amphibians as a result of livestock grazing has been documented and is likely in and around these known and unsurveyed breeding areas and other habitats under this alternative.
- Direct mortality and other indirect impacts are likely in these two known subpopulations (they are entirely within the Browns Creek and Fourmile Allotments). This represents 40% of the known population of boreal toads in the Planning Area which is significant. In addition, other unsurveyed areas that may also have breeding boreal toads within allotments would also be subject to these direct and indirect impacts.
- Potential habitat degradation from livestock grazing/use includes, but is not limited to: the reduction/trampling of vegetation in habitats; trampling/compaction of streambanks and uplands; degrade hydrologic processes/function of wetlands and other riparian systems; reduction of willow regeneration could impact beavers (an important species that creates toad habitats); degradation of hibernacula; adverse impacts to water quality, and chemistry; and increased potential to spread of *Bd* to populations where this disease has not been previously detected.
- Protective measures designed to minimize the above impacts (design criteria) and habitat assessments, surveys of habitat for toads in previously unsurveyed suitable habitat, or monitoring of sites within allotments would not occur under this alternative, as would occur under the Proposed Action. Thus the level and potential of impact is substantially increased compared to Alternative A and C.
- This species is experiencing significant and dramatic declines, related to habitat destruction, diseases, chemical contamination, acidification of water, increased UV light, introduced predators, over collecting, climatic change, and general environmental degradation. Degradation of habitat caused by grazing, recreation, road construction, logging, and hydrologic alteration by development of water resources have all been identified as being responsible for this decline.
- Adverse impacts from grazing, in combination with cumulative effects of other current and future activities include direct and indirect mortality, fragmentation of habitats, and habitat degradation from: recreation activities (camping, hiking, OHV/vehicles, etc.), roads, vegetation treatments, mining, etc. and the increased threat spreading *Bd* from these and other activities. Important impacts from these activities may also increase predation of toads/eggs/young, and potential adverse impacts such as climate change, and other factors all may act synergistically with other environmental stressors that directly, indirectly, and cumulatively affect boreal toads in the short-term (one year or less), long-term (multiple years), as well as permanently.

All of the adverse impacts listed above and those discussed previously are likely to occur under this alternative, causing substantial adverse impacts to boreal toads during critical periods such as breeding, foraging, and hibernation, as well as impacting their shelter and other important

components of their life history. This includes both direct and indirect impacts that would add to the cumulative effects discussed above. These impacts would be short-term (one year or less), long-term (multiple years), and permanent in nature, as livestock grazing under this alternative could cause substantial impacts/changes to their habitats and increase mortality as described above. Given that this species currently exists in only 1% of its historical range (Keinath and McGee 2005) and continues to decline, this incremental impact to this population in the Planning Area – such as would occur under this alternative is significant. Lastly, this represents 40% of the known boreal toad subpopulations within the Planning Area, which is a significant amount that would be highly impacted under this alternative. Based on this and the above rationale, this alternative, when added to the cumulative effects of other ongoing and future reasonably foreseeable private, state, and federally activities is ***"likely to result in a loss of viability in the Planning Area, or in a trend toward federal listing"*** of the boreal toad.

Alternative C (Proposed Action)

Direct, Indirect, and Cumulative Effects

Specific impacts from livestock grazing to these species, as discussed above for Alternative B, apply here as well, and are incorporated by reference; however, the level of impact discussed under Alternative B would be substantially reduced for these species under this alternative due to the implementation of the design criteria which are used to achieve desired condition. Furthermore, under this alternative the Implementation Plan and Monitoring Plan will establish effective and timely monitoring to ensure and appropriate adaptive options are taken to achieve these desired conditions.

Under this alternative, changes in plant composition to less palatable species, reduction of species that are palatable, and change in vegetative structure would not likely occur to a substantial level due to the Monitoring Plan and design criteria. In a variety of different habitats, there is a positive relationship between volume and structure diversity of vegetation and density of birds and other wildlife, which could generally improve and be greater than under Alternative B. Livestock grazing could continue to alter vegetative species composition, reduce the number of herbaceous species in the understory, decrease the volume of the understory, and change the abundances, compositions, and richness of wildlife species; however, these effects would not be substantial and would be less than under Alternative B.

Approximately 120 new/redeveloped proposed range water developments are included in this alternative. It is possible however; these proposed water developments and subsequent depletions could result in a loss of wildlife/aquatic habitat downstream of proposed water developments that could impact these species and/or their prey directly and indirectly. However, it is anticipated that the potential loss/impacts in these habitats would be small relative to the benefit gained through better distribution of livestock across allotments and specifically, out of riparian areas. 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), improving water relations and allowing quicker recovery of impacted riparian areas. The potential impact of these depletions will be greatly minimized through use of 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, etc.). Natural water bodies (i.e., kettles, ponds, lakes, etc.) would not be used as a source for off-site watering. 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 using these design criteria and others that would limit livestock use of riparian habitats and encourage use away from these areas using monitoring and implementation of adaptive management options. Specifically, those limiting the utilization by livestock of herbaceous and woody species, limiting the amount of bare ground and soil compaction, and others would be used to move towards and achieve the desired condition for this species and the habitats.

Livestock grazing under this alternative could have some short- and long-term 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 would not occur due to the design criteria. These impacts and other changes in vegetative communities from livestock grazing would indirectly, directly, and cumulatively affect the species addressed here.

Approximately 8,800 acres of known or potentially suitable boreal toad breeding and associated habitat may be within the Little Cochetopa C&H, Arkansas C&H, Browns Creek C&H, Chalk Creek C&H, Fourmile C&H, and Union C&H allotments. Suitable habitat would have protective measures which would add considerable protective measures for toads and their habitats, although not all of the impacts (direct and indirect) would be eliminated. Areas with potential boreal toad breeding habitat would be surveyed using accepted/recommended methodologies for determining presence. Some short-term impacts could occur within sites that may have toads until they are surveyed. Within the 5-year window all assessments and surveys will be completed, however.

Although the above impacts to these species are likely, and they may become less abundant in the project area under the proposed action, they are unlikely to be extirpated in the near future, as sufficient refugia (ungrazed sites) exist within the project area. Based on these and the above rationale, the proposed action "may adversely impact individuals, but not likely to result in a loss of viability in the project area, nor cause a trend toward federal listing".

Management Indicator Species

Amendment 30 to the LRMP (Forest Service 2005) identified four MIS for the Pike and San Isabel National Forests. Two species are fish and two are terrestrial animals. The two terrestrial species analyzed are identified in the table below. The fish will be described in the Fisheries section.

Table 3-3. Terrestrial 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

Abert's Squirrel (*Sciurus aberti*)

Background – Abert's squirrel is ecologically dependent on ponderosa pine (Pinus ponderosa), with open understory for both nesting sites and food (Keith 1965) and therefore generally limited to open montane forests. Target feed trees represent less than 10% of the trees in stands populated by Abert's squirrel along the Front Range, and they are chemically and physiologically different from trees not used (Allred and Gaud 1994). Tree chemistry also affects nest-site selection. On the PSICC, surveys show approximately 92% of nests were in a tree group with 75% having three or more interlocking canopy trees. Hypogenous fungi are an important part of their diet and bone and antlers are often gnawed for their mineral content (Pederson et al. 1987). Home ranges are from 5 to 20 ha (12-49 ac), depending on season and sex of animal (Hall 1981). Since 1989, fires and insect activity on the PSICC have combined to remove the canopy cover on 60,000 acres of ponderosa pine/Douglas-fir in large blocks of habitat.

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 which this species relies heavily for food and shelter. However, Romme et al. 2006 states that perceived current "epidemics" of MPB observed today may in fact be well within the historical range in variability and Colorado, and the Rocky Mountains have coexisted with these native bark beetles and defoliators for thousands of years. They found that there is no evidence to support that current levels are unnaturally high, as similar outbreaks have occurred in the past. Romme et al. (2006) identified four complex and interactive ecological factors that control insect populations such as MPB in Colorado, thus affecting Abert's habitat.
Long-term drought, which stresses trees and makes them more vulnerable to insects;
Warm summers, which further stress the trees and may accelerate growth of insects;
Warm winters, which enhance survival of insect larvae; and
Abundant food (trees) for insects in Colorado's extensive and often dense forests.

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 mature ponderosa pine mortality, 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 3-4. Approximate acres of potential Abert's squirrel habitat within active allotments

Allotments	Acres of Abert's Squirrel Habitat*[1]			
	Forage	High	Moderate	Total
Fourmile	800	3,850	1,450	6,100
Bassam	650	2,000	1,800	4,450
Cameron	800	1,900	1,250	3,950
Little Cochetopa	0	2,500	700	3,200
Arkansas C&H	550	1,450	100	2,100
Chalk Creek	700	850	400	1,950
Aspen Ridge	200	900	650	1,750
Chubb Park	150	1,000	200	1,350
Bear Creek	0	500	50	550
Browns Creek	150	100	0	250
Union	0	0	0	0
Total	4,000	15,050	6,600	25,650

*All habitat structural stages (HSS) are for ponderosa pine habitats only.
[1]Rounded to nearest 50 acres

Direct and Indirect Effects to Abert's Squirrels

Table 3-3 shows that approximately 29,500 acres of potential Abert's squirrel habitats are mapped for the Leadville and Salida districts, essentially all (25,650 acres) of which is within the Salida allotments being analyzed.

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 pine 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.

Due to the degraded and unnaturally high fuel loading conditions currently present within many of these allotments, existing dense understories would likely continue to develop. Not until other treatments including but not limited to thinning of the understory and use of prescribed fire to reduce ground and ladder fuels, these unnaturally high fuel conditions would continue to pose a threat of higher intensity fires than would occur otherwise and threaten Abert's habitat. The establishment of additional areas of densely overstocked forests as a result of livestock grazing would not result from alternative and Abert's habitat would not be further degraded. Livestock grazing's absence would not alter the risk of stand replacing fire under this alternative. Furthermore, the lack of grazing would improve forested ecosystems from current conditions and eventually allow degraded areas in riparian and uplands to move toward an upward trend and a more natural plant community as native trees, shrubs, forbs, and grasses recolonize former pastures, although this could take many decades, if possible. Each of these factors would result in generally improved habitat conditions for Abert's compared to the baseline condition.

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 low 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)
Grazing under current livestock grazing management would continue to remove fine fuels and alter species composition to 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 Appendix 1 of the BE/BA are implemented. 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 things, 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 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 than in Alternative B.

Cumulative Effects

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.

- Historic mining activities have had great impacts on many species addressed in this assessment responsible for shaping the landscape and vegetation today. Historic uses of the Forest included intensive use by miners, market hunters, and trappers. Much of the mixed conifer was harvested for mining timbers, fuelwood, and charcoal. Snags and CWD that provide important habitats were also harvested for fuel, which are lacking today. Many of the large diameter trees were removed. Within some areas, only lodgepole and aspen were regenerated, reducing species diversity. These activities have affected wildlife and plant species addressed here indirectly and cumulatively through fragmentation, habitat loss, and loss of effectiveness through human disturbance.
- Fire suppression has led to increased fuel loading and canopy closure. For example, fire suppression has prevented natural thinning of the predominately lodgepole 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 because of fire suppression in ponderosa pine forests, a dense understory of shade tolerant tree species (Douglas-fir and others) has developed instead of 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.
- 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.
- Human development is expected to continue in the Analysis Area on private lands. This will continue to destroy and fragment species habitat, fragment/isolating populations, increase the risk of weed invasion, and the incidence of catastrophic wildfire causing direct and indirect adverse effects to wildlife and their habitat through direct and indirect

habitat loss for these species.

- In addition, to the activities outlined above, several hazardous fuels and salvage projects are currently being implemented and planned on the Salida and Leadville districts within or immediately adjacent to the following allotments: Little Cochetopa, Arkansas C&H, Browns Creek, Chalk Creek, Cameron, Aspen Ridge, Bassam, Chubb, Fourmile, Union, and Arkansas S&G.

If adverse effects are not minimized at the local level, cumulative effects may occur. Past and present forest management activities have caused changes in plant community structure and composition across the forests. These management activities have altered the present landscape to various degrees and have had direct, indirect, and possibly cumulative effects on MIS and big game species. These effects can be minimized by following Forest Service standards and guidelines and by implementing the design criteria to monitor or offset impacts. With these protective measures in place, cumulative effects are less likely to be adverse.

