# Chapter 3
# Affected Environment

## A. INTRODUCTION

This chapter describes the existing condition of the environment that may be affected by the alternatives. This description of current resource conditions provides the basis for assessing the projected environmental effects of the alternatives discussed in Chapter 4 (Environmental Consequences). It also provides the context for assessing how the alternatives respond to the issues identified in Chapter 1:

- Riparian function
- Water Quality and Quantity
- TEPCS viability
- Socio-economic impacts

Included in this chapter are statistical analyses of condition and trend of major vegetation types. This data; from long-term trend studies, range site analysis, big-game range trend studies, and repeat photography; cumulatively indicates that 70% or more of the vegetation is in fair or better condition with in excess of 75% ground cover.

## B. HOW THIS CHAPTER IS ORGANIZED



## C. CHAPTER DEFINITIONS

A number of terms commonly used in rangeland management and analysis documentation occur throughout this chapter. There are many terms that are specific to rangeland issues. A glossary of definitions is included at the end of the chapter and in the appendix to ensure proper understanding of terms used in rangelands and rangeland management.

## D. DESCRIPTION OF ENVIRONMENT[1]

The eight grazing allotments within the Project Area cover approximately two-thirds (178,000 acres) of the 260,000-acre Beaver Ranger District—covering the southeast and northwest corners of the District and excluding the Beaver River corridor, the high-elevation alpine Tushar peaks, and the northeast corner below the fault-line escarpment (see Project Map at page ii). The Beaver District is located along the western edge of the Colorado Plateau province, Utah high plateaus subprovince, adjacent to the eastern edge of the Basin and Range Province. This area displays characteristics of both provinces, and some geologists would make this area a distinct physiographic province called the Basin and Range - Colorado Plateau Transition. Portions of Millard, Piute, Garfield, Beaver, and Iron Counties are within the Project Area. Beaver, Junction, Circleville, and Marysvale, are adjacent cities/towns. Elevations in the project area range from 5200' in Sevier Valley to over 12,000' on the Tushar Mountains.

### 1. Topography/Geography

Although the major alpine peaks of the Tushar range are not within the project area, the general topography of the area is defined by the prominence of these magnificent peaks. The Tushar Mountains, which at over 12,000 feet, are the second-highest mountain range in the state (just behind the powerful Uintas and just ahead of the imperious La Sals) rise from Beaver and I-15 at unbelievable angles and, on clear days, are visible from over 100 miles. The Tushar Range runs north from Utah Highway 153 (Hwy 53 dissects the project area within the Beaver River corridor from Beaver to Junction) for 20 alpine miles, extending northward to the Pahvant Mountains along the western edge of the Sevier River, from Mt. Holly through Mt. Belknap at the northern end. Chief peaks: Circleville Mt. (11,440 ft), Mt. Belknap (12,137 ft), and Delano Peak (12,173 ft). Rugged, forested canyons drape east and west from the crest of the range. The Tushar Mountains are the remnants of ancient volcanoes that formed thick piles of volcanic rocks (the Tushar peaks). Many of these volcanic rocks are rich in mineral deposits, including ores of gold, silver, mercury, copper, lead zinc, uranium, manganese, iron, aluminum, and potassium. The Kimberly Mine (see historical repeat photography in Appendix I), located in the Tushar Mountains, was once the Queen of Utah gold camps, employing 300 miners around the turn of the century. The town flourished until its mines closed in 1907. Erosion by water, wind, and glaciers over the past 15 million years has largely removed the distinctive volcano shape from these mountains. However, a drive through Marysvale Canyon, the east side of the range shows a profile of the volcano's flank with the several flows sloping off to the east. Here too, the distinctive yellow color of Big Rock Candy Mountain attests to the later stages of volcanic activity. Sulfer-laden fluids reacted to form sulfuric acid which then ate away much of the rock and gave it the distinctive sulphur yellow color. Similar sulphur deposits are also found at Cove Fort and Sulphurdale at the northeast corner of the Tushar Mountains. Here there is still enough heat left to form steam for an electrical generation plant that serves Provo. There is a northwest- to north-trending range-front fault along the east side of the Tushar Mountains, southwest of Marysvale. The fault is in an area of diffuse faulting in the Marysvale-Circleville area, west of the Sevier Valley fault.

### 2. Climate/Precipitation

The Fishlake National Forest has been in a prolonged drought, culminating with the driest year on record in 2001-02, when the seven-water basin area that covers Southern Utah had a year-end average

[1] Note: This section of Chapter 3 provides some general discussion of environmental elements and resources that occur within the project area. The resources discussed here were not specifically identified as key issues (i.e.: for which there is a dispute about the environmental effects of the Proposed Action that is an unresolved conflict). Detailed descriptions of the existing condition of the four identified issues are discussed separately at Sections E, F, G, and H of this chapter.

precipitation total of only 59% of normal. Records indicate that during this monitoring period, about 50% of the years were droughty, including 1994, 1996, 1999, 2000, and 2002. Some precipitation sites across the Forest demonstrated the variation in rainfall distribution and indicated even more frequent and more severe drought years. In areas across the Forest where there was a yearly alternating drought cycle, the carryover effect from the intermittent "wet" years probably moderated the cumulative impact of the several dry years.

While most of the moisture coming into the project area is associated with frontal systems from the Pacific Ocean, there is a period in mid- to late summer when convectional rainfall is very important. During this time, moist air masses from the Gulf of California or the Gulf of Mexico periodically enter the area. The moist air is unstable and convectional processes frequently cause cloudbursts and flash flooding. The heavy convectional precipitation tends to be localized, but in the narrow canyons of southern Utah the danger of flash floods is high both from local cloudbursts and from heavy downpours that might fall many miles upstream.

Precipitation varies with elevation; the analysis area receives approximately 8 inches of precipitation at lower elevations and up to 36 inches at the highest elevations. Freeze-free seasons last from 20 to 140 days. The high-elevation mountainous region of the Tushar Mountains provide for an undifferentiated highland climate. Mid-latitude highland climates are generally considered as humid regions with severely cold winters and cool to cold summers. The treeless summits have a tundra climate, where the temperatures are too cold to permit the growth of trees. Mean monthly temperatures in the highland zone are usually below 72ºF. In contrast the average June through August temperature in Beaver City is 85ºF. Beaver City, sitting on the eastern edge of the Great Basin desert and at the western foot of the Tushars, receives an average of 11.3 inches of precipitation each year. 3.6 inches (32%) of the annual total comes during the July through September summer period. In contrast, at the higher mountain elevations within the project area, the Beaver River Basin with Snotel precipitation stations at Big Flat and Merchants Valley average 32 inches of precipitation each year. Most of the precipitation falls on this mountainous region as snow. With the water year beginning on October 1, on the average, 57% of the precipitation comes by April 1, with a full 80% coming by the end of June. During the last 11 years, which encompasses the extended drought from the late 1990's into the new century, and although 2000, 2002, and 2004 were droughty years with 76%, 62%, and 79% of average, respectively, five of the eleven years were significantly above average yielding an eleven-year average of 96% of normal.

**Table 3-1 Average Annual Precipitation 1994-2004**

| Beaver River Water Basin | 1971-2000 Average | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual Precipitation | 31.6 | 25.7 | 40.6 | 26.4 | 44.5 | 39.6 | 31.8 | 24.3 | 31.0 | 19.5 | 26.5 | 25.0 |
| % of Average | -- | 81% | 129% | 83% | 141% | 124% | 100% | 76% | 97% | 62% | 84% | 79% |

The following table shows the average inches of precipitation delivered throughout the year at different elevations within the assessment area. Spring snowmelt usually creates the largest peak flows each year (Table 3-3), although intense summer thunderstorms have resulted in large floods in some watersheds.

| Table 3-2 Average Monthly Precipitation In Inches | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Site Name** | **Elev (Ft)** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Mean Annual** |
| **Big Flat** | 10290 | 2.4 | 2.5 | 3.2 | 3.7 | 3.3 | 4.0 | 3.3 | 3.1 | 1.6 | 1.7 | 3.3 | 1.9 | 34 |
| **Merchant Valley** | 8750 | 1.8 | 2.3 | 3.5 | 2.5 | 3.6 | 3.0 | 2.9 | 2.5 | 1.2 | 1.6 | 2.6 | 2.1 | 29.6 |
| **Beaver, Ut** | 5940 | 0.9 | 0.7 | 0.8 | 0.8 | 0.9 | 1.1 | 1.0 | 1.0 | 0.6 | 1.2 | 1.5 | 1.0 | 11.3 |

| Table 3-3 Annual Streamflow Data For The Beaver River Gaging Station | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station Name** | **Period of Record** | **Avg total period of record annual flow (kac-ft)** | **1999** | | **2000** | | **2001** | | **2002** | | **Rank of lowest total annual flow, 2002** |
| | | | **Total anniual flow (kac-ft)** | **Percent of Average** | **Total annual flow (kac-ft)** | **Percent of Average** | **Total annual flow (kac-ft)** | **Percent of Average** | **Total annual flow (kac-ft)** | **Percent of Average** | |
| **Beaver River** | **1915-2002** | **38** | **37** | **97** | **25** | **65** | **29** | **77** | **16** | **41** | **3** |

## 3. Major Vegetation Types

Vegetation communities depend on elevation, precipitation and aspect. Pinyon-juniper communities occur at the lowest elevations within the analysis area on alluvial fans, valleys, hillsides, benches, mountainsides, canyon walls and ridge tops. Big sagebrush, black and low sage, and mountain brush communities are found at middle elevations on alluvial fans, valleys, hillsides, benches, paleo-landslides, canyon walls, mountainsides, mountain summits and ridge tops. Mixed conifer and seral and stable aspen occur at successively higher elevations on hillsides, benches, paleo-landslides, canyon walls, plateau side-slopes, mountainsides and mountain summits. Spruce-fir communities grow at high elevations, particularly on north aspects on benches, canyon walls, mountainsides, mountain summits, and ridge tops. Subalpine vegetation communities on valleys, benches, plateau side-slopes and mountainsides dominate the highest elevations within the project area. Small areas of ponderosa pine trees are found growing on extremely cobbly sandy loam soils at middle and high elevations on mountainsides. Primarily riparian-aquatic vegetation communities dominate areas along drainage ways and stream terraces. Although the Fish Creek and Bullion Research Natural Areas are located in the vicinity, no existing RNA's are within the Project Area.

The following vegetation community type acreages are derived from Graphic Information System (GIS) analysis data compiled for the current Forest Plan revision process. The acreage figures may differ somewhat from original range analysis maps. The major vegetation community on all but the Cottonwood Creek and Junction Allotments is Mixed Conifer and Ponderosa Pine (MC/PPine), which makes up 40% of the total acreage within the project area. Next in order of composition is the pinyon-juniper (PJ) type, which makes up 25% of the area. PJ is the major component of the Cottonwood Creek (100%) and Junction Allotments (92%), in contrast to the North Indian (11%) and the South Beaver (11%) Allotments where the MC/PPine type prevails at 53% and 55%, respectively. Neither aspen nor sagebrush are major community types on any of the allotments, averaging at only 4% and 5%, respectively, of the total landscape. Likewise, grasslands and riparian areas, combined, average less than 3% of the total allotment acreage. See the Vegetation Types map in Appendix K for a spatial display of vegetation communities.

| Table 3-4 Forest Plan Revision Modeling Of Major Vegetation Communities | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Allotment % Veg Type** | **Mt. Brush** | **MC, PPine** | **N/A** | **Grass** | **PJ** | **Aspen** | **Oak** | **Riparian** | **Sagebrush** | **Water** | **Crop land** | **Total Acres** |
| Circleville | 4.027 | 12,975 | 335 | 2,084 | 9,924 | 2,274 | 2,291 | 38 | 3,631 | | | 37,579 |
| % | 11% | 35% | 1% | 5% | 26% | 6% | 6% | | 10% | | | |
| Cottonwood Creek | | | | | 423 | | | | | | | 423 |
| % | | | | | 100% | | | | | | | |
| Junction | | 164 | | | 5,361 | | 185 | 50 | 58 | | | 5,818 |
| % | | 3% | | | 92% | | 3% | 3% | 3% | | | |
| Marysvale | 1,815 | 1,966 | | 63 | 3,180 | | 1 | 77 | 2 | | | 7,103 |
| % | 25% | 28% | | 1% | 45% | | | 1% | | | | |
| North Indian | 6,207 | 21,087 | 1,493 | 346 | 4,260 | 1,475 | 3,434 | 219 | 326 | 32 | 2 | 38,881 |
| % | 16% | 53% | 4% | 1% | 11% | 4% | 9% | 1% | 1% | | | |
| Pine Creek Sulphurdale | 5,359 | 5,445 | | 1 | 12,351 | 522 | 5,711 | 162 | 661 | 1 | | 30,212 |
| % | 18% | 18% | | | 40% | 2% | 19% | 1% | 2% | | | |
| South Beaver | 5,199 | 24,619 | | 1,472 | 5,124 | 2,673 | 3,958 | 100 | 1,754 | 171 | | 45,069 |
| % | 12% | 55% | | 3% | 11% | 6% | 9% | | 4% | | | |
| Ten Mile | 1,841 | 4,372 | | 411 | 3,359 | 344 | 365 | 95 | 1,686 | | | 12,472 |
| % | 1%5 | 35% | | 3% | 27% | 3% | 3% | 1% | 13% | | | |
| Total | 24,449 | 70,628 | 1,829 | 4,376 | 43,982 | 7,287 | 15,944 | 741 | 8,117 | 203 | 2 | 177,555 |
| % | 14% | 40% | 1% | 2% | 25% | 4% | 9% | <1% | 5% | <1% | <<1% | |

## 4. Landscape Scale Assessments of Major Vegetation Types

- **Properly Functioning Condition (PFC) Assessment of Existing Condition[2].** Vegetative communities are frequently described by vegetative community type and whether or not these communities are within the parameters of properly functioning condition (PFC). For vegetation, properly functioning condition can be defined as one in which the vegetation is resilient to perturbations to structure, composition and function, and is sustainable over time. Vegetation that is within its historic range of variation is commonly assumed to be properly functioning.

| Table 3-5 Existing and Desired Condition of Major Vegetation Types | | | |
|---|---|---|---|
| **Vegetation Type** | **Existing Condition** | **PFC Assessment** | **Desired Condition** |
| **Aspen** | Approximately 85 percent of the quaking aspen are in the mid-age, mature and old-age condition. Many aspen stands are being replaced by conifers through plant succession. Approximately 60 percent of aspen have succeeded to conifers and 10 percent to sagebrush. | **High Risk.** There is a high probability that significant acreage of this community will continue to succeed to other vegetation types. | Aspen ecosystems contain a variety of age classes, reflected in diverse structural components distributed across the landscape. Aspen systems regain dominance, reclaimed mainly from Englemann spruce/subalpine fir and mixed conifer types accompanied by marked increases in understory vegetation and groundcover. Conifers occupy less than 15% of the canopy. Mature and old aspen stands comprise about 30% of the structural class distribution. Young aspen comprise about 40% of the structural class distribution. Dominant aspen trees are generally less than 100 years old. Other age classes are evenly distributed between early, young, and mid age classes. Associated herbaceous and woody vegetation are highly variable. Perennial grasses and forbs dominate these areas with a range of shrub |

[2] Landscape level assessments of vegetation community existing conditions are taken from the Properly Functioning Condition Assessment, Utah High Plateaus and Mountain Section, July 1996. These are subjective assessments made at a broad scale, based upon on-the-ground work experience within these specific communities and personal, professional knowledge and exposure to community types in the State of Utah. Decline in understory biomass production is discussed in terms of its relation to canopy closure, rather than any site-specific study.

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| | | | cover. Bare ground is minimal within aspen systems. Aspen regeneration success is achieved. |
| **Pinyon-Juniper** | Pinyon-juniper currently exceeds its historical distribution and density by as much as 60 percent. The proportion of stands in early to mid-seral condition is less than characteristic under historical conditions. Erosion rates in dense stands are accelerated because there is little understory vegetation to help retain the soil. | **High Risk.** The risk associated with this cover type is high because of accelerated erosion caused by reduced herbaceous ground cover. | Pinyon pine and Juniper cover types are managed to return to natural historic ranges within shallow, rocky soils and rough topography where fuels are sparse or absent and fire occurrence is limited. The desired condition is to improve or maintain stable watershed conditions by maintaining vegetation with healthy ground cover and plant communities dominated by desired perennial grasses, forbs, with a range of shrub cover. Invasion and dominance by cheatgrass is limited by reestablishment of native grass species. Properly functioning uplands with associated herbaceous and woody vegetation provides for plant communities that are diverse in seral status and structure and provide food and habitat for game and nongame animals, songbirds, raptors, and reptiles, forage for livestock, and a variety of recreational opportunities and aesthetic values. Mature and old structure conditions account for about 40% of p/j acres. The remainder occurs in earlier successional stages containing a patchwork of shrubs and forage components. Natural disturbance regimes (generally fire) encourage an ever-changing patchwork restraining p/j from becoming dominant within sagebrush systems. Microbiotic crusts, which are generally found only in the p/j or dry sagebrush types, are present, protected, or encouraged to re-establish. |
| **Sagebrush-Grass** | The sagebrush ecosystem is characterized by shrubs, principally of the genus Artemisia, which are usually one to seven feet high. This is a vegetation community whose vegetation is overwhelmingly dominated by sagebrush, with a preponderance on some sites approaching a monoculture. Most sagebrush stands are currently outside a balanced range of structural classes and are not functioning properly. Most presently occur as mature plants in sites with more than 15 percent sagebrush cover and greater than 20 percent bare mineral soil exposed. Soil stability and productivity may be seriously affected from a loss in understory production. | **Moderate Risk.** The risk of soil loss and subsequent damage to sites is high. Soil stability and productivity may be seriously affected from a loss in understory production. | The desired condition is to improve or maintain stable watershed conditions by maintaining vegetation with healthy ground cover and plant communities dominated by desired perennial grasses and forbs, with a range of shrub cover. Properly functioning uplands with associated herbaceous and woody vegetation provides for plant communities that are diverse in seral status and structure and provide food and habitat for game and nongame animals, songbirds, raptors, and reptiles, forage for livestock, and a variety of recreational opportunities and aesthetic values. Ground cover is sufficient to provide protection from erosion. Soils are productive and support mu ltiple age shrubs, forbs, and native grasses. The desired mix of cover classes for sustainable sagebrush ecosystems for all ecological purposes and needs is:10 percent of the sagebrush area has 0 to 5 percent shrub canopy cover; 50 percent of the sagebrush area has 6 to 15 percent shrub canopy cover; 40 percent of the sagebrush area has greater than 15 percent shrub canopy cover. |
| **Mt. Brush** | Fire control has allowed other species such as pinyon-juniper and sagebrush to replace mountain brush communities in some areas. Mountain mahogany is primarily in an old structural condition and is not successfully regenerating. Birch | **Moderate Risk.** The risk is slow to moderate for a slow, continued decline of mahogany species, while oak is not presently at risk. | Mountain brush communities (combinations of mainly curl leaf mountain mahogany, birch leaf mountain mahogany, serviceberry, manzanita, currant, ceanothus, nine bark, rose, Gambel oak, Sonoran scrub oak, and sagebrush) along with a variety of grasses and forbs consist of multiple vegetation layers with alternating vertical dominance. Stands of vigorous, reproducing plants with a dense |

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|---|---|---|---|
| | leaf mahogany remains in good condition on north-facing slopes; however, on southerly slopes, especially where wild ungulate use is heavy, a continued decline will eventually lead to a decline on north aspects, as ungulates search for food. Gambel oak is judged to be in moderate to excellent condition throughout its range. | | grass/forb understory provide for good ground cover conditions for maintenance of healthy watershed conditions. Satisfactory condition for browse species in big game winter range is described based on the maintenance of stands of vigorous, reproducing plants and healthy ground cover conditions. |
| **Meadows, Mountain Grasslands and Parklands** | Succession of Engelmann spruce and subalpine fir into meadows and open, high-mountain parks is altering the historical patterns and proportions in the vegetation mosaic. | **High Risk.** There is a high probability that significant acreage of this community will continue to succeed to Engelmann spruce and subalpine fir. | Mountain grasslands and parklands are maintained as open, un-timbered areas dominated by grasses, grass-like plants, and forbs. Ground cover is sufficient to provide protection from erosion. Meadows, mountain grasslands, and high mountain parklands provide beautiful pastoral openings and exposures and opportunities for unobstructed mountain vistas that are not observable from mountain terrain completely cloaked in forest. Meadows encompass a broad environmental spectrum including: wet meadows (perennially saturated), dry meadows (only wet early in growing season), alpine meadows (high elevation), bogs (always wet, somewhat stagnant), and seeps. |
| **Englemann Spruce-Subalpine fir** | Structural stages are not balanced in this community. Age classes are primarily old age classes, with few areas in seedling/sapling sized Engelmann spruce. Spruce beetle is rapidly changing the age and structural conditions over much of the area. Current and recent Engelmann spruce beetle epidemics have affected extensive landscapes, favoring a shift to more dominance by subalpine fir. | **High Risk.** Potential major changes in stand structure and composition are probable for this community as a result of the late seral structure. | Englemann spruce-subalpine fir communities are composed either of pure Englemann spruce or mixed stands of spruce, subalpine fir and aspen. The mature and old structure components represent about 40% of the spruce-fir systems with the remainder distributed within younger structural classes. Insect and disease populations are generally at endemic levels. Localized insect or disease outbreaks are generally confined by a variety of structural and successional stages. Large areas of bug-killed Engelmann spruce forest are restored to natural mosaics and landscapes. Stands in early seral condition are advancing through successional stages to return to pure and mixed stands of mature and old growth conifer. Number and size of stand-replacing fires and loss of the timber component is minimized, limiting the loss of the organic layer, critical soil nutrients, and soil erosion. |
| **Noxious Weeds and Invasive Plants** | Approximately 2,423 acres of invasive noxious weeds occur on North Indian Creek, Marysvale, Circleville, and Pine Creek/Sulphurdale allotments, including: leafy spurge (1 ac), musk thistle (20 ac), scotch thistle (1563 ac), diffuse knapweed (1 ac), dalmation toadflax (1 ac), russian knapweed (1 ac), and whitetop (836 ac). | **High Risk.** This community type is currently described as at a high level of departure from properly functioning condition, which places the health and viability of aquatic and riparian species at some degree of risk. | The desired future condition of the Forest would have an absence of any new invader noxious weed species. Current noxious weed infestations are controlled and contained to existing sites. Early detection, rapid response, and effective control measures are effective in eradicating new species and small infestations. A significant reduction of established infestation species is desired in areas receiving heavy human use and areas with special management objectives. |
| **Riparian Areas** | During the most recent decades, riparian areas have been significantly affected by | **High Risk.** The greatest risk of invasion, spread | Riparian areas in Late seral stages or Potential Natural Community (PNC) are maintained, and areas in Very Early to Mid seral status are improved to Mid seral |

| | | | |
|---|---|---|---|
| | succession to conifer species. Changes in fire frequencies and interruption of historic disturbance patterns have encouraged encroachment by conifers. Increased conifer densities have led to decades of reduced flows, lowered water tables, exotic plant encroachment, increased water temperatures, concentrated runoff, and changes in vegetation density and composition. Some riparian areas suffer from loss of soil-holding vegetation. | and dominance by exotic invasive plants is expected to occur in the Wyoming big sagebrush, pinyon-juniper, oak, and mountain shrub communities. Within these communities, cheatgtrass and other introduced plants have demonstrated their potential to dominate. | and/or Late seral status, consistent with inherent capabilities of the ecosystem. Riparian zones host a diverse structure, age class and composition of native riparian dependent species. Riparian area vegetation includes: conifers, aspen, willows, box elder, maple, dogwood, birch, alder, cottonwoods, sedges, rushes, and grasses. The stream substrate, gradient, elevation, and disturbance history determine plant occurrence. Plant communities are healthy and self-perpetuating. Woody vegetation provides a variety of size classes, wildlife habitats, stream shading, snags and down logs, aesthetic values, and supports other ecosystem functions. Riparian areas have stable stream banks, shorelines, and channels, which meet State water quality standards. Stream channels maintain a seasonal water level elevation in which the bank full discharges access the floodplain regularly, thereby recharging riparian aquifers, ameliorating spring floods, and providing for optimal late season stream flows and cool water temperatures necessary to provide for full support of the streams' beneficial uses. Low-gradient riparian areas have restored sinuosity and naturally meandering channels. Residual vegetative biomass traps sediment and builds and enlarges meadows. |

- **Ecosystem Assessment.** In 1998 The Fishlake National Forest Ecosystem Assessment was completed to evaluate the health and well-being of all lands included in the Forest http://www.fs.fed.us/r4/fishlake/forest.report/ecosystem.html . A total of 1,582,000 acres were analyzed. The assessment identified seven primary vegetation cover types and a miscellaneous "Other" category which included alpine, mountain mahogany, riparian, and tall forb communities. The following table provides perspective on the present composition of the Fishlake National Forest. This data can relatively be compared to the Beaver Ranger District.