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, 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). A more recent study by Cook et al. (1998) illustrated that "it remains uncertain that thermal cover significantly influences the nutritional condition, survival, or productivity of wild ungulates". Cook et al. (ibid) found no significant, positive effect of thermal cover on elk condition, and in fact found that "dense cover provided a costly energetic environment, resulting in significantly greater overwinter mass loss, fat catabolism and (in one winter) mortality". Open road densities greater than 1.5 miles per square mile of habitat on summer range or one mile per square mile of habitat on winter range are also considered a limiting factor (Rodrick and Milner 1991).

Winter range and calving areas include approximately 210,000 acres (62%) and 54,000 acres (16%) of the Analysis Area, respectively (Colorado Division of Wildlife 2005). The RAMPS allotments represent approximately 78% and 44% of the elk winter range on the Leadville and Salida Districts and San Isabel NF respectively (Table 3-4). Mapped elk and mule deer winter

and elk calving habitats are shown in Table 3-5.

Table 3-5. Potential elk winter range at the Project Area, District and Forest Scales.

MIS Habitat	Acres of Potential Winter Range on National Forest Lands			
	Allotments[2]	Leadville & Salida RD[3]	San Isabel NF[3]	PSICC[3]
Elk Winter Range[1]	210,000	270,000	480,000	820,000
Elk Calving Area[1]	54,000	120,000	160,000	220,000

[1]Elk winter range and calving areas obtained from CDOW GIS coverages and clipped to the FS ownership.
[2]Rounded to nearest 1,000 acres
[3]Rounded to nearest 10,000 acres

Table 3-6. Mapped deer and elk habitat within allotments.

Allotments	Acres of Deer and Elk Habitat[1]		
	Elk Winter	Mule Deer Winter	Elk Calving
Arkansas C&H	7,000	7,500	3,500
Aspen Ridge	16,500	16,500	2,500
Bassam	35,500	35,000	6,500
Bear Creek	3,500	3,000	2,000
Browns Creek	5,000	5,000	3,000
Cameron	54,000	64,500	1,000
Chalk Creek	4,000	4,500	2,000
Chubb Park	11,000	11,000	3,000
Fourmile	21,000	23,500	3,000
Little Cochetopa	21,500	19,000	11,000
Union	7,500	7,500	2,500
Total	**186,500**	**197,000**	**40,000**

[1]Rounded to the nearest 500 acres.

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. Available forage quality and quantity on winter ranges should increase since nearly seventy-five percent of Salida and Leadville's elk winter range is within livestock allotments. 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 less than 200,000 elk in 1990 to nearly 300,000 elk by 2003 (Figure 1). Additionally, noxious weed spread would not be exacerbated by domestic livestock (Bartuszevige and Endress 2008) 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. See the Abert's squirrel discussion above for more detailed discussion. 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)

Streamside areas have historically been grazed by herbivores with varying degrees of impact, both positive and negative. They found that the critical element influencing effects of grazing is proper management of grazing activities. Because of the history of overgrazing throughout the west there is little available research on the effects of "proper grazing" and as shown below, almost all of the research and field studies compare over-use with no use at all. Forage utilization standards and guidelines were developed to ensure, with proper management, the achievement of identified future conditions of forest rangeland resources. Properly managed livestock grazing, permitted within standard and guideline limits (as specified in the R2 Range Handbook, LRMP, and other guidelines) is designed to cause no significant impacts to rangeland or other resource values.

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 are critically important to big game (including elk) survival during severe winters such as lower elevation and steep southerly aspects. Many of these critical areas lie adjacent to agricultural or residential areas, and an increased threat of additional development exits, such as the case within the Analysis Area. The majority of traditional elk winter range has been converted to agricultural or urban area in the Arkansas River Valley and elsewhere. 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.

Continuing current livestock grazing management would eventually cause an elk population decline and/or reduction in carrying capacity to a limited degree. Even though proper grazing can be beneficial to ungulates, improper management, which has occurred for quite some time in many allotments can be even more detrimental. Overuse or repeated use during the same season without rest or rotation has caused a negative shift in allotment conditions in many cases as indicated by the available monitoring data. Overall habitat conditions for allotments under current management coupled with the fact that elk winter range coincides with nearly three-quarters of all Leadville/Salida allotments and the current statewide elk population is approaching 300,000 causes great concern. Without immediate action and adequate monitoring this current management would negatively affect the elk population, especially on the Salida

District where most allotments are located. In the short-term (10 years) elk habitat would diminish and support slightly fewer elk with an increased chance of winter mortality. This trend would continue in the long-term (over 10 years) and a large-scale winter die-off would become more likely.

Alternative C (Proposed Action)

Under the Proposed Action, specific design criteria have been developed to address protection and improved habitat conditions. Potential impacts would be eliminated altogether or significantly reduced by the implementation of these criteria for elk.

The Proposed Action should maintain desirable conditions and improve the undesirable conditions caused by the current grazing management due to the implementation of the design criteria listed above. 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 avoiding conversion to less desirable/palatable vegetation and or bare ground. 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 in contrast to Alternative B.

Cumulative Effects
Activities listed in the general cumulative effects has cumulatively impacted elk populations through habitat fragmentation, habitat loss and habitat degradation. The implementation of Alternative A benefits elk habitat and would not contribute to the detrimental cumulative effects.

Alternative B would add to the cumulative effects by continuing vegetation shifts and increasing the chance of large population fluctuations. The proposed action (Alternative C) with the implementation of the design criteria and monitoring would improve current conditions, but would still add to the cumulative effects—to a less extent than Alternative B.

The effects of Alternatives A or the Proposed Action (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 elk, their habitat, or population viability over the Planning Area. Alternative B would interact to have a noticeable effect on elk and their habitat, but would not have a collectively significant effect on population viability over the Planning Area. Elk would remain viable on the planning unit under all alternatives, since approximately 75 percent of the winter range is located outside the project area and elk would continue to use the allotments.

3.5 FISHERIES and AQUATIC INVERTABRATES_____

The Analysis Area is defined at different scales for the species addressed in this assessment. This area has been analyzed to determine physical and biological characteristics including dominant vegetation types, topography, administrative boundaries, and watershed boundaries. These characteristics and others were validated through field visits by project biologists. Project specific aquatic surveys for the species listed above were not conducted. However, species specific fish surveys have been conducted by the FS and CDOW in many streams within the Analysis Area between 1998 and 2007, in conjunction with other project level work. Also, because no surveys were conducted for Rocky Mountain capshell snail or *O. susanae*, we assume presence within suitable habitats until adequate surveys are completed.

Critical Habitat
There is no proposed or designated critical habitat for any federally listed aquatic species within the Analysis Area; therefore, there will be no direct, indirect, or cumulative effects from the Proposed Action, any of the other alternatives considered, or that of any interdependent or interrelated action to any critical habitat. Critical habitat will not be addressed further in this assessment.

Species considered
Only those federally threatened, endangered, proposed/candidate, and FS sensitive aquatic species with the 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. 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*)

Federally Listed Species
Greenback Cutthroat Trout (*Oncorhynchus clarki stomias*)
Federally threatened greenback cutthroat trout have been documented from eight locations across the PSICC, none within the Analysis Area. Intensive surveys have been conducted by the CDOW and FS to document populations of greenbacks across the PSICC.

Existing Condition
Eighteen fish bearing streams were identified within grazing allotments. To determine if greenback cutthroat trout were present in streams, 15 of these streams (83%) were selected for fish surveys (Table 3-6). Streams were not selected at random; therefore, generalization of results from sampled to un-sampled streams would not generally be statistically defensible. 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.

Table 3-7. Summary of fish survey results

Allotment	No. perennial fish-bearing streams	No. fish-bearing streams surveyed	Brook or brown trout present	Survey agency	Year of survey
Arkansas C&H	1	1	Yes	FS	2005, 2006, 2007
Arkansas S&G	2	2	Yes/No	CDOW	2004, 2006
Browns Creek C&H	1	1	Yes	FS, CDOW	2004, 2005, 2006, 2007
Chalk Creek C&H	1	1	Yes	CDOW	2004, 2006
Union C&H	2	0			
Bassam C&H	1	1	Yes	CDOW	2006
Cameron C&H	1	1	Yes	CDOW, FS	2006
Bear Creek C&H	0	0			
Chubb C&H	0	0			
Fooses Creek C&H	2	2	Yes	CDOW, FS	2005, 2006, 2007
Fourmile C&H	1	1	Yes	FS	2005, 2006, 2007
Aspen Ridge C&H	0	0			
Little Cochetopa C&H	6	5	Yes	FS, CDOW	1998, 2000, 2005, 2006, 2007

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. The nearest documented populations are located approximately 160 kilometers north of the Analysis Area. Project specific surveys for Rocky Mountain capshell snail or potential habitat were not conducted and the Analysis Area could contain individuals or habitat. Therefore, we assume presence of Rocky Mountain capshell snail within the Analysis Area.

The desired future condition for Rocky Mountain capshell snail is outside the scope of this assessment. However, the desired future condition for suitable habitat for all aquatic species including Rocky Mountain capshell snail can be specified. Riparian ecosystems meet or move towards at least an upper mid-seral stage. Riparian plant communities are healthy and self-perpetuating. State and Federal water quality standards met. Stream channels and still water-body shorelines are stable and well vegetated with appropriate species. Suitable riparian habitat exists for viable populations of fish and wildlife and terrestrial and aquatic invertebrates.

Ochrotrichia susanae (Caddis fly)

O. susanae is only known from two locations world wide, one from Trout Creek Spring just south and downstream of the Chubb Park C&H allotment. *O. susanae* is only known from this habitat "type" (large springs - Flint and Herrmann, 1976) and extensive surveys have been conducted (USDA R2 Sensitive species evaluation form, 2007b). Because the habitat type is very limited and not known to occur within other grazing allotments, it's doubtful that other

populations exist or would be impacted by livestock grazing. There could, however, be indirect effects to the known population near Trout Creek Spring due to water depletions from proposed livestock water developments up stream in the Chubb Park Allotment.

The desired future condition for *O. susanae* is outside the scope of this assessment. However, the desired future condition for suitable habitat for all aquatic species including *O. susanae* can be specified. Riparian ecosystems meet or move towards at least an upper mid-seral stage. Riparian plant communities are healthy and self-perpetuating. State and Federal water quality standards met. Stream channels and still water-body shorelines are stable and well vegetated with appropriate species. Suitable riparian habitat exists for viable populations of fish and wildlife and terrestrial and aquatic invertebrates. Trout Creek Spring discharge is not reduced from upstream depletions.

Greenback Cutthroat Trout

Alternatives A, B and C: The presence of brook and/or brown trout in all but one surveyed stream within the Analysis Area likely precludes the persistence of greenback cutthroat trout populations (Benke 1992, Harig et al. 2000, Young and Harig 2001, Young et al 2002, and others). Fifteen of eighteen fish bearing streams in allotments were surveyed for greenbacks. Streams were not selected at random; therefore, generalization of results from surveyed to unsurveyed streams would not generally be statistically defensible. 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. These generalizations include that brook and/or brown trout are present in virtually all streams within the analysis area, and genetically pure greenback cutthroat trout are not present in any streams within the Analysis Area. Moreover, recent genetic testing disputes the purity of most existing greenback populations (Metcalf et al. 2007), including five of the eight populations on the PSICC. Metcalf et al. (2007) conclude from this recent testing that there are only four, known genetically pure populations of greenback cutthroat trout worldwide. Given these factors, we conclude that federally threatened greenback cutthroat trout are not present within the Analysis Area and therefore; there will be ***"no effect"*** (direct, indirect or cumulative) from any alternative selected.

Rocky Mountain Capshell Snail

Alternative A (No Grazing)
The effect of this alternative would improve riparian systems where livestock grazing has had negative effects. This may result in an increase in the quantity and quality of Rocky Mountain capshell snail habitat in the Analysis Area. 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 systems would move toward the desired condition from a livestock grazing standpoint, but may never reach it because of the continued impact from these other activities. As riparian systems improve, the quantity of suitable habitat for Rocky Mountain capshell snail would likely increase as well. If Rocky Mountain capshell snail is present in the analysis area, greater production may be expected.

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 cumulative effects to Rocky Mountain capshell snail due to livestock grazing.

Implementation of Alternative A will improve and contribute to properly functioning riparian systems across the Analysis Area, improving and protecting aquatic habitat as well. Implementation of Alternative A would have a wholly beneficial impact to this species.

Alternative B (Current Management)
Significant effects to Rocky Mountain capshell snail populations from Alternative B would likely be indirect rather than direct. It's possible that individual snails could be trampled by livestock wading and watering in natural lakes, ponds or kettles. But the greater impact would likely be from livestock grazing in riparian areas and degrading aquatic habitat, thereby, indirectly impacting snail 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 snail habitat similarly. Therefore, it would be difficult, if not impossible, to isolate and quantify the effects to snail 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 for snail production. For this analysis to accurately reflect impacts on snails, we assume that the quantity and quality of riparian systems is directly related to Rocky Mountain capshell production.

The function of riparian systems, the protections they afford aquatic habitats and the possible effects (direct, indirect and cumulative) due to livestock grazing were thoroughly discussed in Section 10.0 of the Fisheries BE.

The impact from implementation of Alternative B would be *cumulative* to the Environmental Baseline established in Section 8.0 of the Fisheries BE. These cumulative effects would be greater than those under Alternative A or C.

Impacts from degradation of riparian systems and water quality, increased water temperatures, destabilization of stream banks, increased erosion and sedimentation, loss of stream cover, etc., would directly impact Rocky Mountain capshell snails negatively. Under current management, some degraded riparian areas are not moving toward the desired condition in an acceptable time-frame.

Implementation of Alternative B will allow livestock grazing to continue under current management strategies. Alternative B does not require an intensive riparian Monitoring Plan or an Implementation Plan to guide decision makers. Moreover, water developments and fencing needed to better distribute livestock across the allotment will not occur, and may result in livestock congregating and degrading riparian areas as has historically occurred. Existing, degraded riparian areas may remain in that condition and new areas may become degraded.

Lastly, specific design criteria developed to protect aquatic species and their habitats may not be implemented. Therefore, implementation of Alternative B is "*likely to result in a loss of viability in the Planning area, or in a trend toward federal listing"*.

Alternative C (proposed action)
Negative impacts to riparian systems and snail habitat from implementation of Alternative C will be similar in scope to those of Alternative B discussed above, but the magnitude of these impacts would be less severe because of : (1) specific design criteria developed to prevent depletion of natural lakes, ponds and kettles, (2) an intensive riparian Monitoring Plan developed by an interdisciplinary team of resource professionals, (3) an Implementation Plan developed to guide decision makers on the appropriate responses to monitoring data and lastly and most importantly, (4) proposed range developments (water developments, permanent fencing, etc) to better distribute livestock across the allotment and prevent congregation of livestock in riparian areas.

In general, intensive riparian monitoring will occur and the results will be used to make determinations of rangeland conditions and whether or not conditions are moving toward the desired future condition in a reasonable timeframe for the allotment. If not, then an alternate set of management actions would be implemented to achieve the desired results. These adaptive management actions or tools are listed in Table 2-1. The tools were developed to address specific deficiencies in rangeland conditions common to some of the grazing allotments addressed in this evaluation.

Cumulative effects were thoroughly discussed in Section 10.3 of the Fisheries BE. Under Alternative C, the cumulative effects would be similar in scope to those of Alternative B, but the magnitude would be less severe.

Implementation of Alternative C will allow livestock grazing to continue with adaptive management to achieve the desired condition for riparian systems. However, riparian systems and Rocky Mountain capshell snail habitat will continue to be impacted from livestock grazing until the desired condition is met. Therefore, implementation of Alternative C "*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"*.

***Ochrotrichia susanae* (caddis fly)**

Alternative A (no grazing)
O. susanae is not present or expected on any grazing allotments covered in this assessment. Therefore, Alternative A will have *"no effect"* (direct, indirect or cumulative) on *O. susanae*.

Alternative B (current management)
The Lower Chubb pasture in the Chubb Park allotment is on private land north of one of the known locations of *O. susanae* approximately 0.4 kilometers and upstream. Because livestock cannot access this location, there will be no direct effects on *O. susanae* from grazing the Lower Chubb pasture. However, under current management, a water well and pipeline exist on the northern end of the allotment, upstream approximately 5.5 km, and pipes water south to several sources of livestock water. It is unknown if the aquifer at the well site is connected to Trout

Creek Spring where *O. susanae* is known. If it is, then some depletion and loss of downstream habitat could be expected. Potential effects will be minimized because of existing design techniques such as overflow devices and shut off valves. Therefore, any depletion of water would be no greater than what the livestock drink and a small amount for evaporation. We feel this will not adversely impact *O. susanae* habitat.

The effect from implementation of Alternative B will be *cumulative* to the Environmental Baseline established in Section 8.0 of this assessment. The cumulative effects will not be substantial, but would be greater than those under Alternative A.

Implementation of Alternative B "*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"***.**

Alternative C (proposed action)
The effects from Alternative C to *O. susanae* are similar in scope to those of Alternative B, but will be of less magnitude because of specific design criteria developed to reduce the impacts of proposed livestock water developments. To summarize, overflow devices reduce any depletion to only that that is used for livestock watering and minimal evaporation. In case of malfunction of the overflow device, an overflow return will be used to return water to the drainage of origin and to a point as close to the source as practicable. Shut off valves will be closed, eliminating the depletion, shortly following the grazing event. The grazing events are of short duration (20-25 days). Lastly, Trout Creek Spring discharge volume will be monitored twice annually to determine if upstream depletions are reducing habitat for *O. susanae*. If so, then alternative sources of livestock water will be explored or grazing will be reduced or restricted from the Lower Chubb pasture.

Under Alternative C, the cumulative effects would be similar in scope and less in magnitude to those described previously for Alternative B.

Implementation of Alternative C "*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".*

FISHERIES MANAGEMENT INDICATOR SPECIES (MIS)

Amendment 30 to The Land and Resource Management Plan (U.S.D.A. Forest Service 2005) for the PSICC identified greenback cutthroat trout (*Oncorhynchus clarki stomias*) and brook trout (*Salvelinus fontinalis*) as fish MIS for the Pike and San Isabel National Forests.

Summary
Greenback cutthroat trout were observed in only three streams (Fourmile Creek – Fourmile allotment; Chalk Creek-Arkansas S&G allotment; and Browns' Creek- Browns Creek allotment). Because of genetic impurity, none of the populations are afforded protections under the Endangered Species Act. They are genetically similar to pure greenbacks in that they share the same life-history characteristics including spawning times and needs, rearing, foraging behavior and etc.; therefore they remain suitable for this MIS analysis. The population trend for these

introgressed populations is likely stable. A major factor in this stability may be the result of stocking efforts by the CDOW, however.

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.

Population trend: Greenback cutthroat trout 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.

Habitat trend - Intensive reintroduction efforts by the FS, CDOW, U.S. Fish and Wildlife Service and other stakeholders are currently underway and have met with limited success. Reintroduction projects typically involve identification of sites with suitable habitat and a high likelihood of success. Once a stream has been identified, in most cases, a barrier to upstream fish migration is constructed, followed by chemical removal of non-native salmonids and stocking of pure strain greenback cutthroat trout. Several streams have been identified as future reintroduction sites on the PSICC, but none within the Plan Area. Because of these reintroduction efforts, greenback habitat is expanding slightly. Simultaneously, however, brook trout are invading new waters and contaminating future habitat. It's difficult to determine with any certainty whether suitable greenback habitat is decreasing, remaining stable or increasing across the PSICC and Plan 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.

Population Trend: Brook trout have displaced native trout from most of Colorado's high mountain streams, a primary factor in the federal listing of greenback cutthroat trout as "threatened". The U.S. Forest Service along with the Colorado Division of Wildlife, U.S. Fish and Wildlife Service and many other land management agencies have removed brook trout from some streams and lakes as a component of an intensive effort to restore greenback cutthroat trout populations on the PSICC. However, the continued range expansion by brook trout may offset any decline in population trend due to these removals. Where brook trout live in un-impacted habitats their numbers are "at least" stable, if not increasing slightly (Greg Policky, CDOW 2005, per. com.). However, in impacted habitats, such as those positive for Whirling Disease, population trends are downward.

In summary, 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.

Habitat Trend: Brook trout habitat relationships are well known. Optimal stream habitat for brook trout is characterized by clear, cold water; silt-free rocky substrate in riffle-run areas; well vegetated stream banks; abundant instream cover; deep pools; relatively stable flow regime and stream banks; and productive aquatic insect populations (Raleigh 1982). Also, the relationship between brook trout and beaver ponds has been well documented (Winkle et al. 1990; Johnson et al. 1992). See Raleigh (1982) for a more detailed description of brook trout habitat needs.

Standard 12.1 (3) of the Watershed Conservation Practices Handbook (FSH 2509.25) states that 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. This direction, over time, should reduce the number of degraded riparian areas on the Forest, and brook trout habitat will improve. Properly functioning riparian areas have greater capacity to minimize deleterious effects from surrounding management activities on stream habitats. Also, the PSICC Five-Year Fisheries Action Plan is heavily weighted with fish habitat improvement projects. The implementation of these projects will increase the amount and quality of brook trout habitat on the Forest.

Fish density and biomass are intimately linked to the quantity and quality of fish habitat within

streams and lakes. Based on fishery data from streams across the Analysis and Planning Areas, we conclude that no clear habitat trend is observable and therefore it is likely static.

Direct, Indirect and Cumulative Effects Common to Action Alternatives

The following description of effects to brook trout and greenback cutthroat trout are similar, if not identical, for each species. Because livestock have few direct effects on fish, we evaluated the direct effect of grazing on aquatic habitat, especially riparian areas.

Impacts to riparian systems from livestock grazing
Livestock can negatively affect four general components of riparian systems: 1) streamside vegetation; 2) stream channel morphology; 3) shape and quality of water column; and 4) structure of stream bank soil (Platts 1979, 1981a, 1981b, Kauffman and Krueger 1984, Platts and Nelson 1989).

In addition to providing key habitat requirements for many terrestrial species, vegetation next to water bodies plays a major role in sustaining the long-term integrity of aquatic systems. Values provided include thermal regulation, bank stability, fish cover, woody debris input, storage and release of sediment, flood attenuation, surface-ground water interactions, and plant-and-animal habitats. Riparian zones provide critical services for all ecosystem types, and are especially important in arid regions where they supply the primary source of moisture for plants and wildlife (Meehan et al. 1977). Riparian buffers must be managed with care to protect these values and services. Properly functioning riparian zones protect aquatic systems by acting as giant sponges during flood events, raising water tables and maintaining a source of stream-water during dry seasons (Belsky et al. 1999).

This analysis focuses 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.

Livestock grazing affects the riparian zones along stream corridors by changing, reducing, or eliminating vegetation, and can eliminate riparian zones altogether through channel widening, channel aggrading, or lowering of the water table (Platts 1991). Livestock grazing in riparian areas can cause changes in plant species composition (Schulz and Leininger 1990), reduce structural complexity (Ohmart and Anderson 1986), reduce understory, and replace native species with nonnative species (Krueper et al, 2003).

Several determinants of water quality including quantity of sediments and bacteria, water chemistry and stream temperature can be adversely impacted by livestock grazing. One of the primary hydrological impacts attributed to grazing is increased storm runoff and peak flows caused by an interaction of two chief factors: 1) greater soil compaction and thus decreased soil infiltration caused by trampling, and 2) less vegetation and litter on the surface to protect the soil

and absorb rain. Increased flood and peak flows results in greater erosion than would be observed otherwise. Erosion can lead to the presence of fine sediment in spawning gravel and is negatively related to the survival of fish embryos and emergent fry (Chapman 1988, Scrivener and Brownlee 1989, Weaver and Fraley 1993, Young et al. 1991).

Cumulative Effects of the Proposed Action
Below is a summary of historic and on-going activities within the analysis area that directly and indirectly affect aquatic species addressed in this assessment.

- Historic mining activities have impacted fish species addressed in this assessment and has also been responsible for shaping the landscape and vegetation today.
- Fire suppression has led to increased fuel loading and canopy closure. Fire suppression has prevented natural thinning of the predominantly lodgepole stands and limited tree growth.
- Numerous activities require continued use of, or construction of roads and trails. Roads in particular (as discussed above) increase soil erosion, increase sedimentation, fragment, and directly remove habitat and facilitate the spread of invasive and noxious weeds.
- Recreation is a frequent non-winter use of the Forest within the analysis area. Angling is a popular sport and directly removes individual fish.
- Introduction of non-native species such as brook, brown and rainbow trout have extirpated greenback cutthroat trout from most of their historic range through competition and hybridization. Simultaneously, brook and/or brown trout populations have spread and thrived in most fish-bearing streams across PSICC. Introduction of whirling disease from hatchery stockings of non-native salmonids has negatively impacted brook trout populations. Whirling disease was not present on the PSICC until after greenbacks were lost from most of their historic range.
- Beaver historically played a substantial role in forming stream and pond systems and controlling seasonal flows. However, during the rural period from approximately 1700 to 1910, beaver were “trapped-out” of much of the area. This created substantial modification to stream channels and riparian vegetation, negatively impacting greenback habitat.