**Table 3-6 Fishlake National Forest Ecosystem Assessment**

| Vegetation Types | Acres | Existing % | Historical % | Desired % |
|---|---|---|---|---|
| **Pinyon pine/juniper** | 341,419 | 22 | 5 | 10 |
| **Spruce/fir** | 309,639 | 20 | 3 | 10 |
| **Sagebrush/grass/forb** | 306,652 | 19 | 21 | 21 |
| **Aspen** | 251,058 | 16 | 34 | 26 |
| **Gambel oak** | 164,862 | 10 | 11 | 11 |
| **Other** | 98,059 | 6 | 11 | 10 |
| **Mountain brush** | 69,333 | 4 | 7 | 6 |
| **Ponderosa pine** | 41,307 | 3 | 9 | 5 |

All of the vegetation types present are shaped and influenced by fire. With the settlement of the areas around the Forest and use of the Forest by settlers, the frequency of fire dramatically decreased. With the decrease came changes in the amount and distribution of the various cover types. For instance, the assessment reported that the amount of land area in the spruce/fir cover type today is almost seven (7) times that which existed prior to settlement. Likewise, the land area in pinyon pine/juniper today is four (4) times that which existed prior to settlement. On the other hand, the land area in aspen cover type today is only 47% of that which existed prior to European settlement. Much of this change can be attributed to the exclusion of fire from the landscape.

## 5. **Condition and Trend of Major Vegetation Types**.

For the purposes of determining rangeland condition and trend, several evaluations have been made, including 1) Parker 3-Step long-term trend studies, 2) re-reading of range site analyses in 2001 and 2002, 3) the Utah Division of Wildlife Resources Big Game Range Trend monitoring studies conducted in 1985, 1991, 1998, and 2003, 4) Dr. Charles Kay's repeat photography comparison study, and 5) Condition of Range Revegetation projects. Range ecological condition (composition and vigor) is generally stable to up. In current terms this would equate to sustainable. The degree to which encroachment by PJ, sagebrush, and mixed conifer is occurring suggests that most range sites are "at risk". The presence and expansion of noxious weeds, although relatively small in acreage, also is an indicator of being "at risk". Trend, as indicated by ground cover, is generally stable to up.

### a. **Long-Term Trend Studies**

- **Parker 3-Steps and Nested Frequencies.** In the early 1980's Parker 3-Step studies were abandoned as the method for determining range ecological condition and trend. These established study sites were to be replaced by Nested Frequency transects. Nested Frequency studies have been installed, but have not been reread, in the following allotments:

**Table 3-7 Nested Frequency Long-Term Trend Studies**

| Allotment | Nest Frequency Study | Year Established |
|---|---|---|
| North Indian Creek | Indian Rangers Pasture | 1987 |
| | Miller Hollow | 1986 |
| Pine Creek/Sulphurdale | Brush Creek | 1985 |
| South Beaver | Big Twist | 1986 |
| Circleville | Birch Creek Wildlife | 1985 |
| | Betensen Flat | 1986 |

**Table 3-8 Parker 3-Step Long-Term Trend Studies**

| Allotment | Parker 3-Step | Vegetation Score | | | | Trnd | % Ground Cover | | | Trnd |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Study Yrs | Base | Last | Chng | | Base | Last | Chng | |
| PC/Sulphurdale | Brush Creek | 1953-1977 | -20 | -6 | +14 | ? | 86 | 95 | +9 | ? |
| South Beaver | Coyote | 1956-1977 | 89 | 70 | -19 | ? | 82 | 75 | -7 | ? |
| South Beaver | Widemouth | 1964-1977 | 35 | 60 | +25 | ? | 80 | 69 | -11 | ? |
| South Beaver | Round Flat | 1954-1975 | 68 | 50 | -18 | ? | 74 | 66 | -8 | ? |
| Circleville | Pole Canyon | 1953-1979 | 23 | 74 | +51 | ? | 74 | 89 | +15 | ? |
| Circleville | Betenson Flat | 1957-1975 | 44 | 40 | +4 | ? | 53 | 64 | +11 | ? |
| Ten Mile | City Crk 344 & 5 | 1964-1975 | 51 | 53 | +2 | ? | 88 | 88 | 0 | ? |
| Ten Mile | City Crk 341,2,3 | 1954-1969 | 28 | 39 | +11 | ? | 85 | 89 | +4 | ? |

At the time these studies were completed, 6 of the 8 studies (75%) showed vegetation condition to be stable or up and 5 (63%) showed ground cover to be stable or up, as well. Average ground cover was 79%. This compares to the 80% average ground cover determined in the 2000-2002 range site analyses studies.

In addition to the Parker 3-Step studies, some of the Range Site Analyses were established to help determine long-term trend. Of the 6 studies showing a vegetation trend, 67% (4) were in a stable or upward trend. Only 44% of the 8 soil scores were in a stable or upward trend. However, average percent ground cover is 78%, consistent with scores from other studies reported here.

| Table 3-9 Range Site Analysis Long-Term Trend Studies | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Allotment** | **Rg Site Analysis** | **Vegetation Score** | | | | **Trnd** | **% Ground Cover** | | | **Trnd** |
| | | **Study Yrs** | **Base** | **Last** | **Chng** | | **Base** | **Last** | **Chng** | |
| Ten Mile | Ten Mi Pasture | 1974-1979 | 17 | 29 | +12 | ? | 81 | 87 | +6 | ? |
| Ten Mile | Upper City Ck #2 | 1967-1978 | 60 | 68 | +8 | ? | 80 | 64 | -16 | ? |
| Ten Mile | Upper City Ck #3 | 1967-1978 | 69 | 68 | -1 | ? | 88 | 65 | -23 | ? |
| Circleville | Oak Basin | 1968-1982 | 92 | 54 | -38 | ? | 84 | 76 | -8 | ? |
| Junction | Belly Ache BM4 | 1968-1979 | 68 | 73 | +5 | ? | 60 | 60 | 0 | ? |
| Pine Creek | Winter Deer | 1952-1980 | 45 | -5 | -50 | ? | 69 | 87 | +18 | ? |
| South Beaver | Birch Creek | 1969-1975 | | | | | 70 | 64 | -6 | ? |
| South Beaver | South Creek BM2 | 1968-1971 | | | | | 86 | 80 | -6 | ? |
| South Beaver | Coyote | 1969-1971 | | | | | 81 | 84 | +3 | ? |

Allotment files for the Circleville, Pine Creek/Sulphurbeds, North Indian Creek, Marysvale, and Junction Allotments contain Range Environmental Analysis data for 246 range site analyses. There are 125 studies located on the Pine Creek/Sulphurbeds Allotment; 42 on North Indian Creek; 7 on Marysvale; 8 on Junction; and 64 on Circleville. These range analyses were conducted between 1974 and 1981 and were the basis for determining tentative stocking capacities. At that time 72% of the vegetation types were in fair or better condition, with 78% being in a stable or upward trend. Vegetation types showing the most downward trend were PJ at 48%; mountain brush at 47%; and sagebrush at 33%. Likewise, soils in the PJ type and the mountain brush type were in significant downward trends: 70% and 60%, respectively (see Appendix P for detailed analysis data).

b. **Range Site Analysis.** During 2001-2002, 58 of the 246 range site analysis described above were re-read on allotments within the project area on all but the Junction and Allunite-Cottonwood Allotments. There were 11 sites re-read on South Beaver, 18 on Pine Creek, 7 on Ten Mile, 15 on Circleville, 6 on Pine Creek-Sulphurbeds, and 1 on North Indian Creek. Refer to the Range Site Analyses data tables and location map in Appendix J for study summaries.

| Table 3-10 Range Site Analysis Condition & Trend Summary for the Project Area | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **Vegetation Condition (acres)** | | | **Vegetation Trend (acres)** | | | **Soil Trend (acres)** | | |
| **Veg Type** | **# Rg Sites** | **Good-Ex** | **Fair** | **Poor** | **Down** | **Static** | **Up** | **Down** | **Static** | **Up** |
| **Grassland** | 11 | 1792 | 106 | 323 | 106 | 116 | 1999 | 20 | 202 | 1999 |
| **Meadow** | 21 | 1377 | 422 | 73 | 89 | 240 | 1543 | 73 | 358 | 1441 |
| **Sagebrush** | 41 | 1918 | 924 | 3372 | 1968 | 1330 | 2707 | 747 | 2551 | 2707 |
| **Mt Brush** | 107 | 4422 | 4120 | 943 | 3770 | 4298 | | 4859 | 3209 | |
| **PJ** | 25 | 526 | 4030 | 4615 | 4286 | 4687 | 198 | 6412 | 2561 | 198 |
| **Aspen** | 39 | 1675 | 3480 | 0 | 1701 | 2934 | 520 | 1151 | 3196 | 808 |
| **Conifer** | 2 | 26 | | 393 | 393 | 26 | | | 393 | 26 |
| **Tot Acs 34537** | 246 | 11736 | 13082 | 9719 | 12313 | 13631 | 6967 | 13262 | 12470 | 7179 |
| **Percent of Tot** | | 34% | 38% | 28% | 37% | 41% | 21% | 40% | 38% | 22% |

The summarization of these range site analyses indicates that upland range conditions are in a high fair to low good condition with stable to upward trends. There are some indications that the most significant changes in condition and trend may have occurred between 1930 and 1981, and trends since that time have leveled or moderated.

| Table 3-11 Range Site Analysis Summary | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Species Diversity** | | | **WS Resource Value Rating** | | | **Ground Cover** | | |
| **Score** | **Rating** | **Trend** | **Score** | **Rating** | **Trend** | **Score** | **Rating** | **Trend** |
| 59 | High Fair – Low Good | ? ? | 92 | Desired | ? ? | 80 | Good – Low Excellent | ? ? |

Using a scale of 0-20 = VP; 21-40 = P; 41-60 = F; 61-80 = G; 81-100 = E, three of the 7 vegetation types rated "good" in species composition: Sagebrush, Mt. Brush, and Mixed Conifer. Four of the vegetation types sampled rated "fair" in species composition: Aspen, PJ, Grassland, and Meadow. 86% of the studies have Forage Value Ratings that indicate stable or upward trends in species diversity. Although the sagebrush types have a "Good" species diversity score, the average summed score of all 11 sites is relatively low at "66". The sagebrush type has the highest percentage of sites (27%) in a downward species diversity trend, but it also has the highest percentage of sites in an upward trend. The species diversity data indicates that, although the scores show a slight upward trend, the relative change is insignificant. Total forage values indicate only a 4% change (+16 points) since the original reading.

The "Watershed Resource Value Rating" (RSVR) score is based on plant species that have high values for watershed protection. 95% of the studies have RSVR scores that indicate stable or upward trends in high value watershed species. With a ranking of 61-85% being a "high" score and 86-100% being the "desired" range of RSVR values, 100% of the site analyses sampled had "desired" RSVR values. 93% of the sites have ground cover trends of stable to up. The aspen type has the best ground cover score at 93%. The PJ type has the lowest ground cover at 69%, but that average score has only dropped 2% from the original average score measured about 40 years ago. The RSVR data indicates that, although the scores show a slight upward trend, the relative change is insignificant. The total WS RSVR values indicate a less than 1% change (+2 points).

Vegetation types showing the most improvement in ground cover are: sagebrush (3 of 11 sites, 27%, have increased trend ratings), mountain brush (9 of 18 sites, 50%, have increased trend ratings), and mixed conifer (1 of 2 sites, 50%, have increased trend ratings). The ground cover data confirms the slight upward trend. Ground Cover values indicate a moderate 8% change (+41 points).

Summarized data for the sagebrush vegetation type sampled only in the Circleville, Pine Creek, and Ten Mile Allotments shows that 9 of the 11 sites measured (82%) have a crown cover greater than 15%. This is a significant departure from the balance range of 40%. This results in a corresponding large departure (32%) from the balance in the 5-15% range. Two sites recorded a crown cover in the 5-15% range. Likewise, 82% of the sites are outside the balance standard of having less than 20% bare ground. However, 91% of the sites record that ground cover is in stable or upward trends from previous readings, and watershed resource value ratings indicate that 91% of the sites are at high or desired levels.

**Table 3-12 Range Site Analysis Sagebrush Summary**

| **Balanced Sagebrush Crown Cover Ranges** | | | | **Balanced Range of Bare Ground in Sagebrush Sites** | | | |
|---|---|---|---|---|---|---|---|
| | 0-5% | 5-15% | >15% | 0-20% | 21-40% | 41-60% | 61-100% |
| Balance | 10% | 50% | 40% | Bare ground less than 20% | | | |
| Site Analyses | 0% | 18% | 82% | 18% | 73% | 9% | 0% |
| Variance | -10% | -32% | +42% | | 73%% | 9% | |

c. **Big Game Range Trend Studies.** The Utah Division of Wildlife Resources Big Game Range Trend monitoring studies conducted in 1985, 1991, 1998, and 2003 are intended to monitor vegetation composition changes (range trend) on key big game areas. These studies are available on the world-wide website at http://www.wildlife.utah.gov/range/wmu22.htm. Key areas are defined as those areas "where deer or other big game have demonstrated a definite pattern of use during normal climatic conditions over a long period." This project emphasizes deer and elk habitat, and winter ranges for both deer and elk comprise the bulk of the trend studies. Every five years the trend studies are reread and the status of the vegetation in key areas of each herd unit is evaluated. Wildlife Management Unit (WMU) 22 covers the Beaver Ranger District Management Units and contains 4 key sample sites, within the project area, in

oak-sagebrush, big sagebrush, and PJ vegetation sites. Each of these study sites is located along the lower-elevation boundary between National Forest and the BLM (see Big Game Range Trend map and studies in Appendix N).

Three of these sites (Oak Basin, Sheep Rock, Rocks Reseeding) are on areas that have been chained or Dixie harrowed and seeded, followed by wildfires. Principal grasses include crested wheatgrass, intermediate wheatgrass, Indian ricegrass, and bottlebrush squirrel tail. Major browse species include Gambel oak, mountain big sagebrush, Wyoming big sagebrush, and antelope bitterbrush. If there is a 15 %, or more, change in score from one measurement to the next, an upward or downward trend change is noted; a change in value of less than 15 % indicates a stable change in trend.

The average general long-term trend from 1985 to 2003 for all four studies, based on percent change, is stable for percent ground cover (-13%), down for percent litter (-19%), stable for browse plants per acre (-2%), and stable to up (+6% to +195% on the Sheep Rock) for sum of nested frequency values of grasses and forbs.

**Table 3-13 Big Game Range Trend Summary**

| Browse (?=change) | | Grasses/Forbs | | Ground Cover | | Litter | |
|---|---|---|---|---|---|---|---|
| **% ?** | **Trend** | **% ?** | **Trend** | **% ?** | **Trend** | **% ?** | **Trend** |
| -2% | ? | +6% | ? | -13% | ? ? | -19% | ? |

The studies note the influence of fire and drought on both ground cover and vegetation scores. If the studies are analyzed for trend during the reading of only the last 5 years, during the drought period between 1998 and 2003, values for all readings are stable: percent ground cover (-9%), percent litter (-10%), browse plants per acre (-13%), and (+4%) for sum of nested frequency values of grasses and forbs (see Big Game Range Trend data tables in Appendix N).

d. **Repeat Photography.** In August 2003 Dr. Charles Kay (Utah State University) completed a repeat photography study (using comparative photos from as early as 1872 to 2001) of rangeland and forest sites on the Fishlake National Forest. A selection of 32 of these repeat photos, specific to the allotments in the project area, is included in Appendix I. Dr. Kay's work is available on the World-wide Web at http://extension.usu.edu/rra/. The website is titled "Utah's Rangeland Reference Area Website and provides rangeland reference data based on visual comparison of historical and recent photos. The project uses what is called repeat photography to compile a long-term perspective of ecological changes on the land. Dr. Kay concludes through photo representation: "Utah's rangelands were in very poor condition at the beginning of the 1900's due to unregulated livestock grazing. With the advent of modern range management, however, vegetation conditions have improved dramatically throughout south-central Utah. In general, Utah's rangelands are healthier today than at any time during the last 100 years."

In all, 355 repeat-photosets were completed. Grasslands were depicted in 321 photosets, sagebrush in 237, pinyon-juniper in 98, mountain brush in 92, aspen in 223, conifers in 221, and woody riparian species in 90. All photosets were evaluated for plant cover and whether the sites showed accelerated soil erosion. In general, grasslands and aspen declined, while sagebrush, mountain brush, pinyon-juniper, and conifers increased.

**Table 3-14 Repeat Photography Trend Indicators**

| Vegetation Type | # Photosets | % Showing Loss of Area | % Showing Little Change | % Showing Increased Area |
|---|---|---|---|---|
| Grassland (1) | 321 | 39 | 58 | 4 |
| Sagebrush (4) | 237 | 17 | 54 | 29 |

| | | | | |
|---|---|---|---|---|
| Mountain Brush (5) | 92 | 2 | 18 | 79 |
| Mixed Conifer (6) | 221 | 0 | 8 | 92 |
| Pinyon-Juniper (9) | 98 | 1 | 5 | 94 |
| Aspen (10) | 223 | 64 | 27 | 9 |
| Woody Riparian | 90 | 20 | 52 | 28 |
| **Trend Indicator** | **# Photosets** | **% Downward** | **% No Change** | **% Upward** |
| Plant Cover | 355 | 8 | 64 | 27 |
| Soil Erosion | 355 | 18 | 81 | 1 |

Dr. Kay's interpretation of these photosets attributes the significant loss of grasslands to replacement by sagebrush, pinyon-juniper, and conifers. His comparison of the photos also indicates that most grasslands appeared more heavily grazed in the past than when re-photographed. Likewise, most of the decrease in sagebrush occurred as a result of PJ and other conifers that invaded and replaced shrub communities. Conversely, sagebrush increased by invading grasslands. In 94% of the photosets PJ increased, often dramatically. In only one instance did PJ decline, and that was a site swept by wildfire. Mountain brush readily invaded grassland and sagebrush communities and showed significant increases on 79% of the sites. In 64% of the photosets, aspen declined, while it remained unchanged in 27%, and increased in 9%. This is similar to other research that has reported a major decline in aspen across the Intermountain Region. In 92% of the photosets, conifers increased, often markedly. In no photosets did conifers decline.

Dr. Kay concludes that, in south-central Utah there has been no widespread decline in woody riparian species attributable to livestock grazing. In fact, woody riparian vegetation has actually increased in many areas despite continued livestock use. Dr. Kay compared plant cover and soil erosion on all 355 repeat photos to determine if rangelands had been negatively impacted by livestock grazing and other multiple-use activities. In 64% of the photo pairs, there was no apparent change in plant cover, while in 27% plant cover increased, often markedly. In only 8% of the photosets was plant cover judged to have declined. Similarly, in 81% of the photosets, there did not appear to be any evidence of accelerated soil erosion, while in 18% of the paired images, active soil erosion had declined. In only 5 (1%) photosets was soil erosion judged to have increased.

The repeat photography study includes several comments about the vegetation condition. The grassland communities appeared more heavily grazed in the retakes in only 4% of the photo pairs. Pinyon and juniper has generally moved into sagebrush and grassland communities. Biodiversity has declined in areas that are now conifer forests, but were not conifer forests in the past. The increase in conifer forests has occurred at the expense of aspen, meadows, and riparian communities. This statement is in the woody riparian species section: "in south-central Utah there has been no widespread decline in woody riparian species attributable to livestock grazing." The following statement is from the plant cover and soil erosion section. "While Utah's rangelands were very heavily grazed during the late 1800s and early 1900s…, repeat photographs show that this is no longer true in south-central Utah, and that in general, range conditions have improved."

Dr. Kay concluded that there has been a marked decrease in grasslands and aspen communities as a result of increased invasion from conifers, subalpine and montane and the loss of sufficient aspen regeneration to sustain a new aspen forest. Changes in climatic conditions are not considered to be the major influence. Rather, competition from woody species that grow and thrive in the absence of periodic fire. With this increase of woody growth, forage production dropped sharply. The result is decreased carrying capacity of the range for wildlife and domestic livestock. This was a key conclusion of the study. "At

present, there is little sign of widespread overgrazing in south-central Utah and range conditions are generally better today than they were during the early 1900s."