Each of the above activities has cumulatively impacted both greenback and brook trout populations substantially through habitat fragmentation, habitat loss and habitat degradation. The implementation of the preferred alternative (Alternative C) should not contribute to the cumulative effects on brook trout, greenback cutthroat trout or their habitats significantly.

Effects of Rangeland Developments
To better address degraded hot-spots in riparian areas on some allotments, the proposed action includes establishment of water developments to better distribute livestock to the uplands and out of riparian areas altogether.

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. 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.

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 not result in a ground water deficit (authors' professional judgment).

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 DETERMINATIONS

Based on data from fish surveys from across the Analysis and Planning Areas, we conclude that genetically pure greenback cutthroat trout are absent from the Analysis Area, and there would be no effect (direct, indirect or cumulative) to their population viability.

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 riparian systems 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 systems 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 riparian systems improve, the quantity of suitable habitat for greenback cutthroat trout and brook trout would increase. 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)
Effects to brook trout and introgressed 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 degraded riparian areas are not moving toward the desired condition in an acceptable time-frame. Implementation of Alternative B will allow livestock grazing to continue under current management strategies. Alternative B does not require an intensive riparian Monitoring Plan or an Implementation Plan to guide decision makers, as does Alternative C. Alternative B also does not include proposed water developments and fencing needed to better distribute livestock across the allotment. This may result in livestock congregating and degrading some riparian areas as has historically occurred. Existing, degraded riparian areas may remain in that condition and new areas could become degraded. Lastly, specific design criteria developed for Alternative C to protect riparian habitats may not be implemented.

These effects, however, should not substantially impact introgressed greenbacks or brook trout. Introgressed greenbacks are regularly stocked by the CDOW in many streams within the Analysis and Planning Areas, offsetting any negative effects from implementation of Alternative B. Moreover, there are approximately 30 introgressed populations in the Planning Area, and negative impacts to the introgressed greenback population in Fourmile Creek would not affect the viability of these other populations or the population as a whole.

Brook trout are widespread across both the Analysis and Planning Areas and this project is small in scope, relative to the distribution of brook trout. Lastly, results from fish survey data indicate that fish populations in streams on grazing allotments are within the natural variability and sampling error of streams from ungrazed lands. We conclude from this that brook trout are not being differentially impacted from livestock grazing. Therefore, we have no viability concerns.

The cumulative effects from implementation of Alternative B will be greater than those under Alternative A or C. However, effects from Alternative B 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 brook trout or greenback cutthroat trout. 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 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 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. Secondly, 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. Thirdly, the Implementation Plan will guide decision makers on the appropriate responses to monitoring data. 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.

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 should benefit greenback cutthroat trout and brook trout through improved habitat protection. This may lead to an upward population trend and protect species viability.

3.6 BOTANY

The Analysis Area has a diverse vegetation species composition, structural stages, topography, and elevational ranges within its boundaries. Topography varies from steep-sided V-shaped canyons and U-shaped glaciated valleys to gentle valleys at the foothills of the mountains. Slopes range from flat on some of the grassland areas to vertical along the faces of rugged, rocky peaks. Forests and their understories vary with soil development, moisture, and exposure from moderate to extreme weather conditions.

The 67 pastures among the 11 active range allotments analyzed in this environmental assessment have a wide diversity of vegetation over the nearly 227,000 acres in the allotments. Among these vegetation types, some can be merged for convenience of discussion. Alpine tundra, alpine tundra/krumholtz, and barren are discussed as alpine. Shrub types, while very distinct vegetatively, are discussed together as an ecological type. Riparian and wetland types are also merged, as are ponderosa pine types.

ANALYSIS OF EFFECTS – FEDERALLY LISTED AND PROPOSED SPECIES

The USDI Fish and Wildlife Service has identified one federally listed species as having part of its range on the Pike and San Isabel National Forests. This is the threatened Penland's alpine fen

mustard (*Eutrema penlandii*).

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 Penland's alpine fen mustard 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, Penland's alpine fen mustard in the project area, the proposed project will have no effect (direct, indirect, or cumulative) on this species.

REGIONAL FORESTER'S SENSITIVE SPECIES

The table below includes Regional Forester's Sensitive Species, 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. 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 the table 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.

Table 3-8. TES, and RFSS plants with the potential to occur

Scientific name **Common name**	**Habitat**	**Status**	**Species present?**	**Habitat present?**	**Rationale for not carrying forward in analysis**
Aquilegia chrysantha var. *rydbergii* Rydberg's golden columbine	Montane, subalpine; rocky ravines near streams; 6000-8000 ft.	RFSS	No	No	Outside known range of species
Armeria maritima ssp. *sibirica* Siberian sea thrift	Alpine; tundra, grassy slopes; 11900-13000 ft.	RFSS	No	Yes	
Astragalus leptaleus Park milkvetch	Montane; sedge meadows, grassy streambanks; 6600-9000 ft.	RFSS	No	Yes	
Botrychium lineare Narrowleaf grapefern	Montane, subalpine; grass/forb meadows, sagebrush, cirqueland; 7900-11000 ft.	Federal candidate; RFSS	No	Yes	
Braya glabella Smooth northern-rockcress	Alpine; scree slopes; 12000-13000 ft.	RFSS	No	Yes	

Scientific name **Common name**	**Habitat**	**Status**	**Species present?**	**Habitat present?**	**Rationale for not carrying forward in analysis**
Carex diandra Lesser panicled sedge	Montane, subalpine; fens, wet meadows, pond shores; 7500-9650 ft.	RFSS	No	Yes	
Carex livida Livid sedge	Montane, subalpine; hummocks in rich fens; 8800-10100 ft.	RFSS	No	Yes	
Cypripedium parviflorum Lesser yellow-lady's-slipper	Montane, subalpine; moist forest, aspen groves; 7400-8500 ft.	RFSS	No	No	Outside known range of species
Draba exunguiculata Garys Peak draba	Alpine; talus slopes, fell fields; 11500-14000 ft.	RFSS	No	Yes	
Draba grayana Gray's draba	Alpine, subalpine; tundra, gravelly slopes; 11000-14000 ft.	RFSS	Yes (Browns Creek, Arkansas)	Yes	
Draba smithii Smith's draba	Montane, subalpine; canyons, talus slopes; 7700-13100 ft.	RFSS	No	No	Outside known range of species
Drosera rotundifolia Roundleaf sundew	Subalpine; peatmats, fens; 9100-9800 ft.		No	Yes	
Epipactis gigantea Stream orchid	Wetlands; open, early successional areas; 4800-8000 ft.	RFSS	No	Yes	
Eriogonum brandegeei Brandegee's buckwheat	Pinyon-juniper; open sagebrush; 5700-7600 ft.	RFSS	No (near Chalk Creek)	Yes	
Eriophorum altaicum var. *neogaeum* Whitebristle cottongrass	Alpine, subalpine; fens, marshes, streamsides; open water; 10160-13200 ft.	RFSS	Yes (Union)	Yes	
Eriophorum chamissonis Chamisso's cottongrass	Alpine, subalpine; fens, marshes, peat soils; 10400-12000 ft.	RFSS	No	Yes	
Eriophorum gracile Slender cottongrass	Montane, subalpine; graminoid dominated fens, wet meadows; 7000-11140 ft.	RFSS	No	No	Outside known range of species
Festuca hallii Plains rough fescue	Alpine, subalpine; tundra, dry grasslands; 11000-12000 ft.	RFSS	No	Yes	

Scientific name **Common name**	**Habitat**	**Status**	**Species present?**	**Habitat present?**	**Rationale for not carrying forward in analysis**
Ipomopsis globularis Hoosier Pass ipomopsis	Alpine, exposed ridges, gravelly slopes; 11500-14000 ft.	RFSS	No	Yes	
Kobresia simpliciuscula Simple bog sedge	Alpine; glacial outwash, wet fens with hummocks, moist gravelly tundra; 9000-12800 ft.	RFSS	No	Yes	
Machaeranthera coloradoensis Colorado tansyaster	Alpine, subalpine; parks, scree slopes, dry tundra; 7600-13000 ft.	RFSS	Yes (Union)	Yes	
Malaxis brachypoda White adder's-mouth orchid	Foothills, montane; in mosses along streams; 7200-8000 ft.	RFSS	No	No	Outside known range of species
Mimulus gemmiparus Rocky Mountain monkeyflower	Subalpine, montane; seepages, wet banks; 8400-11120 ft.	RFSS	No	No	Outside known range of species
Neoparrya lithophila Bill's neoparrya	Pinyon-juniper; xeric woodlands, cliffs; 7000-10000 ft.	RFSS	Yes (Bear Creek)	Yes	
Oreoxis humilis Rocky Mountain alpineparsley	Alpine drainage ways; 12000-13000 ft.; Pikes Peak endemic	RFSS	No	No	Outside known range of species
Parnassia kotzebuei Kotzebue's grass of Parnassus	Alpine, subalpine; wet rocky areas, moss mats; 10000-12500 ft.	RFSS	Yes (Union)	Yes	
Penstemon degeneri Degener's beardtongue	Subalpine, montane; meadows, pinyon-juniper woodlands; 6000-9500 ft.	RFSS	No	No	Outside known range of species
Potentilla rupincola Rock cinquefoil	Subalpine, montane; granitic outcrops, low tundra; 6500-11000 ft.	RFSS	No	No	Outside known range of species
Primula egaliksensis Greenland primrose	Montane; wet meadows, montane fens, edges of creeks; alkaline conditions; 9000-10000 ft.	RFSS	No	Yes	
Ptilagrostis porteri Porter's false needlegrass	Subalpine, alpine; willow carrs, hummocks; 9200-12000 ft.	RFSS	No	Yes	

Scientific name **Common name**	**Habitat**	**Status**	**Species present?**	**Habitat present?**	**Rationale for not carrying forward in analysis**
Ranunculus karelinii Ice cold buttercup	Alpine; scree slopes, dry rocky areas; 12000-14100 ft.	RFSS	No	Yes	
Rubus arcticus ssp. *acaulis* Dwarf raspberry	Wetlands; willow carrs, mossy streamsides; 8500-9700 ft.	RFSS	No	No	Outside known range of species
Salix arizonica Arizona willow	Subalpine; wet meadows, seeps, streams; 8300-10800 ft.	RFSS	No	No	Outside known range of species
Salix candida Sageleaf willow	Foothills, montane; rich fens with peat present; 8900-10040 ft.	RFSS	No	Yes	
Salix myrtillifolia var. *myrtillifolia* Blueberry willow	Foothills to alpine; rich fens; 8500-10000 ft.; South Park only in CO	RFSS	No	Yes	
Salix serissima Autumn willow	Montane; calcareous rich fens, peat present; saturated soils; 7800-9300 ft.	RFSS	No	No	Outside known range of species
Spiranthes diluvialis Diluvium ladies' tresses	Wet meadows along streams, springs, seeps; below 6500 ft.	Federally listed, threatened	No	No	Outside known range of species, outside elevational range of species, no habitat
Viola selkirkii Selkirk's violet	Montane, subalpine; cold mountain forests; 8500-9100 ft.	RFSS	No	No	Outside known range of species, no habitat

ANALYSIS OF EFFECTS – Sensitive Species

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. Species may be grouped by their specific edaphic (soil), moisture, or canopy closure requirements. Understanding plant habitat-guild distributions may be useful to assess effects of individual projects, or at the landscape scale, to assess how Forest Service management could affect species restricted to a small "neighborhood." 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, riparian, shrublands, and habitat generalist.

Direct and Indirect Effects Common to All Species Guilds

Alternative A (No grazing)
Under Alternative A, no livestock grazing would occur within any of the analyzed allotments. Ground disturbance and herbivory would be reduced to that which would occur under natural conditions. Soils would not be disturbed or eroded by livestock, nor would plants be uprooted by livestock. Hummocking and pedastaling caused by livestock would not increase and may reduce over time. No rangeland developments reducing available habitat would be constructed. Shifts in species composition to plants tolerant of disturbance or unpalatable species to livestock would be reduced and may be reversed over time.

Alternative B (Current Management)
Plants may be directly affected by herbivory and trampling. Herbivory may lead to reduced vigor and reproduction as plants compensate for lost tissues and energy. Plants may be uprooted. The indirect effects of livestock grazing include erosion and changes in species composition. Through removal of vegetation and hoof shear, livestock grazing may increase the amount of bare soil in high use areas, thus increasing the rate of soil loss. Livestock grazing can change species composition over time if the same area is grazed at the same time of year across multiple years. Plants may be further impacted by hummocking, pedestaling, and soil disturbance in their habitat. Hummocking and pedestaling may be caused by natural processes such as freeze-thaw cycles, elk or other wildlife, or livestock. Native plant species may be impacted through infestations of invasive plant species and the placement of rangeland developments.

Alternative C (Proposed Action)
Ground disturbance and detrimental impacts to the flora would be minimized. Design criteria to protect sites would be fully implemented. 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.

Cumulative Effects Common to All Species Guilds
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.

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. Numerous activities require continued use or construction of roads and trails. Roads in particular increase soil erosion, increase sedimentation, fragment and directly remove habitat and facilitate the spread of invasive and noxious weeds. Unregulated 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.

Localized timber harvest and thinning has led to a more open canopy in some areas with additional light reaching the forest floor, soil disturbance and compaction, development of skid roads, 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. Fire suppression has prevented natural thinning of forests. Denser stands are now more homogenous and susceptible to abnormal levels of insect and disease populations and tree mortality.

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

Direct and Indirect Effects to Habitat Guilds

There are no additional impacts to habitat guilds anticipated beyond those noted for the No Action Alternative and the Proposed Action Alternative. 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 adaptive management.

Alpine

Alternative B - Rangeland developments are rarely placed in alpine habitats, but would lead to intense local disturbance due to concentration of livestock. Erosion of alpine soils is an intensely negative effect as these natural communities develop and revegetate slowly. Soils in wet habitats would be compacted by livestock. Infestations of noxious weeds or invasive plant species resulting from livestock grazing have not yet been documented in the alpine zone.

Grassland

Alternative B – A beneficial effect of livestock grazing in these habitats is maintenance of the site in a more open condition. Many sites are currently being encroached by trees and shrubs as a result of fire suppression. Prescribed fire is a commonly used tool to increase available forage, and livestock are frequently put on the land following a fire to take advantage of palatable forage. Palatable species, if grazed to soon following fire, can be further stressed from herbivory and decline in vigor. Another rangeland management practice contributing to species composition shifts is grazing a pasture at the same time every year. Species most palatable at that time are impacted year after year and decline in vigor. Rotational grazing should improve these trends. Lack of rest may also impact species composition. 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.

Pinyon – Juniper and Shrublands

Alternative B - Substrates occupied by plants restricted to specific substrates are typically of low productivity being low in nutrients and organic matter, and often high in toxic compounds. Ground disturbance accelerates erosion and degrades habitat quality. Substrate specialist plants

tend to be poor competitors, tolerating harsh conditions in their habitats in exchange for a release from competition.

Riparian areas and Wetland

Alternative B - Changes in hydrology caused by livestock grazing may impact all riparian guild species. Under concentrated livestock grazing, stream channels may become shallower and wider. Continued impacts may lead to downcutting of the stream and a subsequent lowering of the water table. Once this process has begun, the extent of wetted soils (area, intensity, and duration) declines. Sedimentation may increase and water quality declines.

In wet meadows, livestock grazing contributes to or accelerates the development of hummocks and pedestals. Hummocking and pedestaling in wet meadows may cause excessive draining of the meadow and lead to a reduction in the area, intensity, and duration of wetted soil.

Cattle, due to their size and propensity for riparian areas, cause soil compaction. Hoof shear on streambanks leads to loss of vegetation, bank sloughing, unstable streambanks, and erosion. Eroding banks result in additional sedimentation in streams. These impacts are detrimental to riparian habitats and the species that inhabit them.

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. Some riparian areas are in a degraded condition with few willows and the flora is dominated by weedy species and increased amounts of bare soil on the banks.

Under pressure from continuous livestock grazing, native species may change in frequency, be replaced by other native species tolerant of these disturbances, or be replaced by non-native 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 drier conditions may invade the riparian zone. It indicates that the riparian zone may be degraded and that habitats for TEPS species or other members of the riparian guild may no longer be available.

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.

Activities such as livestock grazing that alter the amount or quality of water or sediment reaching wetlands may impact wetland species. Current stocking levels may not result in such impacts.

Determination of Effect and Rationale

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

- Cessation of livestock grazing would remove the risk of trampling and grazing by livestock of RFSS (Table 6).
- Species composition shifts toward unpalatable and often highly competitive species would be slowed or reversed.
- The risk of introducing and spreading noxious weeds and other highly competitive plant species would be lessened.
- Negative indirect impacts such as altering of water relations and hydrology would be minimized.
- No rangeland developments would be constructed.

A determination of "no impact" is made for all other RFSS.

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 *Draba grayana*, *Eriogonum brandegeei*, *Machaeranthera coloradoensis*, *Neoparrya lithophila* and *Parnassia kotzebuei* is based on the previous discussion and following rationale:

- Although livestock grazing may be detrimental to the above species due to impacts from herbivory, trampling, and uprooting, these species are mostly scattered in their habitats and at least some populations would escape impacts.
- Livestock impacts are detrimental, and changes induced by livestock grazing may be extremely slow to heal.
- Although undesirable species composition shifts are taking place, it cannot be demonstrated that such shifts would become widespread or intensified as a result of livestock grazing.
- *Draba grayana*, are all short-statured plants growing in areas of low plant cover that would likely receive little utilization from cattle.
- Extensive unsurveyed potential habitat exists within the Analysis Area.
- Monitoring data from the Analysis Area suggests that livestock grazing is contributing to species composition shifts toward highly competitive grazing-tolerant species.
- Habitats occupied by *Eriogonum brandegeei* are usually of low productivity with high percentages of bare ground, giving livestock little reason to loiter. Thus, most adverse effects result from livestock trailing through sites which causes limited impacts.

A determination of "likely to result in a loss of viability in the Planning Area, or in a trend toward federal listing" made for *Eriophorum altaicum* var. *neogaeum* based on the previous discussion and following rationale:

- There are only two known populations of this species within the planning area, and one of these is within the Union allotment. Livestock grazing can contribute to fen and wetland degradation.
- No inventory has been performed to determine the distribution or condition of fens on the PSICC.

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 *Draba grayana*, *Eriogonum brandegeei*, *Eriophorum altaicum* var. *neogaeum*, *Machaeranthera coloradoensis*, *Neoparrya lithophila* and *Parnassia kotzebuei* is based on the previous discussion and following rationale:

- Design criteria will be fully implemented and move habitats toward desired condition, minimizing impacts on the species listed above.
- Frequent quantitative monitoring shall be performed, allowing rangeland managers ample time to adjust management to avert negative impacts to the species listed above.

A determination of "no impact" is made for all other RFSS.

3.7 HYDROLOGY

A. Watershed

The Salida-Leadville project area is located in Chaffee, Lake, Park and Fremont counties, Colorado. Allotments within the project area primarily drain into the Arkansas River basin while small portions of the Bassam (11%) and Chubb (1%) allotments drain into the South Platte River Basin.

Map 3-1 shows the allotment boundaries, the 6th-level watershed boundaries and the watershed condition classes of those watersheds. The watershed condition classes will be discussed later in this document.

Table 3-9 displays additional hydrologic information about each allotment. The general location and the streams draining each allotment are identified. Primary 6th-level watersheds of the allotments are also shown. Downstream communities and or features from each allotment are also displayed.

Map 3-1: Allotments, 6th-level Watersheds and Watershed Condition Classes

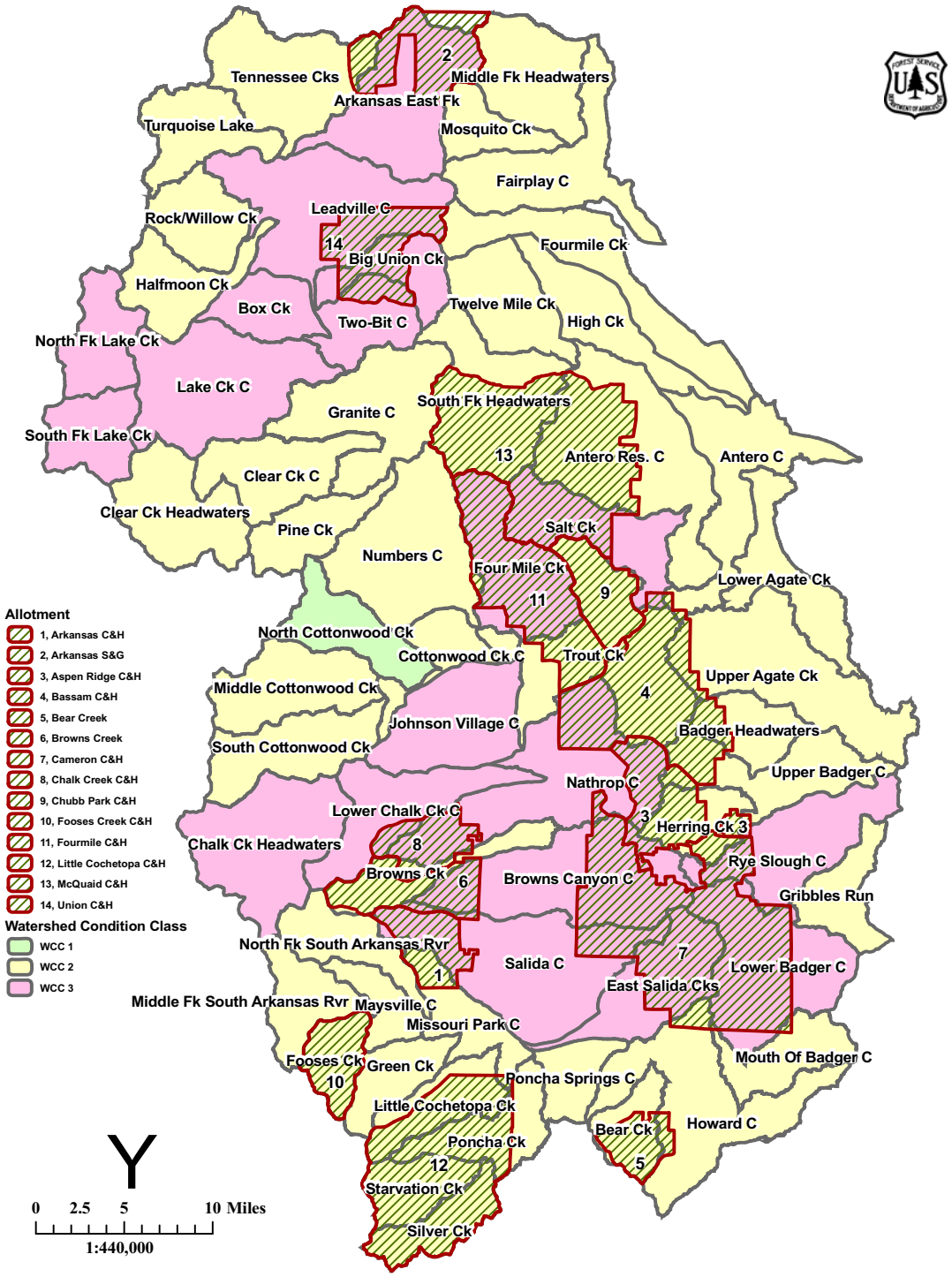

Table 3-9: General Allotment Location, 6th-level Watersheds & Downstream Communities/Features