The Beaver River Watershed Assessment (USDA FS 2003) considered an area of about 123,000 acres. The assessment included an analysis of the historical and existing vegetation conditions. Among the many findings the study demonstrated a nearly 90% decline in aspen dominated landscapes in this watershed from what was historically present in the past 100 to 300 years. That is a reduction in acres of aspen from almost 60,000, nearly 50% of the analysis area, to less than 6,000 acres presently. The major reason for this decrease is the surge in conifer growth with the absence of the period fires that burned in this area historically.

Houston (1954) discussed the use of presence or absence of aspen reproduction as an indicator of range condition. The report states:

> If aspen reproduction was present, the range was considered in satisfactory condition; if absent, in unsatisfactory condition. There are several factors other than grazing, however, that influence reproduction of aspen. It has been commonly observed that dense aspen stands usually produce few sprouts, while open stands usually produce many more. A recent study (13) showed that the presence of herbaceous and shrubby vegetation in and near aspen stands may have a definite effect on reducing aspen reproduction. Also another study (12) indicate that several species are more palatable than aspen sprouts, and the range could be overgrazed from the standpoint of these species without materially affecting the aspen. For these reasons the simple presence or absence of reproduction is not a reliable indicator of range condition. If little reproduction is present, and it can be determined that its absence is due solely to grazing, then this absence is an indicator of unsatisfactory range condition. If the absence of reproduction is not due to grazing, or abundant reproduction is present, then no particular condition class is indicated.

Campbell and Bartos (2001) discussed the characteristics of aspen stands that are in a properly functioning condition (PFC). (They suggested "properly functioning condition exists when soil and water are conserved, and plants and animals can grow and reproduce and respond favorably to periodic disturbance.") "Aspen stands in properly functioning condition will often have the following characteristics: multi-aged stems in the stand, adequate regeneration to perpetuate the stand, age classes mostly less than 100 years old, and good undergrowth beneath the canopy. Both compositional and structural diversity are important…. Landscapes (aggregations of stands) that are compositionally and structurally homogeneous are not in properly functioning condition."

In order to sustain aspen ecosystems it is important to have a sufficient number of younger trees to replace the mature trees that grow old and die. Campbell and Bartos (2001) included a prioritized key to the risk factors for landscapes with aspen. This key was developed on the Fishlake National Forest and field-tested in the Tushar Mountains. Major elements in the key that indicate moderate to high risk to landscapes with aspen present included: conifer cover that exceeds 25% (absolute cover) and situations where aspen regeneration 5 to 15 feet tall is less than 500 stems per acre. These risk factors are indications that such aspen stands are not in a sustainable condition. Generally speaking, the areas of the Betenson Mill fire in 1958, the Pole Creek fire 1996, and a couple of smaller fires and clearcuts during the past two or three decades are the only areas where aspen grows on this mountain range that do not have either one of both of the above mentioned risk factors represented.

Stam (2004) quantified losses of understory production in aspen stands on the Dixie and Fishlake national forests. His findings showed that as conifer species replace aspen, understory production of herbaceous species declines exponentially.

The following two photo-sets on the Circleville Allotment illustrate the trend in range condition generally depicted by Dr. Kay's repeat photography. Refer to Appendix I for a complete view of the photo-sets within the project area.

**Plate 143. BIG FLAT**: 1947 - 1999 LOCATION: Beaver Mountain, Fishlake National Forest, Beaver Ranger District; T29S, R4W, Sect. 19, UTM 4237550 N, 381150 E; elevation 10,160 ft., viewed to north. **CIRCLEVILLE ALLOTMENT.** NOTE: This is a view across Big Flat to the Big Flat Guard Station with Lake Peak, Mount Holly, and Delano Peak in the distance. Although the meadow appears unchanged between the two photos, conifers in the distance appear to have increased while aspen (Populus tremuloides) has declined. All of the aspen stands in the 1999 photo appear heavily invaded by conifers and none of the aspen clones appear to be regenerating. (COMMENTS:1947 photo #447971 taken by the U.S. Forest Service; 1999 photo taken by Kay #4500-28 on Sept. 7. Forest Service photo [2300-R-Scenery] held by the Beaver Ranger District, Fishlake National Forest, Beaver, UT, the National Agriculture Library, Washington D.C.; and the Forest Service Regional Office Photographic Collection [2360-1-Scenic] housed at Weber State Univ., Ogden UT)

1947

1999

**Plate 144. BIG FLAT:** 1933 - 1999 LOCATION: Beaver Mountain, Fishlake National Forest, Beaver Ranger District; T29S, R4W, Sect. 18, UTM 4238300 N, 381300 E; elevation 10,080 ft., viewed to southwest. **CIRCLEVILLE ALLOTMENT**

NOTE: The stock watering trough in the 1933 photo is at a spring just south of the Big Flat Guard Station. The pole and rail fence visible in both photos (right center) is part of the corral at the Guard Station. Conifers have grown to block the view from the 1933 photo point necessitating moving the 1999 photo point approximately 150 feet forward. The line of shrubs visible in the foreground of the 1999 photo are growing at the location of the old water trough. The area continues to be grazed in 1999, but not as heavily as in 1933. The conifers in the distance in the 1999 photo appear to have increased in abundance as aspen (Populus tremuloides) has declined. All of the aspen stands have been heavily invaded by conifers and have not regenerated. (COMMENTS:1933 photo #368978 taken by the U.S. Forest Service; 1999 photo taken by Kay #4500-32 on Sept. 7. Forest Service photo [2500-Watershed] held by the Beaver Ranger District, Fishlake National Forest, Beaver, UT, and the Forest Service Regional Office Photographic Collection [2240-Fishlake-18] housed at Weber State Univ., Ogden UT)

1933

1999

e. **Condition of Vegetation Type Conversions.** Beginning in the early 1960's, the Forest Service initiated a west-wide initiative to reclaim the shrub-steppe communities that had been invaded by pinyon-juniper woodland. These areas had allowed the natural succession process to operate in the absence of the natural fire regime but under the influence of very heavy livestock grazing. The result was that in just under 100 years of grazing, many acres of the shrub-steppe types had been replaced by pinyon-juniper woodlands.

Shortly after the end of World War II, Federal land management agencies began developing land treatment methods to reclaim these shrub-steppe types. As heavy equipment became more powerful and various materials became available from the war effort, the technique of chaining pinyon and juniper woodlands was developed. The technique involves pulling three shots (96 foot lengths) of anchor chain (from destroyer class or larger ships) behind two large crawler tractors. The chain, with 60 to 80 lb links, weighs approximately 15,000 lbs, and has two large swivels installed between the center shot. In the actual treatment, trees and large brush are uprooted by the chain, the area is seeded with a mix of grass, forbs, and browse species and then chained again in the opposite direction. This second pass completely uproots the trees to ensure a good kill and covers the seed.

Every allotment within the project area, except South Beaver, has had some chaining work done within at least one pasture (see Chainings Map in Appendix H). Since the completion of the initial treatments, several processes have been running concurrently; livestock still graze the areas, but under improved management systems and reduced utilization levels; fire suppression continues to be a major factor in the re-invasion of pinyon and juniper ecosystems. During the initial treatments, the chaining also planted pinyon and juniper seeds as the chain rolled over the trees. Further, the young trees had enough flexibility to simply flex over and some escaped the chain. Several attempts have been made to remove the pinyon and juniper with prescribed fire, but these attempts have been met with mixed success. The condition of the treatments varies from some remaining very functional to others needing some type of re-treatment. As a rule, the older the treatment, the more retrogression has occurred. The District has been re-treating some of these areas using prescribed fire, roller chopping, and individual tree cutting.

- Since the 1990's several areas on the Marysvale allotment have been roller chopped or had individual tree cutting, these areas are in satisfactory condition.
- Pine Creek allotment, Cove Creek pasture individual tree cutting; Sulphurdale pasture, individual tree cutting, Pine Creek and Wildcat pastures, prescribed burning. The re-treated areas are productive and in satisfactory condition.
- North-Indian, minor individual tree cutting. Re-treated areas in satisfactory condition..
- Circleville, some Dixie-harrow work in Docks Spring. Most of the old treatments are still somewhat productive and in satisfactory condition.
- Cottonwood-Alunite had a 1996 wild fire and some individual tree cutting. These areas are in satisfactory condition and continue to be productive.
- Joe-Lott-Fish Creek has had some roller chopping and prescribed fire. Production has decreased but still remains in satisfactory condition. Junction has had no recent re-treatment work. This is a dry site with low potential. Winter grazing has maintained the existing condition.
- Ten Mile, no re-treatment has occurred. These areas have poor condition and reduced productivity.

| Table 3-15 Condition of Vegetation Type Conversions | | |
|---|---|---|
| **Allotment** | **Acres Treated** | **Condition** |
| **Ten Mile** | 662.28 | **Poor; needs re-treatment** |
| **North Indian Creek** | 726.97 | **Poor; needs re-treatment** |
| **Marysvale** | 1,114.99 | **2002, 2004 re-treatments** |
| **Circleville** | 2,047.51 | **Variable; some re-treatment** |
| **Pine Creek/Sulphurdale** | 2,296.35 | **Varies; prescribed fire & mechanical treatment in the last 5 years** |
| **Junction** | 436.20 | **Poor Condition** |
| **Cottonwood Creek** | 276.22 | **Satisfactory; 1996 wildfire and some mechanical re-treatments** |
| **TOTAL** | 7,560.52 | |

## 5. Reference Areas and Research Natural Areas

- **Reference Areas and Exclosures.** The Forest Service is not required to maintain large reference areas of protected, undisturbed, pristine areas. However, some small exclosures have been established and studied on the Tushar Mountains.

Mueggler and Bartos (1977) studied the Grindstone Flat and Big Flat exclosures and reported on the changes in clearcut aspen communities that they found 41 years after the initial treatments. Both these exclosures occur within the analysis area for this EIS. The Big Flat exclosure had been compromised by poor fences following this study and was completely decommissioned in the mid-1990s. Their study found that both deer browsing and livestock use could affect the response of aspen regeneration unless the treated areas are at least 10 acres in size.

Kay and Bartos (2000) reported on the Grindstone Flat exclosure also. It is one of only two long-term exclosures with aspen that is found on the forest. They give several reasoned examples to indicate that climatic variation is not having and overriding effect on aspen community dynamics in southern Utah or in the western United States and into western Canada.

Five of the seven conclusions from Kay and Bartos (2000) discuss conditions related to grazing:
1. "Browsing by native and domestic ungulates has hindered aspen regeneration throughout south-central Utah."
2. "Wild ungulates, primarily mule deer, can have a major effect on aspen stem dynamics and understory composition."
3. "Livestock grazing, as historically practiced in southern Utah, has had widespread effects on aspen communities, including changes in understory species composition."
4. "Combined wildlife-livestock use most severely alters aspen community dynamics.
5. "Aspen stands in the Rocky Mountain west dominated by old or single-aged trees are most likely a product of excessive ungulate browsing.

- **Research Natural Areas.** Two research natural areas (RNAs) are located in this high mountain area: Bullion Canyon RNA and Upper Fish Creek RNA. Grazing is not allowed in either of these RNAs, nor has livestock grazing been an issue in either RNA. It should also be noted that the terrain, steep topography and general vegetation found in these RNAs are sufficiently unique that these pristine areas do not provide comparable examples to evaluate grazed verses non-grazed conditions.

## E. DESCRIPTION OF AFFECTED ENVIRONMENT – RIPARIAN FUNCTION

Many of the riparian areas in the western United States were in a deteriorated condition due to overgrazing in the early 1900's. Many of the National Forests in the west were established for watershed protection to correct these overgrazing problems. On the Fishlake NF, numerous watershed restoration projects were implemented to rehabilitate the eroding watersheds. Range analysis was completed, grazing capacities were determined and allotment management plans were implemented. Over time, livestock reductions have occurred and proper use guidelines based on the latest research have been established. The result of all these measures has been to stabilize the riparian areas. There has been steady improvement of the riparian ecosystems over the past 100 years, i.e. they are in much better condition than they were at the turn of the 20th century, however, under current management, many of the riparian areas on the Forest are receiving use in excess of what research is currently recommending for proper use. Since livestock tend to concentrate on riparian areas, they do not show very rapid improvement. Riparian livestock exclosures across the Forest show that rapid improvement of riparian ecosystems can occur when livestock are removed.

Riparian ecosystems are simply defined as those areas and biotic communities that are predominantly influenced by high water tables usually occurring adjacent to surface water. The riparian zone is the transition between uplands-- where there is seldom standing water--and the stream, river, or lake where free flowing or standing water is common. Riparian areas have distinct vegetation and soil characteristics and are uniquely characterized by the combination of high species diversity, high species densities, and high productivity. Stream margins, floodplains, wetlands, marshes, springs and seeps are examples of riparian areas. The Fishlake National Forest Land and Resource Management Plan states that special protection and management will be given to all land and vegetation within 100 feet from edges of perennial streams, lakes and other bodies of water or to the outer margin of the riparian ecosystem if wider than 100 feet (USDA FS 1986a, pg IV33).

Riparian areas make up a small percentage (<1%) of the 178,000-acre Project Area. But they are of prime importance to stream function, water quality and quantity, aquifer re-charge, and fisheries habitat. They are also valuable for livestock grazing, cropland agriculture, timber production, wildlife habitat, and recreational opportunities. Continuous interactions occur between riparian, aquatic, and adjacent terrestrial ecosystems through exchanges of energy, nutrients, and species. Riparian areas typically are a reflection of the overall health of the watershed and are among the first landscape features to show damage from improper management. Riparian areas in poor condition are unable to buffer the effects of accelerated runoff from uplands. A significant portion of the riparian areas within the project area are below their potential, and therefore their capability to provide riparian benefits is currently limited.

**Existing Condition.** Level II Riparian Inventories were conducted in 2002, 2003 and 2004 on the Beaver Ranger District (USDA FS 2002, 2003a and 2004). The streams surveyed fall within the Pine Creek/Sulphurbeds, North-Indian Creek, South Beaver and Ten Mile and Circleville allotments. The streams surveyed on each allotment, along with the Level II report they are found in, are reported in Table 3-20. These surveys are the most recent and comprehensive data source available to evaluate the existing condition of riparian resources on the Beaver Ranger District.

Twenty-seven streams within the grazing allotments on the Beaver Ranger District were surveyed in 2002, 2003 and 2004. Keep in mind that Iant Creek, Blayneys Creek, Hi Hunt Creek, and Indian Creek cover two different allotments and are listed twice in Table 3-20. Degraded riparian conditions were documented in 18 of the 27 streams surveyed. In 9 of the 18 streams where over-grazing problems were documented in riparian areas, the majority of the stream channel was in good condition except for a few problem areas (Table 3-20). For detailed explanations and associated management recommendations for individual streams, please see the complete reports prepared by contractor Jeff Pettey (USDA FS 2002, 2003a and 2004). Table 3-21 displays the overall conclusions and general summary from each Level II riparian survey report.

**Table 3-16 Level II Riparian Surveys Conducted In The Project Area, Listed By Allotment.**

| Allotment | Level II Report | Stream/Creek | Grazing concerns documented Y/N | |
|---|---|---|---|---|
| **Circleville** | Beaver River and Southern Tributaries of the Lower Watershed (USDA FS 2002) | Iant Creek (headwaters) | Y* | |
| | Three Creeks Watershed of Beaver River (USDA FS 2002) | Blayneys Creek (small section below Blaneys Reservoir) | | N |
| | | Hi Hunt Creek (headwaters) | Y * | |
| | Ten Mile and Birch Creeks (USDA FS 2004) | Birch Creek (east) | Y | |
| **Pine Creek /Sulphurbeds** | Little North Creek Area (USDA FS 2003a) | Little North Creek | Y | |
| | | Pine Creek | Y | |
| | | South Pine Creek | Y | |
| | | North Wildcat Creek | Y | |
| | | Wildcat Creek | Y | |
| | North Creek Area (USDA FS 2003a) | Indian Creek | | N |
| **South Beaver** | Beaver River and Southern Tributaries of the Lower Watershed (USDA FS 2002) | Beaver River | | N |
| | | South Fork Beaver River | Y * | |
| | | Lower Kents Lake Creek | | N |
| | | Dry Hollow | Y | |
| | | Iant Creek | Y* | |
| | | LeBaron Creek | Y * | |
| | Three Creeks Watershed of Beaver River (USDA FS 2002) | Three Creeks | | N |
| | | North Fork Three Creeks | | N |
| | | Blayneys Creek | | N |
| | | Hi Hunt Creek | Y * | |
| | | South Fork Three Creeks | | N |
| | Big Twist Creek Area (USDA FS 2003a) | South Birch Creek (west) | Y | |
| | | Big Twist Creek | Y | |
| | | South Creek | Y | |
| **North Indian Creek** | North Creek Area (USDA FS 2003a) | Indian Creek | | N |
| | | North Fork of North Creek | Y * | |
| | | Pole Creek | Y | |
| | | South Fork of North Creek | Y * | |
| | | Pine Creek of South Fork | | N |
| | | Briggs Creek | | N |
| **Ten mile** | Ten Mile and Birch Creeks (USDA FS 2004) | Ten Mile Creek | Y* | |

- **= Over-grazing problem areas were noted in certain riparian sections, but otherwise the majority of the stream channel was documented in good condition.**

**Table 3-17 Report summaries from the 2002, 2003 and 2004 Level II Riparian Surveys. Author: Jeff Pettey, Shell Valley Consulting**

| Report Name / Allotments | Summary |
|---|---|
| **Report: Beaver River and Southern Tributaries of the Lower Watershed (USDA FS 2002).**<br><br>**Allotments: South Beaver and Circleville** | The streams of this report have similar management problems in that de-watering has been established for many years to supply hydroelectric power. The hydroelectric power system is a benefit to the local communities and reduces the need for burning fossil fuels. Communication between the power company and the forest is needed, however, to help manage the natural resources dependent on flows in these streams. Livestock grazing was also identified as a management problem in many sections of stream. Range management remedies need to address stubble height of key riparian species such as water sedge, tufted hairgrass and fowl mannagrass.<br><br>The removal of beaver in many areas has contributed to instability and loss of aquatic habitat. The conditions for a thriving beaver population exist on each stream. The benefits to reestablishing beaver on these streams are enormous, far outweighing problems associated with this natural manager of our streams and rivers. If beaver are reintroduced on these streams they must be managed so they do not harm the hydroelectric works. This should be built into any reintroduction plan.<br><br>Many areas along these streams are functioning in their natural state and support a wide variety of aquatic species of fish, invertebrates and plants. Terrestrial birds and animals rely on these areas as well, and evidence of their use was noted on nearly every creek. These water and natural resources are an important component of the ecosystem. Management should reflect the importance of these areas and work to enhance the ecosystem. |
| **Report: Three Creeks Watershed of Beaver River (USDA FS 2002)**<br><br>**Allotments: South Beaver and Circleville.** | For the most part the Three Creeks watershed is managed well and problem areas were uncommon. The Three Creeks Reservoir is the central hydrology feature of the area; it controls water and sediment discharge out of the watershed. During a normal year of precipitation a reservoir can dampen peak flow and raise flow during late summer, when unhindered flow decreases substantially. Reservoirs also trap sediment which may adversely affect aquatic habitat. Because of the extended drought, Three Creeks Reservoir was very low, causing fine sediments to be entrained in the reservoir, which were then transported downstream. A good flushing flow is needed to clean the streams below the reservoir and expose substrates covered by fine sediment.<br><br>Riparian resources are generally in good condition, maintaining healthy soil and vegetation. There is a higher concentration of dirt roads paralleling many of the riparian areas; these need constant maintenance to ensure that resource damage does not occur. |
| **Report: Little North Creek Area (USDA FS 2003a)**<br><br>**Allotment: Pine Creek/ Sulphurbeds** | The watersheds described in this report are experiencing rapid ecological and hydrologic change, which involves excessive erosion of hill slopes and stream channels, modifications of storm discharge patterns, as well as changes in vegetation composition on both the uplands and riparian area. These changes are evident after reviewing the data and survey notes of the five streams. To altered the downward trend, which is occurring in these watersheds, better livestock management is required. The recommendations listed in this document should be evaluated and strongly considered; however, removal of livestock should be considered as an option on these lands. There has been such deterioration in plant production that the amount of forage currently growing on these rangelands does not sustain the stocking rates.<br><br>Most of the channels are incised and have relatively low vegetation bank cover; soil structure is changing and the riparian vegetation composition is comprised of either low seral species, weeds or plants that are resistant to grazing. Management actions are needed to reverse this trend and restore the area to a productive and stable ecological and hydrological state. |

| | |
|---|---|
| **Report: Big Twist Creek Area (USDA FS 2003a)**<br><br>**Allotment: South Beaver** | The conditions seen on these watersheds do not meet the objectives of healthy watersheds and riparian systems. This is primarily due to livestock and recreation use, which must be managed better for the land, water and vegetation resource to recover to a healthy and productive state. The recommendations listed in this document should be evaluated and strongly considered; however, removal of livestock should be considered as an option on these lands. There has been such deterioration in plant production that the amount of forage currently growing on these rangelands does not sustain the stocking rates.<br><br>Reaches A31-4 and A31-5 of South Birch Creek are examples of the riparian ecological potential of the streams in the area, and should be used as a standard to judge other riparian areas at similar gradients and elevation. It is remarkable how well this area has responded due to the elimination of livestock grazing, and it should support further similar actions on other streams. |
| **Report: North Creek Area (USDA FS 2003a)**<br><br>**Allotments: North Indian Creek and Pine Creek /Sulphurbeds** | The stream and watersheds described in this report drain some of the most diverse and beautiful country on the Fishlake National Forest, as well as some of the most inaccessible. The overall condition of much of these areas is good, although in some areas enhanced management would improve either vegetation health, stream stability or aquatic habitat.<br><br>Much of this area is roadless, and inaccessible by ATVs or even dirt bikes, which is rare on most of this forest. Therefore, much of this area is an excellent candidate for wilderness designation, and this should be evaluated by the Forest Service. This would protect the area from future development, as well as highlighting the natural, scenic and intrinsic values of the high mountains of the Tushar Range. |
| **Report: Ten Mile and Birch Creeks (USDA FS 2004)**<br><br>**Allotments: Ten Mile and Circleville** | The affects of grazing on riparian systems was observed on both streams and indicates that there is a problem with grazing management in this area of the forest. Ten Mile Creek has experienced debris flows from tributary streams, which seem to indicate vegetation cover and stream instability in the higher elevations of the watershed. There was also evidence of heavy grazing on reach H1-9, where a riparian meadow has experienced alterations in vegetation cover and composition. Heavy grazing was noted on much of Birch Creek, where the vegetation composition and cover is being affected by cattle grazing. The use of ATV's is also a concern in these streams, and resource damage has occurred and will happen again if actions are not taken to curb these abuses.<br><br>The Ten Mile watershed provides habitat for a population of Bonneville cutthroat trout, which due to the drought and other limits of the habitat restricts population growth and fish size. However, we saw fish in most reaches below H1-12a. Birch Creek does not appear to have a fishery, and it is unlikely fish would survive in this stream unless habitat is improved. |

The Level II riparian inventories reported a variety of riparian conditions ranging from good to very poor. In some watersheds desired conditions seem to be maintained with current management, yet in other areas desired conditions are not being met. As with previous studies related to riparian areas on the Fishlake National Forest, problems with riparian area condition and implementation of grazing standards were documented. Many channels were incised, had relatively low vegetative bank cover and had altered soil structure. The riparian vegetation composition in these degraded areas was comprised of either low-seral species, weeds, or plants that are resistant to grazing.