Allotment Name	General Location – Drains	Primary, sixth-level watershed (Note: C = Composite)	Downstream Communities, Features
Arkansas C&H	Lower SE flanks of Shavano Peak (Weldon Gulch, Placer Creek, Squaw Creek)	Missouri Park C, Salida C	Poncha Springs, Salida
Aspen Ridge C&H	Upper Cottonwood Creek and Herring Creek watersheds (includes Calf, Cow and Bull Gulch)	Browns Canyon C, Herring Ck, Nathrop C, Upper Badger C	
Bassam C&H	South of US 285 and west of Kaufman Ridge (Castle Rock Gulch), Dry Lakes Creek and Sawmill Gulch, and Arnold and Bald Mountain Gulches	Badger Headwaters, Nathrop C, Trout Ck, Upper Agate Ck, Upper Badger C	Nathrop
Bear Creek C&H	Bear Creek, Rock Creek	Bear Ck, Howard C	Wellsville
Browns Creek C&H	Browns Creek and upper portions of Threemile and Fourmile Creeks	Browns Canyon C, Browns Ck, Salida C	Hecla Junction
Cameron C&H	Generally south of Cameron Mtn. and the west flanks of Graphite and Aspen Ridges	Browns Canyon C, East Salida Cks, Herring Ck, Lower Badger C, Rye Slough C, Salida C	Lots of interspersed private land ownership
Chalk Creek C&H	Generally east of Mount Antero (Eddy Creek, Raspberry Gulch and Little Browns Creek	Browns Ck, Nathrop C	Centerville
Chubb Park C&H	Upper Trout Creek and Chubb Creek west of Trout Creek Pass and Kaufman Ridge	Trout Ck	Includes significant State Land portion
Fourmile C&H	Fourmile and Sevenmile Creeks south of Buffalo Peaks. Also drier gulches west of Limestone Ridge in Trout Creek watershed.	Four Mile Ck, Trout Ck	Buena Vista, Johnson Village

Table 3-9 *Continued*: General Allotment Location, 6th-level Watersheds & Downstream Communities/Features

Allotment Name	General Location – Drains	Primary, sixth-level watershed (Note: C = Composite)	Downstream Communities, Features
Little Cochetopa C&H	Primarily Little Cochetopa and Poncha Creek watersheds SW of Poncha Springs	Little Cochetopa Ck, Poncha Ck, Starvation Ck	Poncha Springs, Salida
Union C&H	West central portion of Mosquito Range (Empire and Big Union Gulches)	Big Union Ck, Leadville C	Mount Massive Lakes area

B. Riparian & Wetland Areas

The riparian/wetland acreage of the allotments is displayed in Table 4. These riparian/wetland acres are extremely important to the health of the watershed. All of these acres are within the capable acres of the allotments, and they tend to be extremely productive. Because of their importance to the flora and fauna communities, all of these areas must be managed and protected to sustain their long-term productivity and health. Presently, there is a need to improve some of the riparian/wetlands areas within the allotments.

Table 3-10: Riparian Acreage of Allotments

Allotment Name	Capable Acres	Riparian Acres	Total
Arkansas C&H	7221	584	8.1%
Browns Creek	6618	783	11.8%
Little Cochetopa C&H	18592	2200	11.8%
Union C&H	6319	1169	18.5%
Aspen Ridge C&H	13243	589	4.4%
Bassam C&H	26649	976	3.7%
Bear Creek	1442	286	19.8%
Cameron C&H	26742	2183	8.2%
Chalk Creek C&H	4765	233	4.9%
Chubb Park C&H	5557	468	8.4%
Fourmile C&H	18227	1287	7.1%

C. Watershed Condition Class

The project area is located within twenty-nine 6th level watersheds as shown on Map 1 and Table 4. Existing condition of the allotments is summarized from a more general perspective in the Inland West Watershed Initiative (IWWI) project to more site specific information on the benchmark areas of the allotments. Water quality and stream/riparian areas of the allotments are also discussed in this section.

Table 3-11: IWWI Watershed Condition Class

COUNT	BASIN	WATERSHED	WATERSHED NAME	IWWI Rating
1	South Platte	101900010101	South Fk Headwaters	2
2	South Platte	101900010103	Antero Res. C	2
3	South Platte	101900010104	Salt Ck	3
4	South Platte	101900010105	Antero C	2
5	South Platte	101900010106	Upper Agate Ck	2
6	Arkansas	110200010103	Leadville C	3
7	Arkansas	110200010112	Big Union Ck	3
8	Arkansas	110200010310	Numbers C	2
9	Arkansas	110200010314	Four Mile Ck	3
10	Arkansas	110200010506	Trout Ck	2
11	Arkansas	110200010510	Nathrop C	3
12	Arkansas	110200010514	Browns Ck	2
13	Arkansas	110200010515	Browns Canyon C	3
14	Arkansas	110200010516	Salida C	3
15	Arkansas	110200010518	East Salida Cks	3
16	Arkansas	110200010602	Lower Chalk Ck C	3
17	Arkansas	110200010704	North Fk South Arkansas Rvr	2
18	Arkansas	110200010705	Missouri Park C	2
19	Arkansas	110200010708	Little Cochetopa Ck	2
20	Arkansas	110200010710	Starvation Ck	2
21	Arkansas	110200010712	Silver Ck	2
22	Arkansas	110200010714	Poncha Ck	2
23	Arkansas	110200010801	Howard C	2
24	Arkansas	110200010802	Bear Ck	2
25	Arkansas	110200010901	Badger Headwaters	2
26	Arkansas	110200010902	Upper Badger C	2
27	Arkansas	110200010905	Herring Ck	2
28	Arkansas	110200010907	Rye Slough C	3
29	Arkansas	110200010910	Lower Badger C	3

IWWI

In 1997 and 1999 the Pike and San Isabel National Forests, Cimarron and Comanche National Grasslands (PSICC) classified watershed conditions in the Inland West Watershed Initiative (IWWI) project. Watershed conditions classes (WCC) were developed and assigned a rating from healthy to degraded. Class I (WCC 1) watersheds are identified as those areas where current and past management activities have not significantly effected the function of stream and riparian areas. Class II (WCC 2) watersheds are identified as those areas where there are currently management activities occurring, and are not in a pristine condition. Class III (WCC 3) watersheds represent areas where major impacts to the land have resulted in severe damage to stream and riparian function.

Within the South Platte River basin the Salt Creek 6th level watershed and within the Arkansas River Basin the Leadville Composite, Big Union Creek, Four Mile Creek, Nathrop Composite, Browns Canyon Composite, Salida Composite, East Salida Creeks, Lower Chalk Creek Composite, Rye Slough Composite and Lower Badger Composite 6th level watersheds were rated in the Inland West Watershed Initiative (IWWI) as Class 3. Sources for sediment include erosion from unvegetated areas such as roads, trails, and bank erosion. The Forest Standards and Guidelines state that threshold sediment levels will not be increased by management activities. A threshold sediment level is the maximum level of sediment a stream can carry without adversely affecting the existing channel stability. The Forest Service has initiated monitoring of riparian condition using Proper Functioning Condition assessments (PFC) in many of these watersheds.

D. Water Quality

The waters of Colorado have been designated according to the beneficial uses for which they are presently suitable or intended to be suitable. The use classifications for streams in the project area are Class 1 Cold water aquatic life, Recreation 1, Water Supply and Agriculture (Colorado Department of Public Health and Environment, Water Quality Control Commission - CDPHE, 1999). State water quality standards require that the San Isabel National Forest comply with the classified beneficial use standard.

CDPHE 303(d) Streams

Chalk Creek has segments listed by the Water Quality Control Division of Colorado (WQCDC) for water quality impairment (CDPHE, 2006). Streams with a 303(d) designation mean that the segment is not meeting water quality standards for all beneficial uses, and require a Total Maximum Daily Load (TMDL). A TMDL determines the pollutant load a water body can accept without exceeding the applicable water quality criteria and allocates the defined load to the point and non-point sources. A TMDL is a process whereby pollutant sources are identified, allocated, and control measures are implemented and monitored

A very small portion of the Chalk Creek allotment (2.5% of the capable acreage) is tributary to Chalk Creek, and it is highly unlikely that grazing is having any effect on the metals concentrations for which this stream has been listed.

Table 3-12: 303(d) Streams

Stream Name	Affected Allotment	303d Impairment	Segment Length (miles)
Chalk Creek	Chalk Creek C&H	Metals	20.3

Summary of Benchmark Areas of Allotments

The San Isabel Zone Hydrologist and/or the hydrology field crew visited many of the allotments during the 2004 and 2005 field seasons, and benchmark areas were rated using the Proper Functioning Condition (PFC) method (USDI, 1998). Benchmark locations were selected by Forest Service Range Specialists. Entire allotments were not reviewed with PFC, stream segments within the allotments were evaluated. The PFC rating focuses on three areas:

- Hydrology
- Vegetation
- Erosion/Deposition

After answering questions related to each of these areas, the stream reach is then assigned a functional rating according to how well it meets the criteria established for each focus area. Functional ratings are as follows:

- Proper Functioning Condition
- Functioning-At Risk Upward Trend
- Functioning-At Risk Downward Trend
- Functioning-At Risk Trend Not Apparent
- Non-functional
- Unknown

PFC results for the benchmark areas are displayed in Table 3-13. Each stream segment or benchmark evaluated has photos that have been located with a global positioning system unit. These data points can serve as effectiveness monitoring points.

Table 3-13: PFC Ratings at Benchmark Areas (2005 Benchmarks only)

Allotment Name	District	Pasture Name	PFC Rating (a)
Arkansas C&H	Salida	Weldon Gul.	FAR (b)
Arkansas C&H	Salida	High Unit	NP (c)
Aspen Ridge C&H	Salida	Calf Gulch	FAR, downward
Aspen Ridge C&H	Salida	Coons Park	FAR, downward
Aspen Ridge C&H	Salida	Bull Gulch	FAR, downward (d)
Bassam C&H	Salida	Dry Lakes	Nonfunctional
Bassam C&H	Salida	Castle Rock Gul.	PFC
Chubb C&H	Salida	Salt Pass Unit	FAR, not apparent (e)
Bear C&H	Salida	Spring Gulch	FAR, downward
Browns Creek C&H	Salida	Upper	PFC
Browns Creek C&H	Salida	Middle	Drop as benchmark
Chalk Creek C&H	Salida	N/A	No benchmark
Cameron C&H	Salida	Willow	FAR, not apparent (e)
Fourmile C&H	Salida	Goddard	Not rated (f)
Fourmile C&H	Salida	Davis Meadows	PFC
Fourmile C&H	Salida	Sevenmile Cr.	PFC
Little Cochetopa C&H	Salida	Marshall Pass	PFC
Little Cochetopa C&H	Salida	Head of L. Coch.	PFC
Little Cochetopa C&H	Salida	Beaver Creek	PFC
Little Cochetopa C&H	Salida	Murphy's Hole	FAR, not apparent
Arkansas S&G	Leadville	N/A	No benchmark
Union C&H	Leadville	Empire Gulch	PFC
Union C&H	Leadville	Empire Reservoir	PFC

Notes: (a) PFC Functional Ratings: PFC = proper functioning condition; FAR = functioning at risk, trend; or nonfunctional.
(b) Trend not specified.
(c) NP = PFC not performed (group visit by ID Team; team completed existing/desired condition form instead).

(d) No points w/in benchmark, yet overall condition above and below BM is FAR.
(e) ID Team felt wasn't in downward trend, left as FAR, trend not apparent.
(f) No defined channel.

F. General Environmental Consequences

The environmental consequences of the proposed alternatives were determined from a qualitative watershed perspective. The primary concerns are riparian recovery, sediment delivery, retention and storage, water quality, and the amount of management that an alternative requires. The number of developed watering sites and new miles of pipeline are also displayed.

Table 3-14: Alternatives Comparison

Concern	Alternative A (No Grazing)	Alternative B (Current Management)	Alternative C (Adaptive Management)
Riparian Recovery Time	3-15 years	Continued status quo-acceptable in some places not in others	3-15+ years
Sediment Delivery	Lowest	Highest	Middle
Water Quality	Best – most rapid potential recovery relative to livestock impacts only	Continued generally unacceptable	Middle-much better than alternative 2 not as good as 1 relative to livestock impacts only
Management Needs/Intensity	Least (after disposition of developed watering sites)	Middle-low to moderate intensity depending on alternative	Most-intensive management
Number of developed watering sites	177	177	312
New miles of pipeline	0	0	40

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 (ponds, seeps, springs and the like) areas across the landscape and from developed sites in the uplands, too.

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 water sites are pits 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. Consumption of water by livestock on these allotments on average is assumed to be fairly constant, and therefore the amount consumed is not expected to vary between the alternatives. What is important, are the existing and proposed locations of these structures. Site suitability of the developed and proposed watering sites can be found in the Soil Specialist report for this project.

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.