The reports from these surveys acknowledged that it is difficult to access the true impact of grazing in a period of drought, but suggested that in many cases better livestock management such as herding cattle out of the riparian zone and into the uplands, along with enforcing proper use standards would help alleviate the extent of degradation that is currently occurring. In the most severely impacted areas, there has been such a deterioration in plant production that the amount of

forage currently growing on these rangelands does not sustain the stocking rates, and a period of complete rest or reductions in time and concentration of grazing were recommended.

In some of the study streams, the Level II Riparian inventories identified over-utilization in either the riparian area, uplands or both. Over-utilization is a direct result of non-compliance with the current proper use criteria. When proper use criteria are not adhered to, resource damage occurs. These observations highlight the importance to establish adequate monitoring measures and appropriate administrative control to enforce current standards. Table 3-22 displays a summary analysis of the Level II riparian data, including Rosgen stream type (Rosgen 1996) and soil compaction, stratified by stream type. This analysis illustrates that the majority of stream length on these streams was comprised of A and B channels, with smaller percentages of C, E and G channels in some cases. For example, the South Fork of the Beaver River was comprised of 76% A channel, 18% B channel and 6% C channel (Table 3-22).

Soil compaction was selected as one of the most useful variables in the Level II data that indicates the extent of grazing activity in a stream reach (Dale Deiter, personal communication). However, it should be noted that soil compaction may not be as useful in addressing riparian plant community composition. The summary of soil compaction data reveals that compaction generally varied by channel type. A channel types generally had the highest percentages of stream length classified with slight compaction, followed by B channels. Although the C, E and G channel types comprised a relatively small percentage of the total stream length, they were rated with the highest percentages of severe soil compaction in many cases (Table 3-22). To illustrate this, the South Fork of the Beaver River can again be used as an example; although only 6% of the total stream length was classified as C channel, when looking only at those C channel reaches, 62% of the channel length was rated with severe compaction. Some streams had C channel types that were classified as 100% slightly compacted (Indian Creek, North Fork of North Creek, South Fork of South Creek and Ten Mile Creek). In most of these areas, the C channels are less accessible to livestock or have cobble substrates that are less susceptible to compaction (Dale Deiter, personal communication).

The information in Table 3-22 supports many of the qualitative observations in the Level II reports, which clearly state that problem areas do exist within the streams surveyed, but they comprise a relatively small percentage of the overall stream network in many cases. The soil compaction data is also generally consistent with Rosgen (1996), who characterized the sensitivity to grazing disturbance by channel type, stating that steep, confined channels (such as A and B types) have very low to moderate sensitivity to grazing disturbance, and that low gradient, unconfined floodplain channels (such as C, E and G types) have very high sensitivity to grazing disturbance.

**Table 3-18.**
**Summary of Rosgen stream type and soil compaction data (by stream type), collected in Level II riparian surveys.**

| Stream | % of total surveyed stream length by Rosgen stream type | | | | | % of stream length classified as having slight, moderate and severe soil compaction, by stream type | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Rosgen A | | | Rosgen B | | | Rosgen C | | | Rosgen E | | | Rosgen G | | |
| | A | B | C | E | G | Slight | Mod | Sevre | Slight | Mod | Sevre | Slight | Mod | Sevre | Slight | Mod | Sevre | Slight | Mod | Sevre |
| Beaver River | 69% | 31% | 0% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | - | - | - | - | - | - | - | - | - |
| S Fk Beaver River | 76% | 18% | 6% | 0% | 0% | 75% | 25% | 0% | 29% | 0% | 71% | 38% | 0% | 62% | - | - | - | - | - | - |
| L. Kents Lake Creek | 89% | 0% | 11% | 0% | 0% | 60% | 14% | 27% | - | - | - | 0% | 100% | 0% | - | - | - | - | - | - |
| Dry Hollow | 41% | 55% | 0% | 0% | 5% | 82% | 0% | 18% | 0% | 15% | 85% | - | - | - | - | - | - | 0% | 0% | 100% |
| Iant Creek | 19% | 55% | 26% | 0% | 0% | - | - | - | 0% | 45% | 55% | 0% | 33% | 67% | - | - | - | - | - | - |
| LeBaron Creek | 32% | 68% | 0% | 0% | 0% | 48% | 52% | 0% | 9% | 91% | 0% | - | - | - | - | - | - | - | - | - |
| Three Creeks | 53% | 34% | 13% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 0% | 100% | 0% | - | - | - | - | - | - |
| N Fork Three Creeks | 0% | 70% | 0% | 30% | 0% | - | - | - | 41% | 19% | 39% | - | - | - | 0% | 0% | 100% | - | - | - |
| Blayneys Creek | 88% | 12% | 0% | 0% | 0% | 100% | 0% | 0% | 0% | 100% | 0% | - | - | - | - | - | - | - | - | - |
| Hi Hunt Creek | 62% | 38% | 0% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | - | - | - | - | - | - | - | - | - |
| S Fork Three Creeks | 100 % | 0% | 0% | 0% | 0% | 52% | 48% | 0% | - | - | - | - | - | - | - | - | - | - | - | - |
| S. Birch Ck (west) | 58% | 26% | 16% | 0% | 0% | 47% | 53% | 0% | 100% | 0% | 0% | 0% | 100% | 0% | - | - | - | - | - | - |
| Big Twist Creek | 22% | 78% | 0% | 0% | 0% | 100% | 0% | 0% | 77% | 23% | 0% | - | - | - | - | - | - | - | - | - |
| South Creek | 38% | 62% | 0% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | - | - | - | - | - | - | - | - | - |
| Little North Creek | 92% | 8% | 0% | 0% | 0% | 100% | 0% | 0% | 23% | 77% | 0% | - | - | - | - | - | - | - | - | - |
| Pine Creek | 91% | 9% | 0% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | - | - | - | - | - | - | - | - | - |
| S. Fork Pine Creek | 98% | 2% | 0% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | - | - | - | - | - | - | - | - | - |
| N. Wildcat Creek | 89% | 11% | 0% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | - | - | - | - | - | - | - | - | - |
| Wildcat Creek | 97% | 3% | 0% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | - | - | - | - | - | - | - | - | - |
| Indian Creek | 57% | 31% | 12% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | - | - | - | - | - | - |
| N. Fork North Creek | 69% | 20% | 11% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | - | - | - | - | - | - |
| Pole Creek | 100 % | 0% | 0% | 0% | 0% | 100% | 0% | 0% | - | - | - | - | - | - | - | - | - | - | - | - |
| S Fk North Creek | 58% | 37% | 5% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | - | - | - | - | - | - |
| Pine Creek of S Fk | 100 % | 0% | 0% | 0% | 0% | 100% | 0% | 0% | - | - | - | - | - | - | - | - | - | - | - | - |
| Briggs Creek | 100 % | 0% | 0% | 0% | 0% | 100% | 0% | 0% | - | - | - | - | - | - | - | - | - | - | - | - |
| Ten Mile Creek | 81% | 13% | 6% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | 100% | 0% | 0% | - | - | - | | | |
| Birch Creek (east) | 35% | 60% | 0% | 0% | 5% | 100% | 0% | 0% | 100% | 0% | 0% | - | - | - | - | - | - | 100% | 0% | 0% |

During April and May of 1998, the Fishlake National Forest Ranger Districts conducted a coarse-filter assessment of the existing resource conditions occurring within the project grazing allotments (USDA FS 1998). According to these evaluations, some of the environmental impacts that were directly related to grazing activities included active headcutting, decreased streambank stability and increased sediment delivery into nearby streams. All eight of the allotments were thought of as having some fragile riparian areas. The allotments that were thought of as having detrimental

conditions existing within their fragile riparian areas also were areas where, in some cases, utilization actually exceeded the proper use guidelines established by the Forest Plan.

Riparian evaluations conducted during the mid-1990's (USDA FS 1996) on many of the stream systems within the Project Area indicate that ecological status of riparian areas associated with narrow, steep, and entrenched stream systems is generally in Late seral stages or at Potential Natural Community (PNC). In contrast, the ecological status of riparian areas along moderate gradient to flat bottom streams varies from Very Early to Mid seral status. Indicators for this lower seral condition include:

- Loss of natural shrub structure, primarily willow
- Lowering of water tables and encroachment of more xeric and less soil-binding vegetation species
- Exotic plant invasion
- Low vigor, density, and species diversity of key hydric and riparian species

The Beaver River Watershed Analysis (BWRA) completed in 2002-2003 (USDA FS 2003b) includes all of the North Indian Creek allotment, the majority of the South Beaver allotment, and portions of the Pine Creek-Sulphurbeds, Circleville and Ten mile allotments. The BRWA documents major vegetation changes in certain vegetation cover types, much of which can be attributed to wildfire suppression. However, the BRWA also attributes some of this vegetation change to grazing by domestic livestock and wildlife. The BRWA concludes that the types and extent of vegetation changes over the past 150 years have substantially reduced the carrying capacity for grazing and browsing ungulates (hoofed mammals), and perhaps may be partially responsible for concentrating use in riparian areas.

In addition, the steep slopes that confine many streams and riparian areas, particularly in the Sourth Fork of North Creek, preclude upland use and therefore concentrate use in fragile riparian areas (Dale Deiter - Fishlake Hydrologist, personal communication). As a result, proper use thresholds for bank stability, riparian stubble heights, or browse use are sometimes exceeded before upland slopes are fully utilized.

Consequently, some streams and riparian areas may be incurring excess use even if upland slopes are not being adversely affected (USDA FS 2003b, Watershed and Aquatics section, pg 18). Again, this information highlights the importance of monitoring and enforcing proper use standards, particularly in fragile riparian areas. The BWRA also classifies some watersheds as not capable of supporting current stocking levels, based on livestock stocking rates in comparison with suitable watershed area. This analysis coincides with the need to address the time and concentration of grazing in certain areas (USDA FS 2002, 2003 a), which is recommended in some of the allotment action plans (Table 1-1).

Many of the streams within the Project Area are set in down-cut channels. Some systems are severely impacted as a result of a weak or disturbed riparian community. In many complexes the willow appears to be in a general state of decline, being heavily browsed and having little or no regeneration. Some key riparian areas are considered to be generally at a moderate to high range of departure from properly functioning condition. Many have improved greatly from historic deteriorated conditions resulting from excessive grazing use at the turn of the century. However, many have not recovered sufficiently to be considered healthy enough to be "not at risk" or threat of possible damage resulting from recurring watershed disturbances and grazing pressure. Some are at

a threshold from which if deterioration occurs, recovery to functionality may be foregone. Most are currently at a state of equilibrium, neither improving nor deteriorating, but not fully functioning or fully contributing to meeting riparian area objectives for ecosystem health.

**Riparian Restoration:** Some allotments within the Project Area have been the location of a substantial number of range and watershed improvement activities. The activities directed toward riparian restoration and enhancement appear to have contributed to an apparent improvement in stream health. This long-term effort and success strongly supports continued efforts to implement riparian restoration and enhancement projects.

Riparian restoration objectives include:

- 1. To sustain an ability to produce a variety of potential natural communities consistent with inherent capabilities of the ecosystem
- 2. To re-establish high quality beaver habitats, where appropriate, and stabilize streambanks
- 3. To manage for higher amounts of sedges and grasses to filter sediments and absorb nutrients and other pollutants and meet Clean Water Act goals
- 4. To restore riparian structure and willow components for fish and wildlife values

Beaver are a keystone species, but they are not a species indicated in the Forest Plan for which monitoring is required. There is no legal mandate that requires the Forest Service to manage for beaver habitat; however, by default, beaver are included in the consideration of riparian dependent obligates. Keystone Species are species that enrich ecosystem function in a unique and significant manner through their activities, and the effect is disproportionate to their numerical abundance. Their removal initiates changes in ecosystem structure and often loss of diversity. The ponds, wetlands, and meadows formed by beaver dams increases bio-diversity and improves overall environmental quality.

The presence of beaver in Utah brought the early trappers to the region during the period 1825 through 1834. Jedediah S. Smith, a famous historical figure and mountain man ventured here in 1826-27 naming the Beaver River that flowed through the valley as the "Lost River." John C. Fremont, Kit Carson and Joseph Walker passed through following the "Old Spanish Trail" while surveying for the government in 1844. Fremont named the River "Rio Buenaventura" thinking it was the mythical river that joined the Missouri River and the west coast at the San Francisco Bay. The town of Beaver and Beaver River were later named for the historic number of Beaver that once inhabited Beaver Canyon. Settled in 1856, Beaver was formally incorporated on 10 January 1867.

At the turn of the century Beaver County was a busy mining and wool manufacturing center. By 1880 it enjoyed rail service with the Utah Southern Railroad extension to Milford and a branch line to the silver mines. But Beaver lacked hydroelectric power. In the early 1900s, between 1905 and 1908, an engineer and contractor by the name of Lucien L. Nunn began construction of a power plant 12 miles east of Beaver in Beaver Canyon. A dam was built across the head of the Beaver Canyon and in 1910 additional smaller diversion dams were built on three streams feeding into the Beaver River. In 1918 Nunn built the Lower Beaver Power Station three miles downriver specifically to serve the Milford mining operations. Eventually, the plant was acquired by Utah Power and Light. Still in operation, the plant and grounds have been named a historic site.

Dynamic management of the Beaver Plant, with upgrades to the operation and improvements on the dam and conduit system to increase and regulate water capacity was a continual operation. During this time, beaver populations were drastically reduced. After many years of over-trapping for its valuable fur, the beaver was almost extirpated in the 1930's. In addition, there was an inherent conflict between early agriculture and beavers. The fertile land flooded by beaver dams, in the "Beaver Bottoms" and river land west of Beaver to Milford was prime farmland. The few beavers that survived the fur-trade era, were likely removed when lands were homesteaded, since they were a hindrance to farming.

Today, although beaver populations are not what they historically were, populations within the State of Utah are apparently secure. The Utah Division of Wildlife Resources indicates that beaver habitat within the Tushar Range is largely Substantial Value Habitat - an area that provides for "frequent" use by a wildlife species [http://dwrcdc.nr.utah.gov/rsgis2/Search/Map.asp?Id=461]. Isolated areas are indicated as Critical Value Habitat - an area that provides for "sensitive" biological and/or behavioral requisites necessary to sustain the existence and/or perpetuation of a wildlife species (see Beaver Predicted Habitat map in Appendix H).

Riparian restoration efforts will be focused on moving very early, early, and mid seral condition ecosystems toward mid-late seral or PNC status. The progress toward this change is what is to be monitored. Healthy riparian communities will be indicated by:

- Diverse age-class distribution (recruitment for maintenance/recovery)
- Diverse composition of vegetation (for maintenance/recovery)
- Hydric species present indicate maintenance of riparian soil moisture characteristics
- Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
- Riparian plants exhibit high vigor, including healthy plant crowns and roots
- Adequate vegetation, dominated by perennial species, is present to protect banks and dissipate energy during high flows
- Plant communities in the riparian area are an adequate source of coarse and/or large woody debris

Some of the allotments under review for the continuation of permitted grazing activity and the subsequent development of new AMP's have been impacted by incidents of wildfire, affected by heavy runoff during spring snowmelt conditions, or endured intense pressure from turn-of-the-century livestock grazing – prior to the establishment of this Forest. In many instances, burned-area emergency rehabilitation treatments or watershed restoration measures have been applied to these disturbed landscapes in an effort to limit accelerated erosion losses and protect long-term soil productivity. Most of the subwatershed areas that were previously consumed by fire experienced geologic instability in the form of soil creep, slumping, landslides, or denudation by historical grazing practices remain categorized as " Class III " type units with respect to their overall geomorphic integrity. The Class III rating is defined as:

> "…These subwatersheds have low soil and water integrity relative to their overall potential under the existing disturbed conditions. In many areas, capital investment along with revised management will be necessary to restore soil conditions in an effort to control accelerated erosion and nonpoint pollution. Land disturbing activities are not precluded, but they must complement recovery. More than 20% of the riparian areas are presently at risk – because these fragile sites are not in properly functioning condition" (Inland West Watershed Reconnaissance Project – R1/R2/R3/R4, 11/1997).

The subwatersheds occurring within the analysis area that were disturbed by dramatic incidents of wildfire during recent years (resulting in a Class III existing condition rating), list as follows:

| Table 3-19 Class III Watersheds: Wildfire Disturbances | | |
|---|---|---|
| **RANGER DISTRICT** | **ALLOTMENT** | **SUBWATERSHED** |
| Beaver | Ten Mile<br>Circleville | City Creek<br>City Creek, Oak Basin Canyon, Cottonwood Creek |

Capital investments in the form of emergency seeding, contour felling, temporary fencing, trail stabilization, grade control plugs, road closure gates, culvert replacements, waterbar construction, channel armoring, along with special law enforcement agreements were applied to public lands administered by the Forest Service following wild fire incidents; special appropriations of EFFS - FW22 funds were used to finance these various land, road, trail and channel treatments. Revised management has been implemented within these burned-areas by temporarily closing some allotments to livestock grazing, until field monitoring results indicate that soil hydrologic function is restored to near natural conditions.

The subwatersheds occurring within the analysis area that were impacted by geologic hazards, disturbed by historical grazing practices, or subjected to the encroachment of woody vegetation into their riparian communities (resulting in a Class III existing condition rating), list as follows:

| Table 3-20 Class III Watersheds: Geologic Disturbance | | |
|---|---|---|
| **District** | **Allotment** | **Subwatershed** |
| Beaver | South Beaver<br>Pine Creek-Sulphurbeds | Coyote Creek, Lee's Spring Wash, Big Twist Creek, North Fork of Big Creek<br>Lower Pine Creek, North Wildcat Creek, Indian Creek, Black Hollow |

It should be noted that " most grazing activities " associated with domestic livestock on upland landscapes do not exceed the maximum thresholds listed in the R4 / Soil Quality Standards for causing detrimental site disturbances. In addition, the distribution of above-ground organic matter is usually sufficient, in terms of protecting the soil surface from accelerated erosion losses, according to the R4 / SQS areal extent guidelines. Specifically, at least 85 % of the activity areas have soil properties that remained in satisfactory condition using the current grazing systems based on sampling observations made during implementation, effectiveness or validation type monitoring studies. When deemed necessary, some of the mitigating conservation measures that could be implemented to reduce the effects of soil disturbances caused by livestock grazing would include surface tillage of puddled areas, subsoiling through severely compacted locations, redistributing humus-enriched topsoil in displacement areas along with seeding, planting and mulching highly erodible sites in order to establish protective ground cover.

Many of the grazing allotments occurring within the analysis area contain significant amounts of acreage in shallow / non-renewable type soils. These fragile sites are located on moderately steep hillsides, steep mountain sides and very steep ridge top areas. Most of these upland landscapes are recognized as non-range and considered relatively unsuited for grazing purposes due to limited forage production and the potential for highly erodible conditions. By definition, shallow landscapes are distinct areas having less than 20 inches of soil material occurring directly over impervious bedrock or an indurated hardpan layer. These non-renewable sites have a " maximum threshold " for soil-loss tolerance at the erosion rate of 1 ton/acre/year. During unfavorable climatic

conditions and in times of improper stocking or poor management, livestock may actually utilize these areas of steep to very steep terrain. This situation results in the detachment and transport of eroded soil material -- with losses actually exceeding the threshold rate of 1 ton/acre/year in some disturbed areas. Quite often, eroded sediment is the richest part of the soil profile -- usually its surface horizon containing most of the site fertility in the form of plant nutrients and humified organic matter.

Overgrazing has caused a decrease in vegetative cover and an increase in soil compaction on many of the allotments. This has caused a decrease in infiltration and an increase in runoff from these areas, which has caused increased erosion and impacts to the streams, especially where bank damage or degradation to the riparian vegetation has occurred. Since some riparian areas have continued to receive heavy use of over 55% utilization (4-6 inch stubble height), the infiltration rate is probably still adversely impacted in these areas. Less water is held on site; which alters streamflow and channel stability. Sedimentation and increases in water temperatures have also resulted. The channels are less able to withstand flood events, and many of the stream channels within the allotments were damaged and severely downcut by the flood events of 1983 and 1984. However, with grazing, most of these channels are slowly showing recovery.
Many of the riparian and wetland areas within the grazing allotments considered in this assessment are not currently in ``proper functioning condition" (USDI BLM, 1993). They do not have the diversity of vegetation or the amount of sedges, willows or other woody vegetation that would be expected in functioning riparian areas. Many have Kentucky bluegrass as the primary riparian vegetation type. Areas that have exclosures, fences or limited access have better diversity. Riparian areas not in proper functioning condition are more susceptible to damage from natural events or management. Areas with bare stream banks are also found in some allotments. The allotments with riparian areas that are ``functioning-at-risk" or ``not functioning" are listed in the allotment summaries (See Table 3-1).

## F. DESCRIPTION OF AFFECTED ENVIRONMENT – WATER QUALITY AND QUANTITY

Watersheds draining to the north and west are tributary to the Beaver River drainage in the closed Great Basin. Watersheds draining to the east are tributary to the Sevier River also within the closed Great Basin. As required by the Clean Water Act as amended, the State of Utah has adopted a Water Quality Antidegradation Policy that requires maintenance of water quality to protect the instream Beneficial Uses existing as of 1975. The Clean Water Act also directs each State to establish a Nonpoint Source Management Plan. The State of Utah Division of Water Quality and USDA Forest Service Intermountain Region have agreed through a 1993 Memorandum of Understanding to use Forest Plan Standards & Guidelines and the Forest Service Handbook (FSH) 2509.22 Soil & Water Conservations Practices (SWCPs) as the Best Management Practices (BMPs) to meet the water quality protection elements of the Utah Nonpoint Source Management Plan. In the 1998 Utah Nonpoint Source Management Plan, several watersheds were identified as high priority for the implementation of control measures. These watersheds were identified because of nonpoint source impacts to water quality and the potential for improvement using criteria described in the assessment. The Beaver River Watershed is on the list of Utah Priority Watersheds for Nonpoint Source Pollution Control.

| Table 3-21-- Utah Priority Watersheds for Nonpoint Source Pollution Control | | | | |
|---|---|---|---|---|
| **UT High Priority WS** | **Major Problem** | **WS Tributary** | **District** | **Allotment** |
| Beaver River | Nutrients | Several | Beaver | South Beaver<br>North. Indian<br>Pine Creek/Sulphurbeds<br>Circleville (upper portions)<br>Ten Mile (above Puffer Lake) |

In addition, the Forest Plan identifies two Management Areas, within the Project Area, for emphasis of watershed condition, water quality, and fisheries: Management Prescription 4A (emphasis is on fish habitat improvement), and 10E (provides for municipal watersheds):

| Table 3-22—Forest Plan Management Areas With Emphasis on Watershed Condition | | | |
|---|---|---|---|
| **Ranger District** | **Management Area** | **Watershed** | **Allotment** |
| Beaver | 4A Fish Habitat | Pine Creek (West side of Tushar Range) | Pine Creek/Sulphurbeds |
| Beaver | 4A Fish Habitat | Indian Creek | Pine Creek/Sulphurbeds, North Indian |
| Beaver | 4A Fish Habitat | North Fork & South Fork of North Creek | North Indian |
| Beaver | 4A Fish Habitat | South Birch Creek, South Creek, | South Beaver |
| Beaver | 4A Fish Habitat | Birch Creek East | Circleville |
| Beaver | 4A Fish Habitat | Cottonwood Creek | Cottonwood, Marysvale |
| Beaver | 4A Fish Habitat | Pine Creek (East side of Tushar Range) | Marysvale |
| Beaver | 4A Fish Habitat | City Creek | Ten Mile, Junction, Circlevlle |
| Beaver | 10E Municipal WQ | City Creek | Ten Mile/Circleville |
| Beaver | 10E Municipal WQ | Cottonwood Creek | Circleville |
| Beaver | 10E Municipal WQ | Oak Basin | Circleville |
| Beaver | 10E Municipal WQ | Pine Creek | Marysvale |

Under Section 305(b) and 303(d) of the Clean Water Act as amended, each state is required to identify those water bodies that do not meet Water Quality Standards, and work towards identifying and correcting pollution problems. Watersheds that are not meeting their state designated beneficial uses are included in the state 305(b) report to Congress and listed on the 303(d) list. When impaired waterbodies are identified a TMDL document is created by the State, which addresses potential sources of contaminants and action plans to improve water quality, in order to achieve state standards. When this TMDL document is approved by the EPA, the related waterbodies are removed from the 303d list. However, it is important to note that water quality problems can still exist, and the approved TMDL action plan should be followed until water quality standards are met.

Waterbodies within the project area that are currently listed in the 305(b) report (Utah DEQ 2004a) and on the 303(d) list (Utah DEQ 2004b) are included in Table 3-9. A draft TMDL for the upper Sevier River, which includes this area, has been submitted to the EPA, and approval is pending (Utah DEQ 2004c). Table 3-10 displays those water bodies that were removed from the 303(d) list, and are now subject to the Beaver River Watershed TMDL, which was approved by the EPA in 2000 (Utah DEQ 2000).

| Table 3-23—Water Bodies Included on the 303(d) List | | | |
|---|---|---|---|
| **Ranger District** | **Allotment** | **Waterbody** | **Pollutants of Concern** |
| Beaver | Circleville—the southern end of the allotment, including Birch Creek (east). | Sevier River and tributaries from Circleville Irrigation Diversion upstream to Horse Valley Diversion | Total Phosphorus, Sediment, Habitat Alteration |

| Table 3-24—Water Bodies Removed From the 303(d) List and Now Subject to the Beaver River WS TMDL | | | |
|---|---|---|---|
| **Ranger District** | **Allotment** | **Waterbody** | **Pollutants of Concern** |

| | | | |
|---|---|---|---|
| Beaver | South Beaver | Kents Lake | Total Phosphorus, Dissoled Oxygen, pH |
| Beaver | South Beaver | LaBaron Reservoir | Dissolved Oxygen, pH |
| Beaver | South Beaver | Beaver River-tributaries | Total Phosphorus, Noxious Aquatic Plants, |
| Beaver | Circleville (upper sections) | Beaver River- tributaries | Riparian Habitat Alteration |
| Beaver | North Indian | Beaver River- tributaries | |
| Beaver | Ten Mile (above Puffer | Beaver River- tributaries | |
| Beaver | Lake) | Beaver River- tributaries | |
| | Pine Creek/Sulphurbeds | | |

Another indicator of stream health is the macroinverterbrate population within the stream. The Biotic Condition Index (BCI) is used to measure the condition of the macroinverterbrate community. The BCI is an index that measures the macroinverterbrate community of a stream against its own potential. It is based on the tolerance of different species to different environmental factors. A low BCI indicates lower water quality and a macroinverterbrate community that is not as healthy as its potential. The Forest Plan standard is a minimum BCI of 75. Some of the sampled streams that do not meet this standard are located within allotments that are part of this project. BCI data for the Beaver Ranger District from 1987 to 2002 (Whelan 2003) are reported in Table 3-29.

**Table 3-25—BCI Data for the Beaver Ranger District from 1987-2002**

| Station | Allotment | YEAR | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 00 | 01 | 02 |
| *Birch Cr West 1 | South Beaver | 75/85 | 74/85 | 82 | - | - | - | - | - | - | - | - | 63 | 69 | - | - | - |
| *Birch Cr West 2 | South Beaver | - | - | - | - | - | - | - | - | - | - | - | 66 | 68 | - | - | - |
| Merchant | None | 96/94 | 91 | 94 | - | - | - | 72 | - | - | - | - | 79 | 86/76 | - | - | - |
| Merchant2 | None | - | - | - | - | - | - | 79 | - | - | - | - | - | - | - | - | - |
| West Fork Merchant. | None | 91/92 | 92 | 98 | 100 | - | - | - | - | - | - | - | - | 72 | - | - | - |
| N Fk Three Creeks 1 | South Beaver | - | 98/82 | 100 | 100/100 | - | - | - | - | - | - | - | - | 79 | - | - | - |
| N Fk Three Creeks 2 | South Beaver | - | 78/91 | 91 | 100/94 | - | - | - | - | - | - | - | - | 87 | - | - | - |
| Indian Cr1 | North Indian | - | - | - | - | - | - | 72 | - | - | - | - | - | 75 | - | - | - |
| Indian Cr2 | North Indian | - | - | - | - | - | - | 66 | - | - | - | - | - | - | - | - | - |
| *Pine Cr 1 | Pine Creek /Sulphurbeds | - | - | - | - | - | - | - | - | - | - | - | 62 | 71 | - | - | - |
| *Pine Cr 2 | Pine Creek /Sulphurbeds | - | - | - | - | - | - | - | - | - | - | - | - | 71 | - | - | - |
| *N Fk. North Cr 1 | North Indian | - | - | - | - | - | - | - | - | - | - | - | 68 | 68 | - | - | - |
| *N.Fk. North Cr 2 | North Indian | - | - | - | - | - | - | - | - | - | - | - | 73 | 71 | - | - | - |
| Beaver River | None | - | - | - | - | - | - | - | - | - | - | - | - | 78 | - | - | - |
| *10 Mile Upper | Ten Mile | - | - | - | - | - | - | - | - | - | - | - | - | - | 81 | - | - |
| *10 Mile Lower | Ten Mile | - | - | - | - | - | - | - | - | - | - | - | - | - | 94 | - | - |
| *Birch Cr East 1 | Circleville | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 76 | - |
| *Birch Cr East 2 | Circleville | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 70 | - |

* Bonneville Cutthroat streams.

## G. DESCRIPTION OF AFFECTED ENVIRONMENT –TECS AND MIS SPECIES

**1. Threatened, Endangered, Candidate (TEC) Wildlife Species.** TEC species and habitat that may occur in the project area include: bald eagle (T), Utah prairie dog (T), and western yellow-billed cuckoo (C). TEPC wildlife, with known occupied habitat, includes peregrine falcon and bald eagle. See the Biological Evaluation (BE) and Biological Assessment (BA) and Vertebrate Wildlife, Plant & Management Indicator Species (MIS) Specialist Report for details.

- **Western Yellow-billed Cuckoo.** The proposed action analysis area contains only 188 acres of potentially suitable habitat in City Creek, North Creek and along the Clear Creek corridor (including Fish Creek and Mill Creek). Portions of City Creek, Clear Creek, Fish Creek, and Mill Creek below 7,000 feet were surveyed for western yellow-billed cuckoos in 2003. All of these surveyed potentially suitable riparian habitats lacked the dense brushy understories needed for the western yellow-billed cuckoo. No western yellow-billed cuckoos were found during these surveys. Additional surveys on other riparian stream courses throughout the Beaver Ranger District were performed in 2002. No western yellow-billed cuckoos were detected during these surveys. To date, there have been no western yellow-billed cuckoos found in the analysis area or on the Fishlake National Forest.
- **Bald Eagle.** There are no nests or roosts on the Beaver Ranger District. Visitation occurrences are in the fall, winter, and spring months only, before or after grazing has occurred. Bald eagle observations have been recorded around lakes and the lower elevational fringes of the Beaver Mountain Tushar Range analysis area during the winter months. Periodic winter bald eagle surveys performed between 1979-2003 have never documented a roosting site anywhere on the Beaver Ranger District. The nearest known historic roosting site is located in Kanosh Canyon on the Fillmore Ranger District approximately 20 air miles to the north of the analysis area. No critical habitat for the bald eagle has been designated on the Fishlake National Forest (Rodriguez 2005). The most limiting habitat component for bald eagles is large diameter trees, which are not affected by grazing.
- **Utah Prairie Dog.** Presently, there are no known prairie dogs in the analysis area or on the Fishlake National Forest. Historically, there was a transplant site in the Rocky Pond area of the Beaver Ranger District. This area is located within the South Beaver Allotment of the analysis area. To date, these transplants have been considered unsuccessful with low reproductive rates as well as no dogs currently occupying the site. No critical habitat has been designated for the Utah prairie dog on the Fishlake National Forest. However, potentially suitable habitat for the Utah prairie dog can be found at lower elevation sites scattered throughout the analysis area.

During the informal consultation process the Fishlake National Forest and the U.S. Fish and Wildlife Service concurred that the bald eagle, Utah prairie dog, and western yellow-billed cuckoo, and/or their habitats, may be affected by the proposed action but will not likely be adversely affected. Refer to the Biological Assessment (BA) in Appendix C for details.

2. **Sensitive Wildlife and Fish Species.** Sensitive species and habitat may occur in the project area. Sensitive wildlife, with occupied habitat, includes peregrine falcon, northern goshawk, flammulated owl, sagegrouse, and three-toed woodpecker. Other **s**ensitive species suspected of occurring, or having potentially suitable habitat in the project area include: spotted bat, Townsend's big-eared bat, and pygmy rabbit. Refer to the Vertebrate Biological Evaluation (BE) in Appendix E and Vertebrate Wildlife, Plant & Management Indicator Species (MIS) Specialist Report for details.

The only sensitive wildlife species known to occur on allotments, which may be influenced by grazing within the project area, is the northern goshawk. The flammulated owl and three-toed woodpecker would not be affected by grazing. Bonneville cutthroat trout are the only sensitive fish species that occurs within the project area.

- **Peregrine Falcon.** Peregrine falcons are known to occur on the Beaver Ranger District within the analysis area. There is one known nest site/territory on the Beaver Ranger District, located in the North Indian Creek Allotment. The nest was last known to be active during 1993 and in 1994. This nest has not been active when formally monitored as recent as 2002 and 2003. Numerous sightings have occurred and suitable habitat is abundant; however, no other nest sites have been located. There have been sightings of peregrine falcons on the South Beaver Allotment, Cottonwood Allotment, and the Joe Lott Fish Creek Allotment. Of these, the North-Indian Creek Allotment and the South Beaver Allotment fall within the scope of the proposed action. Approximately 1,300 acres of potentially suitable nesting habitat occurs throughout the analysis area, which equates to 48% of the habitat on the District and 10% of the potential suitable habitat on the Forest. Their presence is suspected on all allotments within the analysis area, although none have documented the presence of peregrine falcon nesting within their boundaries. There have, however, been documented sightings:

**Table 3-26 Peregrine Falcon Habitat**

| RANGER DISTRICT | ALLOTMENT | HABITAT CONDITION |
|---|---|---|
| Beaver | Pine Creek/Sulphurbeds | Indian Creek sightings |
| Beaver | North Indian | Manderfield Reservoir sightings |
| Beaver | South Beaver | Three Creeks Reservoir |

- **Northern Goshawk.** There are approximatley 75,112 acres of potentially suitable goshawk nesting habitat in the analysis area which equates to 59% of the habitat on the Beaver Ranger District and 19% of that estimated for the entire Forest (Rodriguez 2005). There are 14 known goshawk territories on the Fishlake National Forest (Rodriguez 2005). Northern goshawk surveys have been conducted in 2002 and 2003 in much of the Beaver River Watershed and in other various parts of the analysis area. There are only three confirmed goshawk territories found on the Beaver Ranger District. Two of these territories are located within the Beaver River Watershed. These three nests occur on the North Beaver, South Beaver, and Circleville Allotments. The South Beaver and Circleville Allotments fall within the scope of this proposed action. Further observation records of the northern goshawk have also been documented on the North-Indian Creek and the Pine Creek-Sulphur Beds Allotments. There is, however, suitable goshawk nesting habitat on all of the 8 allotments within the proposed action area. In the Fishlake National Forest goshawks lay eggs and rear young from April 15 through September.
- **Flamulated Owl.** The flammulated owl is known to occur on the Beaver Ranger District within the analysis area. Surveys performed in 2003 for this species revealed presence on the North-Indian Creek Allotment, the South Beaver Allotment, and the Circleville Allotment. Flammulated owls appear to be associated with mature pine and mixed conifer habitat types (Rodriguez 2005). There are approximatley 75,112 acres of potentially suitable flammulated owl habitat in the analysis area which equates to 59% of the habitat on the Beaver Ranger District and 19% of that estimated for the entire Forest (Rodriguez 2005).

- **Three-toed Woodpecker**. The three-toed woodpecker is known to occur on the Beaver Ranger District within the analysis area. There have been numerous recent (summarized in 2002, 2003, 2005) project level surveys, studies, detections, and nest locations of three-toed woodpeckers which depict a broad distribution of this species in the Engelmann spruce and mixed conifer vegetation types within the Beaver River Watershed. Three-toed woodpecker habitat consists of northern coniferous and mixed forest types located at elevations up to 9,000 feet and composed of Engelmann spruce, sub-alpine fir, Douglas fir, grand fir, ponderosa pine, tamarack, and lodgepole pine. This species is attracted to areas where there are numerous dead trees due to fire, insect infestations, blow-down, or other die-off (Rodriguez 2005). There are approximatley 75,112 acres of potentially suitable three-toed woodpecker habitat in the analysis area which equates to 59% of the habitat on the Beaver Ranger District and 19% of that estimated for the entire Forest (Rodriguez 2005).
- **Greater Sage Grouse.** Sage grouse, a member of the sage nesting guild is an indicator of the mature sagebrush type on the Fishlake National Forest and depend almost entirely on forms of sagebrush, primarily big sagebrush, for food from October through May and for cover throughout the year. None of the allotments included in the project area, have habitat suitable for sage grouse. There are known populations of sage grouse on the Richfield and Fremont River Ranger Districts, using Forest lands much of the year with one documented lek. Also, there is some documentation of sage grouse use on the Beaver Ranger District within the analysis area. In 1983, there were historic observation records of sage grouse in the Rocky Pond area of the South Beaver Allotment (within analysis area). Since then, no known occurrences were documented until Sept. of 2004 when 8 individuals were observed in this same area. No known lekking behavior takes place in this area with use being considered as summer or brood-rearing. Sage grouse are solely dependent on sagebrush dominated habitats (Rodriguez 2005). An estimated 43,966 acres of potentially suitable habitat for sage grouse does exist on sagebrush-dominated cover types scattered throughout the analysis area. This comprises 56% of the total estimated potential habitat on the District and just 8% of that on the Forest.
- **Bonneville Cutthroat Trout.** Bonneville cutthroat trout (BCT) are a unique subspecies of the western cutthroat trout complex, native to pluvial Lake Bonneville, which covered parts of Utah, Idaho, Nevada, and Wyoming up to 10,000 years ago. With desiccation of Lake Bonneville they became restricted to headwater streams and remnant lakes with suitable trout habitat. They require cool, clear water with an appropriate pool to riffle ratio and slow, deep water with vegetated streambanks for shade, bank stability, and cover. They prefer summer water temperature of about 55 degrees F, but can survive in water up to 70 degree F. Limitations to this species include loss of habitat from man-made causes such as water diversions, overgrazing of riparian areas, timber harvest and water pollution, although the greatest impact has been the loss of genetic purity as a result of hybridization and competition from non-native trout (Rodriguez 2004, Spahr et al. 1991).

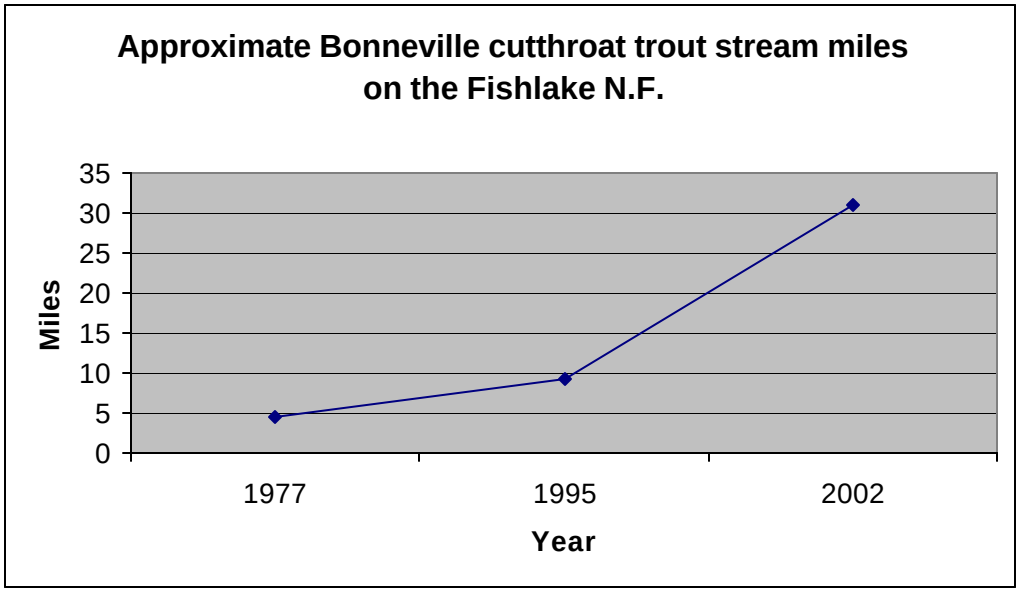
Bonneville cutthroat trout are considered a "high interest Management Indicator Species (MIS)" on the Fishlake National Forest. The Conservation Agreement and Strategy for Bonneville cutthroat trout in the State of Utah guides current recovery actions (Lentesch et al. 1997).

Known stream miles of Bonneville cutthroat trout have increased on the Fishlake N.F. since 1977 due to their reintroduction to several new Forest streams (although yet unknown remnant populations were likely becoming more restricted at the same time). The following graph shows the number of known stream miles of Bonneville cutthroat trout on the Fishlake N.F. from 1977-2002.

This figure increased slightly by 2004 as they become established into two streams with recent reintroductions. There are now known populations of pure strain Bonneville cutthroat trout inhabiting approximately 38 miles of stream habitat on the Fishlake National Forest (Rodriguez 2005). It should be noted that Bonneville cutthroat trout occupied streams still represent a small minority of the total stream miles on the Forest. Populations on the Beaver Ranger District include Pine Creek, North Fork of North Creek and its tributary Pole Creek, Briggs Creek, Birch Creek West, Birch Creek East, and Ten Mile Creek. These populations of Bonneville cutthroat trout occur in streams on the Circleville, Ten Mile, South Beaver, North-Indian Creek, and PineCreek/Sulphur Beds Allotments within the analysis area.

A pure remnant population exists in Birch Creek (west) and a slightly intergressed remnant population exists in the headwaters of the North Fork of North Creek. Reintroduced populations are present in Pine Creek, lower North Fork of North Creek, Briggs Creek, Birch Creek (east) and Ten Mile Creek. Briggs Creek (0.6 miles) is the only Bonneville cutthroat stream completely free of cattle grazing in the project area. Ten Mile Creek also has approximately 2.6 miles of habitat with only a limited influence from livestock grazing. The Utah Division of Wildlife Resources has proposed reintroducing Bonneville Cutthroat trout to the South Fork of North Creek, which would add about 10-11 miles of habitat with limited influence from cattle grazing. Planning documents and Environmental Analysis are currently being prepared for this and other proposed reintroductions. This project would be carried out within 5 years of the decision, if approved by the appropriate decision makers.

Chart 3-27: Bonneville cutthroat trout stream miles on the Fishlake N.F. (Hepworth et al. 2003)




Note: Does not include potential remnant populations that have not been genetically tested or remnant populations that have not yet been found.

3. **Threatened, Endangered, Proposed, and Candidate (TEPC) Plant Species.** No federally listed TEPC plants are known to occur within the analysis area. San Rafael cactus (E), Maquire's daisy (T), Last Chance townsendia (T), and Rabbit Valley gilia (C) are known to occur at other locations on the Fishlake National Forest, but lack suitable habitat within the analysis area.

Currently, no plant species proposed for listing are known to occur on the Forest. See the plant Biological Assesment (BA) and Vertebrate Wildlife, Plant & Management Indicator Species (MIS) Specialist Report for details.

4. **Sensitive (S) Plant Species.** Suitable and occupied habitat exists for Tushar paintbrush, creeping draba, and Beaver mountain groundsel. Suitable, but unoccupied, habitat exists for Arizona willow and wards beardtongue. Potentially suitable habitat for Elsinore Buckwheat is only found on the Junction Allotment. See the Biological Evaluation (BE) for details.