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. Whether on- or off-channel the depletion from livestock is the equivalent of the water consumed. Well placed, off-channel storage sites can provide better water quality for livestock. These sites also improve the general water quality within the allotments as less trampling generally 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 site, 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.

A riparian area at PFC provides 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, it reduces sediment loading helping to meet state water quality standards. A healthy riparian condition provides protection against the extremes of temperature that can limit aquatic life. A healthy, properly functioning riparian system develops root masses that stabilize stream banks against cutting action and supports greater biodiversity. 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.

Many of 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, decreased sediment transport capacity and damaged fisheries habitat by filling riffle/pool complexes with sediment. Oftentimes, the stream channel adjustments result in downcutting and gullying. This in turn lowers the water table and dewaters riparian-associated wetlands.

Alternative A: No Action – No Livestock Grazing

***Direct Effects*:**
Discontinuing livestock grazing in the project area would allow for overall 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 areas would move toward desired conditions. Problems may still persist where multiple use activities and other improvements (i.e. roads and trails) exist.

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 3-15: Existing, Developed Watering Sites

Allotment	Number of Watering Sites
Arkansas C&H	10
Arkansas S&G	0
Aspen Ridge C&H	56
Bassam C&H	61
Bear Creek C&H	4
Browns Creek C&H	1
Cameron C&H	25
Chalk Creek C&H	3
Chubb Park C&H	6
Fourmile C&H	2
Little Cochetopa C&H	7
Union C&H	2
Total	**177**

***Indirect Effects*:**
Water quality and riparian health would start to improve as degraded 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 B: No Change -Livestock Grazing with Current Management
Under this alternative, grazing management would continue as it has in the recent past. According to 2004 and 2005 hydrologic data, current management has resulted in less than desired conditions on portions of several of the allotments.

Overall, there are 177 existing water developments on the eleven allotments covered in this hydrology report based on the current GIS coverage used for this report, see Table 11. Many of these occur in riparian areas. All water developments tend to congregate cattle and can lead to compaction, loss of ground cover, pedastaling, trampled banks and the like.

***Direct Effects*:**
Riparian and stream conditions at some benchmarks (some analyses outside benchmarks) are at PFC or functioning-at-risk with an upward trend. These areas may continue to improve or remain acceptable under this alternative. Other benchmarks were rated as functioning-at-risk with a downward trend or non-functional. These riparian areas and streams may continue to deteriorate with some declining into a non-functional PFC rating. Negatively affected areas will likely continue to expand. The existing, developed watering sites would continue to be utilized and require continue maintenance.

***Indirect Effects*:**
Where stream and riparian areas are at or approaching desired condition, the aquatic systems are 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 vertical stability) as a result of degraded conditions, the water table will drop resulting in a loss of riparian habitat.

Alternative 3: Livestock Grazing using Adaptive Management
This alternative would allow for continued grazing on NFS lands while providing the framework for improving rangeland conditions albeit at a more intensive management level. If the adaptive management alternative is implemented, there will be additional design criteria to follow and adaptive options to implement. This could facilitate riparian area recovery and improved stream health.

In order to move those portions of the capable rangeland from less than desired to desired conditions, adaptive option(s) would be implemented to facilitate improvement. Water-related range improvements and watershed improvement projects may be selected as adaptive options.

<u>Water-related Range Improvements</u>

Under the adaptive management alternative, there is a potential for 135 newly developed watering sites. This count assumes that the redevelopment of the source of an existing water system will not be fenced, yet the source of all new developments will be fenced. These 135 sites were tabulated by using Appendix B of the Rangeland Management Specialist Report, GIS, and supporting data tables.

Table 3-16: Existing and Proposed, Developed Watering Sites

Allotment	Number of Watering Sites
Arkansas C&H	16
Aspen Ridge C&H	80
Bassam C&H	113
Bear Creek C&H	10
Browns Creek C&H	1
Cameron C&H	45
Chalk Creek C&H	6
Chubb Park C&H	12
Fourmile C&H	9
Little Cochetopa C&H	18
Union C&H	2
Total	**312**

***Direct 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.

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.

***Indirect Effects*:**
Water quality would improve along with improved riparian conditions. Stream bank damage would be reduced, which would in turn reduce the amount of sediment aggradation in the stream. Stream temperatures would be reduced from increased shading by vegetation.

Cumulative Effects Common to All Alternatives
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 (Kirchner et al. 2001). Therefore, human and land management activities that alter the risk or the size of catastrophic erosion events have the greatest impact on sediment yield.

Cumulative Effects, Alternative A – No Action, No Livestock Grazing
Under this alternative, livestock grazing would no longer occur, and the direct effects from livestock would cease. As 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.

The elimination of 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 direct effects from livestock would continue to occur. Improper livestock grazing along the riparian area reduces the riparian vegetation and decreases the plants ability to hold the soil as the stream widens. 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 will delay such recovery.

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. 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 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 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 with Adaptive Management
If 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. Stream conditions could become healthier and thus be able to better withstand the effects from other activities in the watershed.

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 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 achieve desired conditions in these locations. Additionally, overall maintenance will increase with the addition of each system.

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 project area of the South Fork South Platte River and Arkansas River basins.

3.8 SOILS

Affected Environment

Introduction

The majority of the analysis area is located within the Arkansas River Drainage. The headwaters of the Arkansas River include the Arkansas East Fork and Tennessee Creeks, watersheds. A portion of the analysis area drains into the South Platt watershed. Included in this area are the South Fork Headwaters, Antero Reservoir, and Salt Creek Watersheds.

Geology for those allotments whose watersheds empty into the South Platte drainage is dominated by Paleozoic Pennsylvanian black shale and Missippian gray limestone. West of Trout Creek Pass, in the Arkansas River Valley, surficial shales and limestone give way to weathered, ancient granite and tertiary gravel.

In the last 160 years the soils of the area have gone through significant changes, particularly in the drainages or historic erosional channels. These changes are related to human use of the soil

resources. Logging, mining and grazing from the 1840's to the 1920's altered erosional and soil development patterns on a spatial and temporal scale that was different from pre-European conditions. Fire suppression and fenced grazing has more recently altered the natural disturbance patterns and created different vegetative spatial and temporal patterns that existed prior to European settlement

Short periods (1-5 years) of drought or wetter conditions now have significant impacts to overall ecosystem and soil health of the area. These short disturbance patterns can cause erosional events in natural surface conditions as well as accelerate erosion in disturbed areas such as roads and trails. These soil losses are generally not acceptable to current demands and use of the landscape.

Although the degree of soil impacts is varied across the analysis area, the greatest severity occurs in areas that are heavily used such as trail corridors, water developments, salting locations, springs and seeps, and stream corridors and their associated riparian 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 compromise 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.

Soil Erosion Hazard Rating

A detailed soil survey of the project area was completed in 1995. This survey provides information about the suitability of the soil for specific land uses and provides information as to the general physical and chemical characteristics of the soil. The Soil Erosion Hazard Rating system was used to describe the current potential of the soils in the project area. This rating system, based upon the hazard of soil loss due to water erosion following disturbance activities that expose the soil surface, is summarized by Allotment. Additional land use interpretations and soil suitability information can be found in the draft soil survey for the Northern San Isabel and Western Pike National Forests Soil and Ecological Land Unit Survey Area (Bruggink, et.al. unpublished)

Erosion Hazard Rating By Allotment

The ratings by allotment are used to indicate the sensitivity of a particular allotment to grazing uses. More than 40 percent of the land area in each of Arkansas S&G, Bear Creek C&H, and Browns C&H Allotments is rated as a Severe Erosion Hazard. Arkansas C&H, Aspen Ridge C&H, Bassam C&H, Chalk Creek C&H, Chubb Park C&H, Fourmile C&H, McQuaid C&H, and Union C&H all have less than 20 percent of their land areas rated as Severe. The ratings provide an indication of the suitability of each allotment to specific land uses that may cause surface soil disturbance. If grazing were to occur throughout these allotments, Arkansas S&G, Bear Creek C&H, and Browns C&H would have greater use restrictions in effect than the other allotments.

Allotment Improvements

Excluding fences, pipelines, and other linear improvements, there are 289 existing or proposed improvements in the allotments which comprise this analysis. Of these improvements, two hundred fifty-four are located on soils with an erosion hazard of one (low erosion hazard); twenty-five are located on soils with an erosion hazard of two (moderate erosion hazard); and ten are located on soils with an erosion hazard of three (high erosion hazard).

Of those improvements located on soils with an erosion hazard of three, five are gates; four are developed ponds; and one is a spring. The soils upon which the improvements are located are generally located on dry, south-facing slopes. There is a mixture of fine soil material and rock outcrop/loose rock. The soils are used for livestock grazing. Maintaining and enhancing the potential natural plant community adjacent to these improvements can reduce the erosion hazard.

Alternative A: No Action – No Livestock Grazing

Direct Effects
Under this alternative overall soil erosional losses would be reduced. In the short term, soil losses would continue to occur in those areas that have been identified as having poor range condition or showing signs of soil loss. 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 reestablished . Damage to willows and other riparian vegetation would be reduced, although elk would continue to exert some impacts on the vegetation.

Indirect Effects
Long-term soil productivity would increase due to a lessening of soil compaction and decreases in sheet and rill erosion and in areas where range condition and soil health are poor. 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. With an increase in vegetative biomass, litter, organic matter, and organic carbon would also increase. Increases surface litter and 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. Riparian health and streambank stabilization would improve in the complete absence of impacts by livestock.

Cumulative Effects Climate, Soils, and Ecological Units
Water quality and watershed health are likely to improve. Elimination of livestock grazing permits in this locality could jeopardize the viability of the ranches associated with those permits. Conversion of land use from ranching to housing developments with associated road

building within watersheds could lead to increased rapid runoff and greater stream sediment loads. Increases in OHV and other recreational uses could also lead to increased runoff and sediment loads in streams.

Alternative B- Current Management

Direct Effects
Under this alternative grazing management would continue as permitted without additional requirements for protection or improvement of soil and riparian resources. The direct effects would be a continuation or an increase of soil erosional losses on allotments 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.

Indirect Effects
The indirect effects would be a loss of long term soil productivity on allotments and areas that have a fair to poor 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 poor or degraded conditions would continue unnatural bank erosion and require greater time periods for recovery to a properly functioning condition.

Cumulative Effects Climate, Soils, and Ecological Units
Under this alternative the allotments would incur current or increased levels of potential soil losses. Roads in all areas and grazing in riparian areas currently show the greatest risk for soil losses in the project area. This alternative adds cumulatively to the potential soil losses of the area and to the potential impacts on the watersheds. Many of the upland and riparian areas had soil and water improvement projects during the 1960'-1970's. Since that time there has been an overall improvement in the health of the watersheds. More recently, several potential improvements to the watershed have been identified including road maintenance, soil and water project work, and changes in grazing management. This alternative does not emphasize any additional improvement or grazing alternatives to increase the level of watershed restoration or protection.

Alternative C - Proposed Management

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 pastures. Limiting grazing to capable areas, placement of salt in upland locations, water improvements, fencing, and frequent rotation of cattle could be added to allotment management. Research to evaluate the effects of experimental grazing strategies is possible under this alternative. 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.

Direct Effects
Because of the changes in management (timing, intensity frequency, shortening of seasons), vegetative cover should be increased on all upland and riparian areas. Soil retention on sites should be improved. Potential soil erosional 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 may include construction or 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.

Indirect Effects
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 Climate, Soils, and Ecological Units
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.

3.9 RECREATION AND SCENERY

Recreation - Affected Environment
The SLPA provides a diverse range of recreation opportunities to the rural communities in the upper Arkansas Valley River Basin east of the Continental Divide and to a lesser extent to the large population centers along the Front Range including the Denver and Colorado Springs metropolitan areas that are within a two to two and-a-half hour drive. The primary recreation acitivities include disperse camping, OHV trail riding, driving for pleasure, early season hunting, multiple trail uses (mountain biking, hiking, horseback riding, and motorcycling) and four-wheel driving. There are three long distance trails, one national trail (Continental Divide National Scenic Trail, CDNST) and two Regional trails (Colorado Trail and Rainbow Trail) that bisect several allotments within the SLPA. These trails are highly sought after for recreation activities and highly sensitive due to their national and regional status. The Fourmile Travel Management Plan involving close to 100,000 acres was approved in October 2002. This plan includes all of the Fourmile C&H, most of the Chubb Park C&H and Bassam C&H, and a small portion of the Aspen Ridge C&H.

The amount of recreation use ranges anywhere from light to heavy. Disperse camping along perennial streams is increasing and causing resource damage as is OHV activity. General public as well as outfitting and guiding activities include rock climbing, horseback rides, llama treks, mountain biking, fishing, backpacking, ATV rentals, scenic tours, four wheel driving, and hunting. Physical barriers and special order restrictions have been implemented in certain areas

to limit motorized use

There are an increasing number of conflicts between recreational users 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. This leads to complaints, some of which are justified when cattle are in O'Haver Lake Campground in the Little Cochetopa C&H allotment. It is difficult to keep gates closed and fences up. This also extends to criminal acts of vandalism on range improvements and harassing livestock. Many users are unaware that grazing is an acceptable practice in Wilderness areas that forbid most forms of resource extraction. Operators of motorized vehicles may not be familiar with the concept of open range grazing.

There are two designated wildernesses Buffalo Peaks, and Sangre De Cristo within the grazing allotments. The Fourmile C&H Allotment pasture in the Buffalo Peaks Wilderness is not used, so there is no effect. The upper part of the Bear Creek C&H Allotment is in the Sangre De Cristo Wilderness, but that portion of the allotment is not used, so there is no effect.

Through decades of neglect, many fences, gates and cattleguards are in disrepair and no longer serve their purposes of confining livestock. This allows animals to access roads, campgrounds and trails, leading to unnecessary conflict and complaints from the recreation community. Old fencing has been left in place on vacant allotments, where it may, in some cases, present a long-term safety issue for the public and wildlife. In addition, some see these fences as aesthetically unpleasing.

The responsibility for maintenance, funding, and possible removal of range improvements structures such as fencing, gates, and cattleguards needs to be fully defined. Improvements such as fencing in inactive or closed allotments are property of the Forest Service and priority should be put on finding funds to remove these improvements when an allotment is no longer in use.
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. Conflicts outside allotments would need to be addressed separately.

Recreation users need to be educated about the role and requirements of livestock grazing. Using signs, posters publications and web sites to alert and explain the presence of livestock may make users aware of the necessity of livestock grazing. People may be less inclined to leave gates open, vandalize range improvements, or harass livestock.

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.

Alternative A: No Livestock Grazing

Direct Effects:
Without grazing livestock, fencing, gates and other range improvements, recreation users may have a more natural and less restrictive experience. There may be fewer conflicts or complaints

from recreation users.

Indirect Effects:
The price of beef may rise if this trend becomes more wide spread. People could lose the connection of grazing on federal lands as a part of our history and culture. There could be an increase in fire spread do to the heavier fuel loading caused by livestock not grazing the grasses down and this could effect recreationist by having to leave the area or closing the area for fire restoration work.

Alternative B: Current Management

Direct Effects:
Conflicts will continue 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.

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 System lands and they may better understand the role of grazing on public lands.

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.

Cumulative Effects - All Alternatives
Considering the past, present, and reasonably foreseeable actions in the project area there are no other cumulative impacts caused by livestock grazing to recreation in the area. As recreation use increases they will be more interaction of the two increasing the chances of negative effects.

3.10 HERITAGE RESOURCES

The Pike and San Isabel National Forests cultural resources staff and various contractors and partners have conducted forty-five cultural resource inventories within the total area for all grazing allotments under study. As a result of these investigations, 407 historic properties (termed “prehistoric sites” or “historic sites”) have been identified and recorded. After the files search, the field survey of the forty-eight sampling units selected specifically for the grazing allotment analysis was done. As a result of this work, sixty-three previously unknown cultural

sites were identified and recorded. Adding the sixty-three new sites to the 407 previously known sites yields a total of 470 cultural properties within the analysis area for the Salida allotments. There are 168 historic cultural properties (or sites), 284 prehistoric sites and eighteen sites with 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).

The cultural resources within the Salida grazing allotments constitute an ample and rich record of prehistoric and historic human habitation and use of this portion of central Colorado – the valley of the Upper Arkansas and the adjacent hill and mountain slopes. 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 470 total cultural properties, 145 are listed in or are potentially eligible for listing in the National Register of Historic Places; the remaining 325 properties are not significant ("not eligible") in terms of the Register.

Most of the 284 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 Salida 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 years old and reflect the bark harvesting activities of late period (A.D. 1800-1870) Indian groups; 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 Salida allotments include tool stone quarries. One especially noteworthy quarry is the Trout Creek Jasper Quarry; prehistoric peoples mined at this location to obtain the raw tool stone which was worked into finished hunting spear and arrow points and other tool types used in processing plant and animal resources. This quarry served as a focal point for groups residing

in the Arkansas Hills and the Upper Arkansas in general and many of the 284 prehistoric properties contain material from this quarry or from nearby quarries with similar raw material.

Seventy-two prehistoric properties are eligible to the National Register of Historic Places and forty-eight 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 Salida 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.

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 includes the surviving constructions of CCC Work Camp F-34 which was situated within the Bassam Allotment. The conservation work completed by the camp crews include erosion control check dam systems, terraces and rock quarry sites in the Bassam and Chubb Park Allotment; these are historically important through their association with the Civilian Conservation Corps (CCC) of the late 1930s and its conservation efforts. The Bassam Guard Station in the Aspen Ridge Allotment is a preserved site reflecting Forest Service history.

This Forest Service Guard Station is listed on the Colorado State Register of Historic Places. Five railroad-related sites which include the former grades of the Colorado Midland, Denver, South Park & Pacific, and the Denver & Rio Grande Western Railroads, the Shirley Site and the Bath-Summit town site are eligible for listing in the National Register. An additional thirty-six sites representing the historic themes listed above have been determined eligible for listing in the National Register, but have not been officially listed; the remaining 126 historic sites are not eligible for listing in the National Register.

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.

<u>Alternative B</u>

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 Salida 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.

Most, if not all, soil types in the Salida 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 extremely 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 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 Salida 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 cause soil erosion and hastens 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 Salida 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.

Cumulative Effects
Under current management practices, there is slight to moderate loss of archeological soils and materials, especially in allotments 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 no 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. No 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, none of the examined cultural properties are situated in riparian zones; therefore, 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 A. 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 C.

Cumulative Effects

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

3.12 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 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 3-17: Present Value – Forest Service

	Alternative A	Alternative B	Alternative C
PV-Benefits	**$9,111.15**	**$76,855.57**	**$76,855.57**
PV-Costs	**-$6,000.00**	**-$52,396.47**	**-$82,994.23**
PNV-Net Value	**$3,111.15**	**$24,459.10**	**-$6,138.66**

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 Officer about the financial costs and benefits tied to selecting any of the alternatives analyzed in this document.

3.12 SUMMARY TABLE OF EFFECTS

Table 3-18: Summary of Effects

Concern	Alternative A (No Grazing)	Alternative B (Current Management)	Alternative C (Adaptive Management)
Range Water Developments	0 (within 10 years)	177	312
Active Allotments	0	11	11
Riparian Recovery Time	3-15 years	Continued status quo - 15+ years	3-15+ years
Sediment Delivery	Lowest	Highest	Middle
Water Quality	Best – most rapid potential recovery	Continued locally unacceptable	Middle-much better than Alternative B not as good as A
Management Needs/Intensity	Least	Middle-low to moderate intensity	Most-intensive management
Potential New miles of pipeline	0	0	40
Hudsonian emerald dragonfly	BI	MAII	MAII
Uncompahgre fritillary butterfly	NLAA-B	LAA	NLAA
Boreal toad	BI	LRLV	MAII
Northern leopard frog	BI	MAII	MAII
Bald eagle	BI	MAII	MAII
Black swift	BI	MAII	MAII
Boreal owl	BI	MAII	MAII
Brewer's sparrow	BI	MAII	MAII
Flammulated owl	BI	MAII	MAII
Gunnison sage-grouse	BI	MAII	MAII
Lewis' woodpecker	BI	MAII	MAII
Loggerhead shrike	BI	MAII	MAII
Mexican spotted owl	NLAA-B	LAA	NLAA
Northern goshawk	BI	MAII	MAII
Northern harrier	BI	MAII	MAII
Olive-sided flycatcher	BI	MAII	MAII
Peregrine falcon	BI	MAII	MAII
Purple martin	BI	MAII	MAII
Three-toed woodpecker	BI	MAII	MAII
White-tailed ptarmigan	BI	MAII	MAII
American marten	BI	MAII	MAII
Canada lynx	NLAA-B	LAA	NLAA
Common hog-nosed skunk	BI	MAII	MAII
Fringed myotis	BI	MAII	MAII
Gunnison's prairie dog	NLJCE MAII	NLJCE MAII	NLJCE MAII
North American wolverine	BI	MAII	MAII
Pygmy shrew	BI	MAII	MAII

Concern	Alternative A (No Grazing)	Alternative B (Current Management)	Alternative C (Adaptive Management)
Rocky Mnt. Bighorn Sheep	BI	MAII	MAII
Townsend's big-eared bat	BI	MAII	MAII
Greenback Cutthroat Trout	NE	NE	NE
Rocky Mountain Capshell Snail	BI	LRLV	MAII
Caddis Fly	NE	MAII	MAII
Penland's alpine fen mustard	NE	NE	NE
Aquilegia chrysantha var. rydbergii Rydberg's golden columbine	NI	NI	NI
Armeria maritima ssp. sibirica Siberian sea thrift	NI	NI	NI
Astragalus leptaleus Park milkvetch	NI	NI	NI
Botrychium lineare Narrowleaf grapefern	NI	NI	NI
Braya glabella Smooth northern-rockcress	NI	NI	NI
Carex diandra Lesser panicled sedge	NI	NI	NI
Carex livida Livid sedge	NI	NI	NI
Cypripedium parviflorum Lesser yellow-lady's-slipper	NI	NI	NI
Draba exunguiculata Garys Peak draba	NI	NI	NI
Draba grayana Gray's draba	BI	MAII	MAII
Draba smithii Smith's draba	NI	NI	NI
Drosera rotundifolia Roundleaf sundew	NI	NI	NI
Epipactis gigantea Stream orchid	NI	NI	NI
Eriogonum brandegeei Brandegee's buckwheat	NI	NI	NI
Eriophorum altaicum var. neogaeum Whitebristle cottongrass	BI	LRLV	MAII
Eriophorum chamissonis Chamisso's cottongrass	NI	NI	NI

Concern	Alternative A (No Grazing)	Alternative B (Current Management)	Alternative C (Adaptive Management)
Eriophorum gracile Slender cottongrass	NI	NI	NI
Festuca hallii Plains rough fescue	NI	NI	NI
Ipomopsis globularis Hoosier Pass ipomopsis	NI	NI	NI
Kobresia simpliciuscula Simple bog sedge	NI	NI	NI
Machaeranthera coloradoensis Colorado tansyaster	BI	MAII	MAII
Malaxis brachypoda White adder's-mouth orchid	NI	NI	NI
Mimulus gemmiparus Rocky Mountain monkeyflower	NI	NI	NI
Neoparrya lithophila Bill's neoparrya	BI	MAII	MAII
Oreoxis humilis Rocky Mountain alpineparsley	NI	NI	NI
Parnassia kotzebuei Kotzebue's grass of Parnassus	BI	MAII	MAII
Penstemon degeneri Degener's beardtongue	NI	NI	NI
Potentilla rupincola Rock cinquefoil	NI	NI	NI
Primula egaliksensis Greenland primrose	NI	NI	NI
Ptilagrostis porteri Porter's false needlegrass	NI	NI	NI
Ranunculus karelinii Ice cold buttercup	NI	NI	NI
Rubus arcticus ssp. acaulis Dwarf raspberry	NI	NI	NI
Salix arizonica Arizona willow	NI	NI	NI
Salix candida Sageleaf willow	NI	NI	NI
Salix myrtillifolia var. myrtillifolia Blueberry willow	NI	NI	NI
Salix serissima Autumn willow	NI	NI	NI
Spiranthes diluvialis Diluvium ladies' tresses	NE	NE	NE

Concern	Alternative A (No Grazing)	Alternative B (Current Management)	Alternative C (Adaptive Management)
Viola selkirkii Selkirk's violet	NI	NI	NI
PV-Benefits	$9,111.15	$76,855.57	$76,855.57
PV-Costs	-$6,000.00	-$52,396.47	-$82,994.23
PNV-Net Value	$3,111.15	$24,459.10	-$6,138.66