**Table 3-28 Sensitive Plant Species Habitat**

| PLANT SPECIE | GRAZING AFFECTS | DISTRICT | ALLOTMENT | |
|---|---|---|---|---|
| Tushar paintbrush | May Impact | Beaver | North Indian<br>Circleville | Marysvale<br>Ten Mile |
| creeping draba | No Impact | Beaver | North Indian | |
| Beaver Mt. groundsel | No Impact | Beaver | North Indian | |

- **Tushar Paintbrush**. Tushar Paintbrush is endemic to the Tushar mountain range in south-central Utah. It can be found in high elevation alpine areas on igneous gravels and outcrops between 10,000 and 12,100 feet elevation. This species is only known to occur on the Beaver Ranger District of the Fishlake National Forest (Madsen 2003). There are 45 known discrete locations of Tushar Paintbrush on the Beaver Ranger District (Madsen 2003). This species is only distributed in Beaver and Piute Counties. This plant species is distributed at high elevations in the Joe Lott Fish Creek, Cottonwood, North Beaver, North-Indian Creek, Marysvale, Ten Mile, and Circleville Allotments. Potentially suitable habitat for this plant species only occurs at high elevations within these seven allotments.
- **Creeping draba.** Creeping draba is found in alpine tundra and high elevation spruce/fir communities in igneous gravels and talus on the Tushar mountain range of the Fishlake National Forest. It only occurs on the Beaver Ranger District of the Fishlake National Forest (Madsen 2003). There are 24 known locations for this species on the Beaver Ranger District (Madsen 2003). These populations occur in the Joe Lott Fish Creek, Cottonwood, and North-Indian Creek Allotments of the analysis area. The North-Indian Creek Allotment is included in the scope of the proposed action. Potentially suitable habitat for creeping draba also occurs on the Ten Mile, Circleville, and Marysvale Allotments. Potentially suitable habitat for creeping draba is characterized by high elevation (10,000 + feet) open igneous gravels and talus with little vegetation cover. This species also occurs in krummholtz-like spruce-fir open talus communities.
- **Beaver mountain groundsel.** Beaver mountain groundsel is found on alpine tundra and high elevation spruce/fir communities on open igneous gravels and talus on the Tushar Mountain Range. It only occurs on the Beaver Ranger District above 10,800 feet elevation (Madsen 2003). There are 9 known locations for this species on the Beaver Ranger District all of which occur on the Joe Lott Fish Creek, North-Indian Creek, and Cottonwood Creek Allotments (Madsen 2003). The North-Indian Creek Allotment is included in the scope of this proposed action. Potentially suitable habitat for Beaver Mountain groundsel also occurs on the Ten Mile, Circleville, and Marysvale Allotments. Potentially suitable habitat for creeping draba is characterized by high elevation (10,800 + feet) open igneous gravels and talus with little vegetation cover. This species also occurs in krummholtz-like spruce-fir open talus communities.

5. **Management Indicator Species (MIS).** Management Indicator Species are required by the National Forest Management Act (NFMA). This act requires National Forests to select a group of representative wildlife and fish species for indicator habitat types. By monitoring their populations and habitat relationships, this information is used to better understand the dynamics within these ecosystems and provide habitat for other species that also depend upon similar conditions within the same habitat type. The Fishlake National Forest has selected Management Indicator Species to reflect the diverse habitat structure found within the Forest (USDA Forest Service 1986, USDA Forest Service 2006). The northern goshawk and Bonneville Cutthroat Trout each are both a sensitive species and a management indicator species.

**Table 3-29 MIS Species Habitat**

| MIS Species | Indicator Habitat Type | Location |
|---|---|---|
| Northern Goshawk | Mature (old growth) conifer | So. Beaver, Circleville |
| Cavity Nesters (hairy woodpecker, western bluebird, mountain bluebird) | Snags (standing dead trees) | District-wide |
| Riparian Guild (Linclon's sparrow, yellow warbler, song sparrow, Macgillivrays warbler) | Riparian communities | District-wide |
| Sage Nesters (Brewer's sparrow, vesper sparrow, sage thrasher | Mature sagebrush | District-wide |
| Macroinvertebrates | Streams (water quality) | District-wide |
| Resident Trout (rainbow, brown, brook, cutthroat, lake) | Streams, lakes, reservoirs | District-wide |
| Elk and Mule Deer | General and winter range | District-wide |
| Bonneville Cutthroat Trout | Cool, clear water with high $O_2$ content | Pine Ck /Sulphurbeds, So Beaver, N Indian Ck |
| Rydberg's Milkvetch | Harsh sites at upper elevs | Bullion Canyon RNA |

- **MIS Monitoring.** Information regarding MIS can be found in *Life History and Analysis of Endangered Threatened, Candidate, Sensitive, and Management Indicator Species of the Fishlake National Forest, Version 4.0* (Rodriguez 2005). This document contains summarized population trend and monitoring information for the Fishlake National Forest.

> "Populations of wildlife are extremely difficult to quantify, and in some cases can vary substantially from year to year. Environmental factors can dramatically influence the recruitment of young and survival of adults. A precise figure on the number of animals is very difficult if not impossible to determine, and would only be valid for a short period of time.
>
> "Population trend is most appropriately addressed at a scale above the project level. Many of the selected MIS occur and range far beyond a local scale such as a project analysis. Individuals, family groups, or herds such as elk, annually use areas much larger area than a typical analysis area and population trend must be examined on a much larger scale to be meaningful. For National Forest Management Act implementation, this scale is the Fishlake National Forest. At a site-specific project level, there is a great deal of fluctuation in wide ranging populations. For most species, it would be technically, and practically inappropriate to conduct population trend sampling at the scale of individual projects. Individual projects contribute to the total population trend but do not usually make up the entire population and trend, unless they are a locally endemic species. For this reason, it is not appropriate to determine population trend at a local level.
>
> "Population trend for threatened, endangered and candidate species is addressed using recovery plans or conservation assessments, strategies and agreements. These broad scale documents are used because they occur and range far beyond the scale of the forest".

- **Mule Deer.** The analysis area lies within the Southern Region Deer Management Area and is wholly contained in hunt unit #22-Beaver. Main management concerns for this unit include depredation on agricultural areas and predation by coyotes and lions. Critical winter range and fawning areas occur within the Project Area. Fawning occurs in moderately dense shrublands and forests, dense herbaceous stands, and high-elevation riparian and mountain shrub habitats, with available water and abundant forage. Fawning peaks during the first two weeks of June in this part of their range.

Shapefiles were obtained from Utah Division of Wildlife Resource's (UDWR's) website and critical and high value deer summer habitat areas were combined for analysis. Because fawn parturition and rearing takes place at a range of elevations and in a variety of habitat types, UDWR has delineated these classes of habitat based on observational data and in some cases limited amounts of radio-telemetry data. Important site specific variables typical of key fawning areas in the West are slopes less than 15%, and forest community types with heavier ground cover—like those with shrub-sapling structural classes found below 9,400 feet in elevation, and close proximity to water (de Vos et al 2003). There are approximately 109,230 acres of deer fawning/summer habitat in the analysis area which is roughly 51% of that on the District and 11% of that estimated on the Forest.

Critical and High Value deer winter range within the project area is depicted in the following table and on the Key Deer Winter Range Map in Appendix N.

**Table 3-30 Critical and High Value Deer Winter Range**

| Allotment | Total Allotment Acres | Acres Critical and High Value Deer Winter Range | Allotment % |
|---|---|---|---|
| **Circleville** | 37,579 | 14,668 | 39% |
| **Cottonwood Creek** | 423 | 423 | 100% |
| **Junction** | 5,818 | 5,106 | 88% |
| **Marysvale** | 7,103 | 4,001 | 56% |
| **North Indian Creek** | 38,881 | 9,879 | 25% |
| **Pine Creek Sulphurbeds** | 30,212 | 16,023 | 53% |
| **South Beaver** | 45,069 | 10,981 | 24% |
| **Ten Mile** | 12,472 | 4,202 | 34% |
| **Total** | 177,557 | 65,283 | 37% |

The Beaver Mountain deer population is at 86% of the herd management objective of 11,000 and the growth trend is static. The DWR collects post-season population data and monitors harvest levels and population trends of all big game species, such as mule deer. This data is displayed in the Fishlake National Forest--Forest Plan Monitoring and Evaluation Report http://www.fs.fed.us/r4/fishlake/publications/tenyear.html that was completed for the reporting period from 1987-2002. These data display a fairly stable population trend in the total number of deer (between 1999 and 2002) on the Fishlake National Forest. The data presented in the Wildlife Life Histories http://www.fs.fed.us/r4/fishlake/projects/deis.shtml demonstrate a decline in the number of individuals being recruited into the population since 1997. These data are consistent with the past several years of drought, coupled with cold winters and increased predation that the Southern Region has experienced. The data presented demonstrates that deer populations fluctuate throughout the Southern Region. Although the numbers of young being recruited into the population are on a decline, the data show an increase in mature bucks into the population as well as

an increase in buck to doe ratios. The lack of fawn recruitment was attributed to multi-year drought conditions and degrading winter ranges. This trend improved with 2004 population estimates up some 24% across the herd units from 57,300 in 2003 to 70,825 in 2004 (Rodriguez 2005). For the Beaver Deer Herd Unit specifically, the population was estimated at 86% of objective or 10,320.

The following table shows the status of deer and elk populations in the Beaver herd unit along with the proportion of winter habitat in the herd unit encompassed within the Forest boundary.

| Herd Unit | DEER | | ELK | |
|---|---|---|---|---|
| | Status (% of herd objective) | % of winter Range USFS | Status (% of herd objective) | % of winter Range USFS |
| Beaver | 86 | 14 | 95 | 34 |

Source: *The UDWR has delineated and classified by value, deer and elk wintering habitat on the Fishlake National Forest. Deer habitat shapefiles (dated 11/2004) were obtained from the UDWR's website and both "high value" and "critical" winter range polygons were combined for this analysis. Likewise, elk habitat shapefiles (dated 11/2004) were also obtained from the UDWR's website and both "high value", "yearlong substantial" and "critical" winter range polygons were combined for this analysis. There are approximately 475,109 acres of deer winter range and approximately 545,711 acres of elk winter range on the Fishlake Forest.*

There is no indication from the Utah Division of Wildlife (UDWR) that any mule deer population declines on the Beaver Mountain herd unit are the result of competition with livestock. The Utah Division of Wildlife Resources Statewide Management Plan For Mule Deer (November, 2003 and currently in effect) [http://www.wildlife.utah.gov/hunting/biggame/pdf/mule_deer_plan.pdf] states:

> "…The deer herd has been in a state of decline for over thirty years. There are many factors contributing to this decline especially the loss and degradation of habitat…There is little evidence to support that elk or livestock are responsible for declines in mule deer populations… Other factors such as predation and disease are intensified when habitat quality is reduced. If deer herds are to recover in Utah, weather patterns will need to return to normal and extensive habitat work will need to be done to rehabilitate critical deer ranges… Mountain lions, coyotes and in some areas black bears are the primary predators of mule deer in Utah. Proper management of these species can help deer populations which are well below population objectives and habitat capabilities.
>
> "In 2003, Utah was in the fifth year of an extended drought. Utah recorded the driest year on record and the hottest month on record (July) in 2002. The hottest month record was broken again in July of 2003. This drought has resulted in poor fawn production and damage to the vegetation on many critical mule deer winter ranges. In order for this downward trend in the mule deer population to reverse, it will be necessary to return to more normal precipitation and weather patterns. Extensive work will also need to be done to rehabilitate drought damaged mule deer ranges…."

The data presented in the 10-year Monitoring Report and the Wildlife Life Histories demonstrate that fluctuations in deer populations have been the result of numerous influences including drought, cold winters, and increased predation from large mammals, habitat modifications and degradation. Although the numbers of young being recruited into the population are on a slight decline from 1999 numbers, the data show an increase in mature bucks into the population as well as an increase in buck to doe ratios. Based on these data, mule deer populations and trends on the Fishlake National Forest appear to be down slightly, however, the data indicated that the number of breeding adults are stable and viable with increases in the total number of mature bucks (3 point or larger), and an increase in buck to doe ratios.

- **Rocky Mountain Elk.** The project area lies within the Southern Region Elk Unit. There are approximately 1,458,049 acres of potentially suitable elk habitat on the Fishlake National Forest, in the UDWR designated Southern Region. In the 1986 Fishlake Forest Plan (II-29, table II-8B), the estimated population size of elk on the Fishlake National Forest was 2,000 head. Based on data collected in cooperation with UDWR, there were approximately 4,000 counted elk in the winter of 2001/2002 (Fishlake National Forest--Forest Plan Monitoring and Evaluation Report http://www.fs.fed.us/r4/fishlake/publications/tenyear.html) . These data were collected during the winter, by helicopter. Helicopter counts are collected on a three-year basis. As a result of habitat improvement projects across the forest these data display a 2000 head increase since 1986 when the plan was signed. Based on the UDWR data, the population trend for elk across the forest is stable to slightly up in trend and viable. Elk herds on the Forest are actively managed by antlerless hunts in an attempt to maintain herd objective levels. Within the Southern Region, elk herds have increased some 26% since 2002 to 13,730 estimated for 2004. The antlerless permits have likewise increased from 1,250 to 2,145 during this same time period (Rodriguez 2005). For the Beaver Elk Herd Unit specifically, the population increased from approximately 350 elk in 2002 to 921 elk in 2005 (95% of the 950 objective), based on recent aerial survey data (Rodriguez 2005). These data also suggest that elk are well distributed across the District and the analysis area.

The current trend is an increasing elk herd until the management objective is reached. The main management concerns for this unit include: depredation on agricultural areas, damage to structural range improvements, forage competition with livestock, expanding ranges and populations, and pre-season use of forage. Currently, the presence and management of elk on the following allotments present the greatest potential to direct and indirect effects from the Proposed Action:

**Table 3-31 Elk Habitat Condition**

| Ranger District | Allotment | Habitat Condition |
|---|---|---|
| Beaver | Pine Crk/Sulphurdale | Small resident herd; larger summer herd |
| Beaver | Marysvale | No critical habitat |
| Beaver | Cottonwood | No critical habitat |
| Beaver | South Beaver | Small resident herd; larger summer herd |

Improved livestock distribution, implementation of revised utilization standards, construction or reconstruction of water sources, maintenance of vegetative treatment areas and elk population management within herd objectives will lessen the impacts of concurrent elk/livestock use within key elk ranges. Critical and High Value elk winter range within the project area is depicted in the following table and on the Key Elk Winter Range Map in Appendix N.

**Table 3-32 Critical and High Value Elk Winter Range**

| Allotment | Total Allot Acres | Acres Critical/High Value Winter Range | Allotment % |
|---|---|---|---|
| **Circleville** | 37,579 | 13,275 | 35% |
| **Cottonwood Creek** | 423 | 364 | 86% |
| **Junction** | 5,818 | 4,828 | 83% |
| **Marysvale** | 7,103 | 5,701 | 80% |
| **North Indian Creek** | 38,881 | 9,127 | 23% |
| **Pine Creek Sulphurbeds** | 30,212 | 12,016 | 40% |
| **South Beaver** | 45,069 | 7,347 | 16% |
| **Ten Mile** | 12,472 | 6,205 | 50% |
| **Total** | 177,557 | 58,863 | 33% |

- **Cavity Nesters (Hairy Woodpecker, Western Bluebird, & Mountain Bluebird).** All of these species occur throughout the analysis area. Hairy woodpecker is common in closed canopy forest and mountain bluebirds frequent open areas and meadow edges. The western bluebird is not especially common in the analysis area but it does occur. Rodriguez (2004) states the hairy woodpecker and western bluebird populations are stable and viable on the Fishlake National Forest. The mountain bluebird population is also stable to slightly up in trend and viable on the Fishlake National Forest (Rodriguez 2005). Approximately 85,929 acres of potentially suitable nesting habitat occurs throughout the analysis area, which equates to 61% of the habitat on the District and 16% of the potential suitable habitat on the Forest. For more information regarding monitoring information, trends, ecology, threats, etc. for these species, refer to *Life History and Analysis of Endangered, Threatened, Candidate, sensitive, and Management Indicator Species of the Fishlake National Forest, Version 4.0* (Rodriguez 2005).
- **Sage Nesters (Brewer's Sparrow, Vesper Sparrow, Sage Thrasher).** The Brewer's sparrow, vesper sparrow, and sage thrasher occur primarily in sagebrush habitats throughout the analysis area. Between 2002 and 2003, there were 14 detections of sage thrasher on the Fishlake National Forest (Rodriguez 2005). Rodriguez (2004) states the Brewer's and Vesper sparrow populations are stable to slightly up in trend, and likely viable on the Fishlake National Forest. Approximately 68,066 acres of potentially suitable nesting habitat occurs throughout the analysis area, which equates to 58% of the habitat on the District and 10% of the potential suitable habitat on the Forest. For more information regarding monitoring information, trends, ecology, threats, etc. for these species, refer to *Life History and Analysis of Endangered, Threatened, Candidate, Sensitive, and Management Indicator Species of the Fishlake National Forest, Version 4.0* (Rodriguez 2005).
- **Riparian Guild (Lincoln's Sparrow, Song Sparrow, Yellow Warbler, and MacGillivray's Warbler).** All four of these management indicator species (MIS) are known to occur within the analysis area and are strongly associated with riparian habitats (Rodriguez 2005). Rodriguez (2004) states the Lincoln's sparrow population is stable and likely viable on the Fishlake National Forest. The yellow warbler population is in an upward trend and likely viable on the Fishlake National Forest (Rodriguez 2005). The song sparrow population is likely stable or in a slightly downward trend, however, it is still likely viable on the Fishlake National Forest (Rodriguez 2005). The MacGillivray's warbler trend is considered stable or perhaps, upward on the Fishlake National Forest (Rodriguez 2005). Approximately 1,281 acres of potentially suitable nesting habitat occurs throughout the analysis area, which equates to 44% of the habitat on the District and 7% of the potential suitable habitat on the Forest. For more information regarding monitoring information, trends, ecology, threats, etc. for these species, refer to *Life History and Analysis of Endangered, Threatened, Candidate, Sensitive, and Management Indicator Species of the Fishlake National Forest, Version 4.0* (Rodriguez 2005).
- **Resident Trout and Macroinvertebrates.** Resident trout species and aquatic macroinvertebrates (refer also to Sections 3E and 3F in this Chapter) are present in perennial riparian stream corridors throughout the analysis area. They are being analyzed simultaneously because they share similar habitats. Effects of the proposed action will be discussed in terms of water quality and the quality of the aquatic environment. Rodriguez (2004) states that populations of rainbow, brown, brook, and cutthroat trout are stable and viable on the Fishlake National Forest. Lake trout numbers have also remained relatively stable on the Fishlake National Forest however, a reduced number become larger (>22-26 inch) trophy lake trout (Rodriguez 2005). Aquatic macroinvertebrate Biotic Condition Index (BCI) trend (1986-2002) for the entire Fishlake National

Forest is down slightly after peaking in the late 1980's, with a generally static trend since the early 1990's (Rodriguez 2005). The Beaver Ranger District watersheds (that have been adequately sampled) peaked in the late 1980's, and have declined slightly since, but generally remain at or above Forest Plan standards (Rodriguez 2005). The exception to this is in the Birch Creek West drainage (South Beaver Allotment) that declined to slightly below standards by the late 1990's (Rodriguez 2005). This Biotic Condition Index (BCI) provides a quantitative measure of aquatic health due to overall watershed condition, land management activities, and natural disturbances. For more information regarding monitoring information, trends, ecology, threats, etc. for these species, refer to *Life History and Analysis of Endangered, Threatened, Candidate, Sensitive, and Management Indicator Species of the Fishlake National Forest, Version 4.0* (Rodriguez 2005).

Healthy trout fisheries occur in numerous streams, lakes and reservoirs. The North Fork of North Creek, Pole Creek, Briggs Creek, and Birch Creek each support pure strains (or relatively so) remnant and/or reintroduced native Bonneville cutthroat trout. Recreational fisheries are supported throughout the assessment area in streams, lakes, and reservoirs. The Beaver River is listed by the State of Utah as a high value Class 2 fishery.

1. **Beaver River**. The main fishable portion of this larger stream is located in Beaver Canyon, east of the City of Beaver. It has a paved road parallel to much of its lower reaches. Fishable tributaries include the South Fork, Lake Stream, and Merchant Creek, as well as other smaller streams. Rainbow trout are stocked in campground and picnic areas, although wild rainbow trout and brown trout are also plentiful. Cutthroat trout and brook trout can be found but are more abundant in headwater areas.
2. **Cottonwood Creek**. This stream flows off the east side of the Tushar Mountains not far from Piute Reservoir. The lower half of the stream is accessible by dirt road, while the upper reaches can be accessed by hiking. The stream contains wild cutthroat trout.
3. **Indian Creek**. This stream is located north of the city of Beaver. A dirt road parallels the stream and ends at Indian Creek Reservoir, which is stocked with rainbow trout. The stream contains mostly brown trout and some rainbow trout.
4. **North Creek**. Located just north of the town of Beaver, North Creek flows off the Tushar Mountains. The south fork is the main fishable stream and has vehicle access to the mouth of the canyon at the lower end. The extreme upper end can be reached by hiking from the dirt road that goes over the Tushar Mountains. About 12 miles of stream extend between the two access points connected by a hiking trail. This beautiful stream has an abundant population of wild rainbow trout and rainbow x cutthroat trout hybrids.
5. **South Creek**. This stream is located just south of Beaver City. The lower end is on Private land but is mostly diverted for irrigation. The best fishable area is upstream, on the Fishlake National Forest. Part of the stream is accessible by a dirt road that follows up the canyon. The upper end is accessible by a hiking trail that follows the stream after the road ends. The stream contains a population of wild brown trout, with a few rainbow trout in the extreme upper end.
6. **Puffer Lake**. Puffer Lake is 18 miles east of Beaver and 16 miles west of Junction on U-153. Puffer Lake and the surrounding area is entirely privately owned by the Puffer Lake Resort, but public access is permitted through agreements with DWR that allow for fishery access to the lake. It is annually stocked with rainbow and brook trout.
7. **Three Creeks Reservoir**. Three Creeks Reservoir is located in the upper reaches of the Beaver River drainage in the Tushar Mountains. It is a small artificial impoundment in a high meadow

at the confluence of the north and south forks of Three Creeks and Lake Stream. It is annually stocked with rainbow trout.

8. **Anderson Meadow Reservoir**. Anderson Meadow Reservoir is high in the Tushar Mountains east of Beaver. It is a small artificial lake in a high meadow. The reservoir was built by the DWR to create a fishery. It is annually stocked with rainbow and brook trout.
9. **Kents Lake**. Kents Lake is high in the Tusher Mountains east of Beaver. It is a small reservoir in a high meadow. There are two other lakes in the immediate vicinity: Upper Kents Lake and Lower Kents Lake. Both are considerably smaller and shallower than Kents Lake itself. The reservoir was created in 1928 by the construction of an earth-fill dam. These lakes are annually stocked with cutthroat, rainbow, and brook trout.
10. **LaBaron Reservoir**. LaBaron Lake is high in the Tushar Mountains east of Beaver. It is a small, shallow natural lake in a high meadow. It was originally either a small natural lake or a small reservoir that was enlarged by the Division of Wildlife Resources as a stabilized lake for recreational fishing in 1966. Water levels are controlled by a dam. It is also known as Laron Reservoir, Blainey Reservoir and LaBaron Lake Reservoir. It is annually stocked with rainbow and brook trout.

- **Migratory Birds.** The Migratory Bird Treaty Act of 1918 decreed that all migratory birds and their parts are fully protected. This Act is the domestic law that affirms, or implements, the United States' commitment to four international conventions (with Canada, Japan, Mexico, and Russia) for the protection of a shared migratory bird resource. Each of the conventions protected selected species of birds that are common to both countries (i.e., they occur in both countries at some point during their annual life cycle). Under the Act it is unlawful to take, import, export, possess, buy, sell, purchase, or barter any migratory bird. Feathers or other parts, nests, eggs, and products made from migratory birds are also covered by the Act. Take is defined as pursuing, hunting, capturing, trapping, or collecting.

Under the direction of Executive Order 13186 signed on January 10, 2001, Federal agencies are directed to evaluate effects of actions and agency plans on migratory birds, with emphasis on species of concern. A recent list of migratory bird species of concern was delineated by the FWS in Birds of Conservation Concern 2002 (USFWS 2002). The proposed action described in this report will occur on lands administered by the Fishlake National Forest. In Birds of Conservation Concern 2002 (USFWS 2002), the migratory bird species of concern are delineated within separate Bird Conservation Regions (BCR's) in the United States. The lands administered by the Fishlake National Forest fall within 2 separate BCR's. These include BCR 9 (Great Basin) and BCR 16 (Southern Rockies/Colorado Plateau). Both species lists have been reviewed. The BCR 9 (Great Basin) and BCR 16 (Southern Rockies/Colorado Plateau) lists have 39 migratory bird species of concern. Five of these species have already been analyzed for effects within this report and within the Biological Assessment (BA) and Biological Evaluation (BE) written for this project. These include the peregrine falcon, yellow-billed cuckoo, the flammulated owl, Brewer's sparrow, and sage sparrow.

- **Rydberg's milkvetch.** The Fishlake National Forest has one MIS plant species, *Astragalus perianus* (Rydberg's milkvetch). This species is not known to occur in the proposed action area. The habitat for this species is tertiary igneous gravels, often on barrens in alpine or montane sites in tundra and spruce-fir communities at 2135 to 3480 m (Welsh et al. 2003). Rydberg's milkvetch is

stable and viable across the Forest (Rodriguez 2005) with 31 known locations containing 95,000+ individuals. There are three monitoring transects that have been established for this species in the Tushar Mountains of the Beaver Ranger District. Rydberg's milkvetch is only known to occur on the Cottonwood and North Beaver Allotments (Madsen 2003). Neither of these allotments is included within the scope of this proposed action area. Suitable habitat for this species in the Tushar Mountains is high elevation (8,000+ feet), igneous intrusive gravels on open barren hillsides with little vegetation cover. Hillsides where this species is usually found are generally gentle sloping. There may be potentially suitable habitat for Rydberg's milkvetch on North-Indian Creek, Circleville, and Ten Mile Allotments. These allotments are included in the proposed action area.

Refer to the Life History and Analysis of Wildlife and Management Indicator Species in Appendix F and the MIS Wildlife Specialist Report in Appendix Q for further details on MIS species.

## H. DESCRIPTION OF AFFECTED ENVIRONMENT – SOCIO-ECONOMICS

The social and economic structure of southern Utah has its roots in agriculture. Livestock grazing is among the oldest land uses in the region and pre-dates establishment of the Fishlake National Forest in 1905--then the Sevier Forest Reserve. Early pioneer uses on the Forest included dairy farming associated with cheese production. Through the years, grazing has been one of those pieces of the income pie for hundreds of southern Utah citizens. It has played an important role in western culture, the counties' economies and the residents' survival. For the most part, grazing is truly a "local business", one that is owned and operated by a local resident. It not only provides area residents with needed products, but it also supports other related, local businesses through their purchases. Profits from local businesses remain at home, continuing to work throughout the community.

Ranch operations within the analysis area are generally designed around calves being born in the spring (March and April) while cattle graze lower elevation private or BLM native rangelands or seeded pastures, until about June 1. At that time the breeding season begins on mid-elevation native or seeded rangeland and continues through August, on the National Forest within the Tushar mountains. Calves are weaned and sold (except for heifer calves retained as cow herd replacements) in October and November. The cowherd is usually pregnancy tested at this time, cull cows are sold, and the remainder of the herd are wintered on hay or lower elevation private or BLM native rangelands until March when the spring calving cycle begins anew.

Livestock grazing allotments on the Tushar Range provide essential livestock forage in order to make viable year-round ranching operations for the majority of the permittees. While livestock graze on public lands during the summer months, those private lands not used for summer grazing are devoted to alfalfa and grass hay production for winter feeding. Reductions in public land grazing could increase the use of private lands for grazing livestock during the summer months. To compensate for the loss of acreage in production, ranchers would have to decrease the number of livestock their ranches could support. The use of public lands for summer grazing is also critical to maintaining the condition of private rangelands that have not been developed into irrigated fields. Most private rangelands tend to be used by big game animals during winter months and are considered to be a limiting factor for big game populations in south-central Utah.

As one of many multiple uses permitted by the Forest Plan, forage for livestock grazing is permitted and contributes to the economic well being of local communities. The primary socio-economic impact area of this analysis is concentrated within Beaver and Piute Counties adjoining the Tushar Mountains and the rural communities along the eastern and western edges of the Range. In the communities immediately surrounding the Tushar Range, rural lifestyles, historic landscapes, and cultural traditions related to the Forests are an important component of their quality of life.

## 1. Desired Condition[3]

*"The Forests continue to be an integral part of life in southwest Utah. They are a source of clean air, water, and open space. The Forests provide visually pleasing landscapes and their existence increases the quality of rural life. The livestock-grazing program is managed for sustainable forage production. Forest resources and long-term land productivity are not degraded. Livestock ranchers are recognized as an important thread to communities' social fabric. Grazing is a living symbol of the rural lifestyle. The livestock grazing industry contributes to open space through a combination of federal and private rangeland. This leads to a low risk of landscape fragmentation that could be caused by future development."*

## 2. Forest Plan Revision Social-Economic Assessment

In December 2003, as part of the Forest plan revision process for the Dixie, Fishlake, and Manti - La Sal National Forests, and in cooperation with the Planning and Demographic and Economic Analysis Sections of the Utah Governor's Office of Planning and Budget (GOPB), a social and economic assessment involving those communities surrounding these Forests was completed. This social and economic assessment shows how people and land are connected and influenced by one another. Economic, social, and environmental sustainability are interdependent goals for forest management, yet the Forest Service has traditionally focused primarily on environmental factors. As human uses and impacts have grown, it has become evident that forest management goals cannot be achieved without understanding economic and social factors as well.

GOPB03 (2003) [ http://governor.utah.gov/planning/usfsintroduction.htm (Chapter Breakout)]found that while true everywhere, it is particularly evident in rural areas and communities that the environment strongly shapes the economy, and is a significant force in social structure and well-being. For example, they found that grazing is not just a business, but a visible symbol of the rural lifestyle. Discussing grazing with a purely economic or environmental logic is not sufficient to address cultural values.

Many rural residents who have lived and functioned in the traditional economic setting for generations
are facing new economic realities and trends, and they are sometimes slow to adapt to these changes. Rural communities often express an uneasy sense that their culture and traditional way of life is at risk of being lost, and they focus a great deal of their energy on safeguarding and defending these important social values and traditional economic activities. GOPB03 (2003) determined that

[3] In Draft for the Forest Plan revision process:
http://www.fs.fed.us/r4/dixie/projects/FParea/LiveDocs/SocEcoDCDraft.PDF

communities in this study area would like to maintain resource-based industries as a part of their economies and culture even as they adapt to new trends:

> "Local communities also state that they know the strength and quality of life of their communities are intimately tied to the health of forest ecosystems. While many residents support resource extraction and traditional industries as essential to supporting their lifestyles, they wish to do so without impairing the land and their livelihoods. They acknowledge that resources are limited, but if properly managed, the Forest can be a continuous source of economic opportunity. Local communities welcome economic growth, but still wish to preserve their rural lifestyle and culture. They frequently believe good stewardship is supported by actively managing the land and that economic prosperity can be tied to this."

GOPB03 (2003) also noted that at the other end of the spectrum are groups who feel people should be only one part of the system, allowing the environment to play a lead role. These groups frequently support minimizing human activities and consumption. They also commonly believe that management should be used primarily to balance human impacts on the environment and restore natural systems.

## County Profiles[4]

### a. Beaver County

#### *County Land Ownership*

68.8% —Bureau of Land Mgt.
8.4% — Forest Service
77.2% --Total Federal Ownership (Total Federal ownership in Utah is the 2nd in the nation at 65.8%)
9.4% — State Trust Lands
12.6% — Private
0.7% — State Wildlife
0.1% — Other
0% — Wilderness Areas
0.6% —Wilderness Study Area (within BLM total)

#### *Landscape*

While much of Beaver County can be described as a Basin and Range landscape, typical of western Utah, the forested peaks on the County's eastern side have a different character. These forested peaks, among the highest in the State, are primarily controlled by Fishlake National Forest. Overall, only one-eighth of the county's land is held privately. The maps illustrate the importance of National Forest lands—the majority of the residents live in relatively close proximity to the forest, and Beaver County estimates 90% of its recreation is based on forest lands. Activities include snowmobiling, hunting, fishing, skiing, and visiting summer homes. Use is on the rise and traffic counts on Highway 153 accessing the forest are rising.

#### *Population*

[4] Utah Governor's Office of Planning and Budget USFS Social-Economic Assessment 2003 Social-Economic Assessment - 12/03, Overview http://governor.utah.gov/planning/usfscountyprofiles_c4.htm

Beaver County's population of approximately 6,000 residents makes it the sixth smallest county in the state. Workshop comments indicated that the State's projection of 1.1% annual county population growth seems conservative when compared to the County's projections and the 2.6% annual growth rate of the last decade. In addition, the county points out the trend of many young families moving to the county.

***Economy***

The local economy traditionally depended on agriculture, grazing, with some share of mining and residents face the challenge of economic growth in an area based on more traditional industries. Agriculture and grazing is still important to the County, but currently relies less on family operations and more on large corporate farms, such as the Circle Four 4 Farm, which spurred an upswing in the economy in the 1990s. Mining activity is currently limited by global market conditions, but there is potential to develop resources such as kaolinite, clay, railroad ballast, and decorative stone. Today, government is the largest non-agricultural industry in Beaver County and is predicted to remain a major employer. Newer businesses, including services and recreation are continuing to grow. Power generation is becoming important with several geothermal plants and the county is exploring wind, natural gas, and coal energy generation opportunities as well. The county is trying to attract small- and medium-sized logistic firms to enhance their economy. Tourism and recreation are also seen as economic development opportunities. Further expansion of Elk Meadows ski resort and promotion of the Piute ATV Trail are some of the best prospects. Beaver County's location along Interstate 15 in close proximity to its juncture with Interstate 70, and at the midpoint between SLC and Las Vegas, is attractive to businesses seeking easy access along a major transportation and trade corridor. The county also has good rail transportation infrastructure and is considering developing an intermodal transportation center as an opportunity to increase trade. Union Pacific Railroad is reaching overload in Las Vegas and could look to Beaver County to expand. The county

***Planning***

County plans show a concern with maintaining the rural character of the community and are interested in establishing an urban growth boundary to keep development close to existing cities and away from valuable agricultural resources. The County is currently undertaking a transportation planning effort, and will focus on the areas near the USFS holdings because the majority of recreation and summer homes are located near the Forest. The County would like to promote more recreational uses and increasingly wish to promote non-motorized recreation. Residents often feel disenfranchised from the land use actions of the federal and state agency lands that dominate their region. Planning

## b. Piute County

***County Land Ownership***

40.1% — Forest Service
33.4% — Bureau of Land Mgt.
73.5% --Total Federal Ownership (Total Federal ownership in Utah is the 2nd in the nation at 65.8%)
12.7% — Private
11.8% — State Trust Lands
1.0% — Water Bodies
0.9% — State Wildlife

0.1% — Other
0 % —Wilderness Areas
0 % —Wilderness Study Area

***Landscape***

Piute County is centered on the Sevier River Valley, which is surrounded by mountainous peaks that capture rains that feed the river and irrigate fields. The valley and surrounding USFS lands provide good grazing, and livestock remains very important to the local economy. Agriculture is also key to the county's lifestyle and many residents wish to keep it that way. The majority of the County's population is settled in the valley in the towns of Circleville, Marysvale, Junction, and Kingston. The county is the third smallest geographically in Utah and is predominantly held in public lands.

***Population***

Piute County has the second smallest population in the state at just over 1,400 residents. Piute County's total population has grown slightly over the last 30 years, and is this slow growth is projected to continue for the coming decades. The younger population is expected to grow the slowest in coming years, while the Hispanic population has been growing and is expected to continue to do so. Many residents currently commute to employment opportunities outside the county. Students are also choosing to attend high school out of the county and as the young population shrinks, the local school district is having a hard time staying viable. Over the past two decades, Piute County has had higher unemployment and lower job growth rates than both the state and the nation and a current lack of economic diversity has made it difficult to attract and retain residents.

***Economy***

Agriculture is the primary employer of residents and is expected to remain strong, although jobs in government and trade are expected to make gains. Low agricultural wages make it difficult to make a living and many residents hold a diversity of jobs to raise their incomes. Mining, once a mainstay of Piute County, has dropped significantly but many residents noted numerous mining exploration efforts, although they have not paid off yet or are not considered regular employment. The Piute School District employs 30 residents, and residential youth therapy camps are also making their mark on the local economy. Piute and Otter Creek Reservoirs have created some job opportunities while also providing local recreational activities and tourism opportunities. Tourism has not played as large a role in the local economy as it has in surrounding counties, but the county is working to develop this sector. Many small businesses now rely on some tourism business to remain viable. Fishlake National Forest is heavily used for motorized recreation and hunting in this region but still remains a unique and somewhat untapped tourism opportunity for the County. The Paiute Trail, built primarily for ATVs and snowmobiling is a popular and growing destination that locals are trying to build upon. A less obvious contributor to the local economy is a small numbers of retirees relocating to the larger towns. The county would like to encourage more year-round industry and has seen several new small businesses open in recent years.

***Planning***

Agriculture is the mainstay of the economy, and the County considers it a matter of policy to preserve rural environment and lifestyle. They would like to encourage economic development through timber, mining, and especially through tourism, but not at the expense of their surroundings. Residents also see economic development opportunities in the management of aspen for timber and possible mining resources. Most residents want operation

of the public lands and state parks to continue as currently conducted, but expressed a desire for involvement in these decisions.

## 3. Economic Concerns

Current local economic concerns over changes in the use of National Forest grazing allotments fall generally into two categories: 1) impacts on resource-dependent communities and the "quality of life" in those communities; and 2) impacts on ranching operations.

## a. Impacts On Resource-Dependent Communities & "Quality Of Life"

### 1. Population and Demographics

There are 2,233,169 people in the State of Utah. Less than ½ percent (7,440) live within Beaver (6,005) and Piute (1,435) Counties[5]. Within the two-county area, the median age of 34.9 is among the oldest in the state, being 6.4 years older than the state's median age of 28.5[6]. Over one-fourth (26.2%) of the two-county residents are over age 55, compared to the state-wide average of 7.4%. The two county area is among the most sparsely populated in the State, having a combined area of 3,348 square miles, the population density is 2.2 persons per square mile, leaving only 7 counties, of the 29 in the State, with less population density[7].

The land base of the socio-economic impact area is predominately rural landscapes and small communities. Because of policies regarding disposal of public land, the western federal lands are extensively interspersed with private and state-owned lands. As a result, the use and management of land under one ownership has a strong influence on the use and management of adjacent land owned by others.

### 2. Dependence on Federal Land Grazing

Livestock have grazed lands within the Tushar range for over 100 years. Permits to graze these lands were not issued until early in the 20th century. The criteria used to allocate grazing permits were primarily based on two concepts -- commensurability and prior use, which favored those operators who depended upon the use of public lands to "round out" the forage supplies needed to sustain a herd. Since that time, dependency has been an issue whenever changes have been proposed that would alter the amount of forage that a livestock operator could obtain from federal lands. Because declining economic activity in rural America has become a national issue, it is particularly important whenever changes are proposed in small economies that are perceived to depend upon the use of federal lands (Godfrey and Bagley 1994).

[5] Utah Governor's Office of Planning and Budget, Demographic and Economic Analysis, Census 2000 data, Rank by Population Density http://governor.utah.gov/dea/rankings.html
[6] Utah Governor's Office of Planning and Budget, Demographic and Economic Analysis, Census 2000 data, Rank by Median Age http://governor.utah.gov/dea/rankings/counties/00medage.pdf
[7] Utah Governor's Office of Planning and Budget, Demographic and Economic Analysis, Census 2000 data, Population Density http://governor.utah.gov/dea/rankings/counties/populationdensity.pdf

Grazing on public lands is an integral part of ranch operations. For several generations, many of the local ranches have been dependent upon the National Forest for summer forage to round out year-long operations. The high percentage of Federal land ownership in south-central Utah, averaging approximately 75% for the two-county area, emphasizes the importance to local ranchers of Federal rangelands in maintaining viable local livestock ranching operations. Currently, the permittees grazing the allotments within the analysis area rely on 12,009 AUMs of forage from the National Forest. This is 30% of the total 40,091 AUMs of feed required for year-round maintenance of these 2531 cattle. Many of the permittees also rely on winter and spring grazing on BLM lands, which further increases their dependency on federal lands.

One of the standard arguments of groups favoring the removal of livestock from public lands it that such a removal would have minimal impact on the U.S. beef cattle industry due to the low proportion of the U.S. beef cow herd utilizing these lands. However, many rural economies and societies would be devastated by such curtailments (Wiedmeier et. al. 2003). Such group's counter that lost revenues could easily be regenerated from other public land uses such as recreation. Wiedmeier et. al. cite Snyder (1995) in noting that a detailed study of such a proposal indicated that this would not likely be the case in Utah.

When the Public Land Law Review Commission published its report to the President and Congress in 1970 (Mitchell, 2000), the section of the report addressing rangelands emphasized the importance of forage coming from public lands. He reported that although public lands accounted for only 3 percent of all forage consumed by livestock in the United States during the 1960's, they supplied approximately 12 percent of the forage in the western range states. In these states, forage from public lands was seen to play a significant role in local economies.

## 3. Quality of Life and Way of Life

Livestock grazing on National Forest System Lands also contributes important cultural and social values to the area. Intertwined with the economic aspects of livestock operations are the lifestyles and culture that have co-evolved with Western ranching. Rural social values and lifestyles, in conjunction with the long heritage of ranching and farming continued to this day from the earliest pioneers in Utah, have shaped the communities and enterprises that make up much of southern Utah. Family, tradition, and the desirable way of life are the most important factors in the ranch enterprise decision—not profit. Some ranch families are much more dependent on ranch income than others. It is widely recognized that many western family ranches operate with limited profit margins. But generally, ranch families are willing to continue in business despite the relatively low economic returns they make. The ranching/farming community is generally opposed to changes that would rapidly alter their lives and communities.

For many of the ranchers in southern Utah, consumptive and quality of life values are the most important reasons for the operation and maintenance of ranching enterprises. Ranchers want an investment they can touch, feel, and enjoy, and they have historically been willing to accept low returns from the livestock operation. Profit maximization appears to be an inadequate model for

explaining rancher behavior; in estimating what impacts reduced livestock grazing will have; and in describing land use and value.

Torell and Bailey (2000) note that "We build our economic models and estimate grazing policy impacts based on the standard economic model of profit maximization". However, they contend, with over 30 years of research and observation, that consumptive and quality of life values are the most important reasons for owning and operating a ranch enterprise. They conclude that profit maximization appears to be an inadequate model for explaining rancher behavior; in estimating what impacts altered public land policies will have; and in describing grazing land use and value. They cite an independent west-wide survey that found that all ownership types (hobbyist to professional rancher) listed the complimentary relationship between private land ownership and family tradition, culture, and values as a primary reason for owning the ranch. Profit maximization was ranked in the middle of all possible objectives for ranch ownership.

In 2001, Torell et. al. determined that the literature does not provide a clear and consistent picture for what motivates farmers and ranchers to continue in agriculture. However, they acknowledge that the literature and general observation clearly indicate agriculture producers are willing to continue in business despite the relatively low economic returns. They concluded that western ranches will not "pencil out". The cows will not buy and pay for a western ranch, especially with debt equity. Torell et. al. surmise that those that would eliminate grazing on public lands note the low economic returns from western ranches and use this as one of the reasons why livestock grazing should end. Those that would end grazing note the special status and treatment agriculture receives in our society and contend this is why grazing of public lands continues despite what economic statistics reveal about agriculture's role in the economy, just as it is a public goal to save the grizzly bear and other endangered species, it historically has been a goal for our society to save the western rancher.

## b. Impacts on Ranching Operations

### 1. Employment and Income

Godfrey and Bagley (1994) conducted a study of livestock dependency on federal lands in Wayne County, Utah. Wayne County is 85% federal lands and is the poorest county in the State. It lies along the eastern edge of the Fishlake National Forest and has many rural similarities to Piute and Beaver Counties. This study would appear to represent the most federal land-dependent county in the State. The data from their study indicates that even in a community which is dominated by agriculture and public lands, only two families were solely dependent on livestock production for their livelihood, and neither of these operations obtained more than 50% of the feed for their livestock operation from public lands.

The most common pattern of employment and income for families in Wayne County involved livestock raising with some type of off-farm employment. While data were not available that indicated the total income of any single household in Wayne County, the income and employment data available suggest that few families could survive on the basis of their livestock or their off-farm employment. Both sources of income are commonly necessary. This

suggests that if reductions in grazing on public lands result in the loss of livestock operations, some individuals in Wayne County would move elsewhere because the income obtained from off-farm employment was not sufficient to sustain these families. It should also be noted that many of these operators would also be forced to "give up" ranching if they lost their off-farm source(s) of income. Thus, the loss of either farm (ranch) or nonfarm income in Wayne County could cause both the farm and nonfarm sectors to decline.

Thomas Power (2004) found similar circumstances in Garfield and Kane County area. He determined that the role of farming and ranching as a source of employment is actually smaller than statistical employment figures, because so much farming and ranching is part-time. The 2002 Census of Agriculture reports 356 farms and ranches in Garfield and Kane Counties. But 147 of these operations had gross sales revenues of less than $2,500, clearly not enough to make a substantial contribution to household income. Only about half of all of the farm and ranch operators identified themselves as being primarily farmers or ranchers. Almost 60 percent of the farm and ranch operators also worked off the farm or ranch. 42 percent worked almost full-time (80 percent of the working year) off the farm or ranch. All of this information taken together suggests that at most about half of the farm and ranch operators rely on their operations as their primary source of income. Power says, that is not surprising given that net income from agricultural operations has been negative for so many years over the last two decades.

The 2002 Census of Agriculture shows 876,951 cattle and calves in Utah, and 906,373 in 1997. In 2002, 5.7 % (49,952) were in Beaver and Piute Counties. Market value of all agricultural sales in the two counties totaled $170,373 in 2002. This is over twice the sales recorded ($72,883) in 1997. The significant increase is due to the origination of a hog market at Circle 4 Farms. **C**ow and calf sales were $21,904 in 2002, up from $13,455 in 1997. Thus, cow and calf sales in 2002 were 13% of total agricultural sales in 2002. Even before the large increase due to hog sales, cow and calf sales were only 18.5% of total agricultural sales in 1997**.** Lines 5 and 6 of the Agriculture Income and Sales 2002 table tell us that in the two counties, 21% of total personal income derives directly from agriculture (farm operators income/agricultural wages, row 7).

**Table 3-33 Agriculture Income and Sales 2002**

| | | | Beaver | Piute | County Total | State |
|---|---|---|---|---|---|---|
| 1. | **EMPLOYMENT** | | | | | |
| 2. | Total wage and salary + proprietors[8] | | 3,086 | 478 | 21,694 | |
| 3. | Agriculture[9] | | 700 | 128 | 2,938 | 20,703 |
| 4. | **INCOME** | | | | | |
| 5. | Total Personal[10] | (X 1,000) | $147,272 | $25,025 | 172,297 | $57,133,565 |

[8] Governors Office of Planning and Budget/Demographic and Economic Analysis , Economics, State and County Long-Term Economic Projections, Table 2. http://governor.utah.gov/dea/LongTermProjections.html

[9] USDA, National Agricultural Statistics Service, 2002 Census of Agriculture, Vol 1 Geographic Area Series, State and County Reports, County Level Data, Utah, Table 7. Hired Farm Labor—Workers and Payroll: 2002. http://www.nass.usda.gov/census/census02/volume1/ut/index2.htm

[10] Governors Office of Planning and Budget/Demographic and Economic Analysis, Economics, State and County Historical Economic Data, Personal Income & Earnings: (1969-2002)—BEA CA 30 Data, http://governor.utah.gov/dea/HistoricalData.html

| | | | | | | |
|---|---|---|---|---|---|---|
| 6. | Ag Payroll + Farm Operator[11] (X 1,000) | $33,546 | $2,318 | 35,864 | $337,044 |
| 7. | Row 6 as share of row 5 | 23% | 9% | 21% | 1% |
| 8. | Per Capita[9] | $24,111 | $18,043 | | $24,639 |
| 9. | Per cap Rank among 29 Counties | 5 | 25 | | |
| 10. | **MARKET VALUE OF SALES** | | | | |
| 11. | All Ag Products sold[12] (X 1,000) | $161,345 | $9,028 | 170,373 | $1,115,898 |
| 12. | Livestock & poultry[11] (X 1,000) | $150,903 | $8,271 | 159,174 | $858,101 |
| 13. | Livestock/poultry share of all ag | 94% | 92% | 93% | 77% |
| 14. | Cattle/calves[13] (X 1,000) | $18,005 | $3,891 | 21,896 | $371,418 |
| 15. | Cattle/calves share of livestock/poultry | 12% | 47% | 14% | 43% |
| 16. | Cattle/calves share of all ag sales | 11% | 43% | 13% | 33% |
| 17. | Cattle/ calves# of animals[12] | 37,551 | 12,432 | 49,983 | 876,951 |
| 18. | Average $ per animal | $479 | $313 | | $424 |

Shading indicates value not disclosed. Estimate is based on increasing the 1997 value the same percent as occurred in Beaver County.

## 2. Relative Importance of Agriculture

Three studies on the effects of livestock reductions have been completed within the south-central Utah region that offer some perspective on the impacts to individual ranch operations and local economies.

**a. John D. Groesbeck, 2004.** The Tax Revenue Impacts On Kane And Garfield Counties Due To Reductions In Productive AUM On The Grand Staircase-Escalante National Monument[14].

In 1992, Kane and Garfield Counties, concerned about the creation of the Grand Staircase Escalante National Monument and the proposed elimination of all livestock grazing, commissioned an analysis by the Southern Utah University (SUU) School of Business (Thayer, 2003). The university's preliminary analysis, prepared March 30, 2002 by Associate Professor of Economics, John D. Groesbeck, relied upon historical economic grazing data and "the actual flow of goods and services between and among economic sectors". The study estimated the initial impact of loss of calf and cow sales and then computed "the impacts that the loss of income has on all the other sectors of the economy". It identified related grazing spending for transportation, labor, vaccinations, services, etc. as 95.7 percent made within the region.

The study determined that "elimination of grazing rights on heretofore multiple-use lands will cause negative economic impacts on the economies of Kane and Garfield Counties. From this preliminary analysis, the economic impacts will range between 2.6 and 3.4 percent of the total

[11] USDA 2002, Table 4. Net Cash Farm Income of the Operations and Operators: 2002; and Table 7. Hired Farm Labor—Workers and Payroll: 2002. http://www.nass.usda.gov/census/census02/volume1/ut/index2.htm

[12] USDA 2002, Table 2. Market Value of Agricultural Products Sold Including Direct and Organic: 2002 and 1997. http://www.nass.usda.gov/census/census02/volume1/ut/index2.htm

[13] USDA 2002, Table 11. Cattle and Calves—Inventory and Sales: 2002 and 1997. http://www.nass.usda.gov/census/census02/volume1/ut/index2.htm

[14] This is an unpublished document. The reference cited here is to Toni Thayer's report in the Garfield County News.

volume of economic activity in the two-county region (about $200 million)." Under different scenarios, annual economic losses for the two counties range from: 69 to 150 jobs, $3.1 million to $6.8 million economic output, and $177,311 to $386,260 sales tax revenue.

**b. Thomas Michael Power, 2004.** The Fiscal Impacts of Closing Certain Federal Grazing Allotments in the Grand Staircase-Escalante National Monument

In 2004, The Grand Canyon Trust purchased federal grazing permits in the Grand Staircase-Escalante National Monument in Garfield and Kane Counties, Utah. The Groesbeck report mentioned above-asserts a reduction of grazing will leave a void in the region's economy and lead to meaningful financial losses from local tax collections. To get at the facts, the Trust engaged Thomas Power, Professor of Economics at the University of Montana, who reached different conclusions.

Power notes that Groesbeck treated suspended grazing permits as having the same value as active grazing permits. He asserts that this clearly is not the case. The most direct evidence of that is the fact that the ranches selling the suspended grazing permits were willing to accept $5 per AUM while demanding $80 for active AUMs, 16 times as much. Suspended AUMs are almost never reactivated. Groesbeck put a value of $100 per AUM on the suspended AUMs, the same value as an active AUM. Power insists that clearly is inappropriate. Power placed no production value on suspended AUMs because, as the name makes clear, they are not available to support cattle production. Groesbeck treated the suspended AUMs as if they are actively being grazed, a counter-factual assumption.

Power's analysis report concludes that the actual impact on Garfield and Kane Counties' government revenues will be, at most, $4,100, about a sixth of the Groesbeck estimate of $24,185. For the 2003 budget years, the combined budgets of the major Garfield and Kane County governmental units, counties, school districts, and municipalities, including road, utility and health care operations, had collective budgets totaling $50.3 million. The estimated tax "loss" represents eight-thousandths of one percent of county government budgets, about one dollar out of every $12,000 of county government revenues. Although Groesbeck's estimate is almost six times larger than Power's estimate, it still represents only five-hundredths of one percent of local government budgets in Garfield and Kane Counties, about one out of every $2,100 of local government revenues (Power 2004).

Power noted that 403 active and 218 suspended animal units were sold by willing sellers to a willing buyer on the open market. The actual selling price was $80 for each active unit and $5 for each suspended unit. The total sales value was about $400,000

- (403 x $80) + (218 x $5) = $33,330 per month.
- $33,330 x 12 months =$399,960

Power provided this comparison of his determinations versus those of Groesbeck:

**Table 3-34 Comparison of Economic Values: Groesbeck vs. Power**

| Assumption | Groesbeck | Power | Comment |
|---|---|---|---|
| Value of Suspended AUMs | $100/AUM | $5/AUM | Evidence from actual market sale |
| Value of Active AUMs | $100/AUM | $80/AUM | Evidence from actual market sale |
| Production from Suspended AUs | $500/yr | $0 / yr | Suspended AU produce no beef |
| Active AUs supported by actual operating base ranches in the Garfield and Kane Counties. | 403 | 200 | Some leaseholders do not have actual base ranches in the two counties. |
| Local Income Tax Payments to Local Government | $55/AU | $0/AU | Sharing of state income tax payments is not based on local income tax collection. |
| Reduced Production from the Active AUMs Transferred | $42/AUM | lower | Actual grazing levels have been well below permitted levels due to drought and economic conditions. |

Power (2004) concludes that one of the reasons that changes in the level of grazing intensity are not likely to have a dramatic impact on local government finances is that agriculture itself does not have a dramatic impact on the local economy. Cattle raising in particular and agriculture in general represents a relatively small part of the local economy. As historically important as agriculture was to the settlement of Garfield and Kane Counties and the development of their local cultures, the role of agriculture in the early 21st century in these counties' economies is dramatically different than it once was.

While agriculture was the source of 20 percent of the jobs in Garfield and Kane Counties in 1969, by 2002, the most recent year for which data is available, the relative importance of agriculture as a source of employment had fallen to a third of this, about 7 percent, and most of those jobs were part-time jobs. More stressful for both farm and ranch operators and the local economy, the net income earned by farm and ranch operators was, on average, negative over the 1982-2002 period. For 9 of the 10 years between 1993-2002 farm and ranch operators lost money. For 15 of the 21 years 1982-2002 that was also the case. When the wage and salary earnings of hired hands are added in, it does not change the picture much: Farm and ranch earnings represented about one-half of one percent of total personal income in Garfield and Kane Counties between 1982-2002. Clearly ranching, whatever its importance in the past and its cultural significance in the present, is not currently the dominant source of either income or employment in Garfield and Kane Counties. This is not likely to change. The decline in the relative importance of ranching in these two counties has been underway for a long period of time (Power 2004).

**c. Darwin B. Nielsen, 1995[15].** Utah State University. Determining Actual Cost Increase to AUMs When a Cut in Allotments is Proposed (East Slope Allotment, Dixie National Forest)

Dr. Nielsen noted that according to indices taken from USDA, "Agricultural Prices", Washington DC, National Agricultural Statistics Service, July 1, 1994, the nonfee costs of

[15] In East Slope Permittees, 1995. Environmental Impact Statement for Revised East Slope Cattle Allotment Management—With a Proposed Solution. Dixie National Forest

grazing federal lands by cattle was $13.82. He then provided a formula for calculating actual cost increase to AUMs when a reduction is made:

| Table 3-35 Nielsen Formula for Calculating Grazing Costs Increase Due to Reduction |
|---|
| **Assume: You run 100 AUMs on a Forest Service Allotment** |
| **Cost = $13.82 x 100 AUMs = $1,382 total cost** |
| **Assume a 40% reduction in AUMs is imposed** |
| **$1,382 total cost ÷ 60 AUMs (after reduction) = $23.03/AUM** |
| **If operating costs go down by 15% with a 40% reduction** |
| **Then: $1,382 x .85 = $1,175 ÷ 60 AUMs = $19.58/AUM** |
| **Therefore the increase in cost of grazing for the remaining 60% on the allotment =** |
| **If costs do not decrease: $23.03 - $13.82 = $9.21/AUM** |
| **If costs decrease by 15%: $19.58/AUM - $13.82/AUM = $5.76/AUM** |

Based on this formula and the proposed reductions on the Pleasant Creek (19%) and Oak Creek (39%) Divisions of the East Slope Allotment, Dixie National Forest, a total cost increase for the entire allotment (assuming no decrease in costs) was $42,800, or an average increase in costs of $6.17/AUM. In addition, a value of $120/AUM[16] was used as the market value of an AUM. For the proposed reduction of 3,230 AUMs, this tallied a loss in permit value to the permittees of $387,600. Impacts on the calving operation were estimated based on an 85% calf crop. A total reduction of 536 mother cows at an 85% calf crop yielded a loss of 454 calves. The value paid for a calf in 1994 was $498.60. This report calculated a calf crop value lost in just one year of $226,364.20. Without considering inflation and numerous other factors, the loss in 10 years was determined to be $2,263,642.

| Table 3-36 Projected East Slope Allotment Losses Due to Reduction | |
|---|---|
| **Annual Net Increase in Total Cost/AUM** | **$42,800** |
| **Loss in Permit Value** | **$387,600** |
| **Annual Loss in Calving Operation** | **$226,364** |
| **TOTAL** | **$656,764** |
| **Loss to Counties (3.5 multiplier)[17]** | **$2,298,674** |

[16] Note: Tanaka and Quigley (1991) (In Nimbey et. al. 1994. Current Issues in Rangeland Economics. Importance of Public Lands Ranchers: An Idaho Case Study. Western Regional Coordinating Committee 55, Range Economics. University of Idaho, Moscow, ID.) estimated the loss of grazing permit value at $36 per AUM.

[17] Dollars generated through livestock are turned over several times in the affected counties. Utah State University economics estimate that this multiplier effect was 3.5 (Nielsen, 1991). Various resources today use a multiplier varying from 3.0 to 5.5 (State of Utah Department of Agriculture and Food http://www.ag.state.ut.us/pressrel/wmmo_commissioner.html)

## 3. Value Contributions to the Economy

### a. Formula #1 for Determining Value and Contribution to the Economy

Heady et. al. (1974)[18] presented an analysis of the economic effects of prohibiting livestock grazing on federal lands. The study focused on the federal lands in the contiguous 11 Western states, where 88% of all federal lands is located. At the time of this study, approximately 12% of the necessary forage in terms of AUMs was supplied by grazing on the federal lands in these 11 states. Power (1994) also concluded a west-wide dependence of 12%, with Utah relying on 24% of its forage from federal lands. In Heady et. al.'s report, they used Utah, among the four states most suitable to estimate production and value per AUM for range-cattle operations.

Heady et. al. (1974) determined through formula that the withdrawal of federal lands from livestock grazing would significantly hamper State and local economies. Based on the factor values in the report, they conclude that in 1974 the value contribution to the economy from cattle and calves on federal lands in Utah was $19,147,571.

Using the data and value contribution procedures from this report[19], some comparison can be shown on a relative scale for the eight allotments within the project area (all values, except where noted, are derived from the Heady et. al. report). In Utah, cattle produce an average of 28.5 pounds of meat per AUM. Therefore, the number of AUMs grazed on National Forest System land within the eight cattle allotments in the project area and the estimated amounts of meat produced by the forage consumed during the permitted grazing seasons may be summarized as follows:

**Table 3-37 Heady Formula: Estimated Project Area Pounds of Beef Production**

| Class of Livestock | AUM's | Lbs. Production |
|---|---|---|
| Cattle and calves | 12,009 x 28.5 = | 342,257 |

Gross receipts from the sale of livestock represent new money brought into the local economy. This money is re-spent several times within the community, which expands economic values far beyond the original amount. Regional economic impacts from permitted livestock grazing were modeled using a multiplier (3.5) derived by Nielson (1991) to determine the induced income dollar benefit per AUM (The Heady et. al report used a 2.25 multiplier. Current indices indicate multiplier values ranging from 3.0 to 5.5). This value was then multiplied by the permitted AUMs prescribed under each alternative. The value represents the amount of induced economic activity in dollars in the state of Utah, and principally benefits those centers of commerce within the two-county area. Using the

[18] This report covering the economic and environmental impacts of grazing on federal lands was prepared by a task force of the Council for Agricultural Science and Technology consisting of 15 top range scientists in the United States and represents the work of knowledgeable scientists who are not involved in the administration or management of federal lands.

[19] It is accepted that this report is 31 years old and data values are "stale". However, for the simple purpose of comparing alternatives, this procedure provides for a relative examination in terms of "more or less" contribution to the economy.

report's gross production value of $ 9.89 per AUM for cattle, the contribution to the local economy per AUM grazed on Federal rangelands would be $34.62. The annual values of livestock production derived from grazing on the 8 project-area allotments may thus be estimated as follows:

| Table 3-38 Heady Formula: Estimated Project Area Cattle Value of Production and Yield to Economy | | |
|---|---|---|
| **Class of Livestock** | **Value of Production** | **Yield to Economy** |
| Cattle and calves | 12009 x 9.89 = $118,769 x 3.5 = | $415,692 |

It should be emphasized that the costs/benefits are estimates, and are used for comparison purposes only. The values do not represent economic benefits in absolute terms. However, for comparison, note that total personal income in the two counties (see Table 3-1) for 2002 was $172,297,000. Therefore the $415,692 yield to the economy figure represents only 0.2% of income in the two counties. Cattle grazing appears to contribute only a small portion of the total economy of the area. The following table illustrates the total production value (net value) and the contribution to the economy for the permitted AUMs on each of the eight allotments. While the representativeness of the values in this report may be questioned, they do provide comparative estimates of forage value.

| Table 3-39 Heady Formula: Project Area Net Value &Contribution to Local Economy by Allotment | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Beaver RD Allotment** | **Acres** | **Livestock Class** | **Permitted Number** | **Season of Use** | **AUM's x 9.89 =** | **Net Value x 3.5 =** | **Contribution to Local Economy** |
| North-Indian Creek | 34,558 | Cattle | 640 | 7/21-9/30 | 1,943 | $19,216 | $67,256 |
| Marysvale | 6,338 | Cattle | 147 | 6/1-9/30 | 776 | $7,675 | $26,863 |
| Ten Mile | 12,620 | Cattle | 200 | 6/11-10/10 | 1,056 | $10,444 | $36,554 |
| Circleville | 38,019 | Cattle | 359 | 6/1-10/15 | 2,132 | $21,086 | $73,801 |
| Pine Creek/Sulphurbeds | 29,537 | Cattle | 600 | 6/16-9/30 | 2,772 | $27,415 | $95,953 |
| Junction | 6,172 | Cattle | 35 | 11/1-2/15 | 162 | $1,602 | $5,607 |
| South Beaver | 45,596 | Cattle | 520 | 6/1-10/15 | 3,089 | $30,550 | $106,925 |
| Cottonwood | 500 | Cattle | 30 | 6/1-7/31 | 79 | $781 | $2,734 |
| Total Cattle | | | 2531 | | 12,009 | $118,769 | $415,692 |

### b. Formula #2 for Determining Value and Contribution to the Economy

Using the formula provided by the East Slope permittees (1994), the 2, 531 mother cows permitted on the 8 project-area allotments would produce approximately 2150 calves at an 85% weaning rate. The value paid for a 500-550 pound calf in May 2005[20] was $658.88.

| Table 3-40 Nielsen Formula: Project Area Value Contribution to Local Economy | |
|---|---|
| **Annual Calf Production Sales Value** | **$658.88 x 2150 calves = $1,416,592** |
| **Less non-fee and fee costs ($13.82 + $1.79[21] = $15.61/AUM) x 12,009 = $187,460)** | **$1,229,132** |
| **Value Contribution to Economy (3.5 multiplier)** | **$1,229,132 x 3.5 = $4,301,962** |

[20] An average of Feeder steer and feeder heifer sales at the Salina UT livestock auction. USDA Market Reports/Reporting Livestock/Reports by Commodity/Livestock/UT.
http://www.ams.usda.gov/mnreports/AG_LS140.txt

[21] 2005 grazing fee on federal lands.

These calculations yield considerably greater figures than those determined by the Heady formula. None-the-less, a calf-production induced contribution value of $4,301,962 is still only 2½ % of the total income in the two counties of $172,297,000 (see Table 3-36).

## 4. Conclusions

Much emotion is tied to the perception that federal lands are relied upon by most ranching operations in the West and that without access to the forage these federal lands provide, many Western ranches would cease to be economically viable. And, while it remains arguable, agriculture is not the mainstay of the Western states economies at regional scales. County statistical data and agricultural census information for the two primary counties impacted by this EIS indicate that these conclusions are true for the south-central Utah region as well. While individual ranch calf sales information may indicate significant values, studies indicate that most ranchers in the area rely on some type of second off-farm income to round out their economic livelihood. The impact on individual ranchers by any significant reductions in grazing use could be devastating, resulting in some ranchers having to "give up" ranching. Some ranchers would have to relocate elsewhere to obtain sufficient employment.

Undoubtedly, grazing on public lands is an integral part of ranch operations in south-central Utah. For several generations, many of the local ranches have been dependent upon the National Forest for summer forage to round out year-long operations. The high percentage of Federal land ownership in south-central Utah, averaging approximately 75% for the two-county area, emphasizes the importance to local ranchers of Federal rangelands in maintaining viable local livestock ranching operations.

What appears most apparent is the importance of values placed on "quality of life" and "way of life". The illustrations in this socio-economic discussion clearly indicate agriculture producers are willing to continue in business despite the relatively low economic returns. In the communities immediately surrounding the Tushar Range, rural lifestyles, historic landscapes, and cultural traditions related to the Forests are an important component of their quality of life.

The Fishlake National Forest recognizes that livestock ranchers are an important thread to communities' social fabric, and that livestock grazing is one of many multiple uses permitted by the Forest Plan. In a formal "desired condition" statement, the Forest Plan direction is to manage for sustainable forage production and the quality of rural life.

**Chapter 3 Definitions**

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

**Affected environment**: The natural, physical and human-related environment that would be sensitive to changes from implementation of the alternatives.

**Animal Unit:** Considered to be one mature cow of approximately 1,000 pounds, either dry or with calf up to six months of age, or their equivalent, based on a standardized amount of forage consumed (26 lbs/day).

**Animal Unit Month (AUM):** The amount of feed or forage required by an animal unit for one month.

**Apparent Trend:** An interpretation of trend based on observation and professional judgment at a single point in time (see Trend).

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

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

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

**Areal extent:** Of or pertaining to an area and the range to which it extends; a measure of the geographic coverage of the sampling area; the physical space covered.

**Big game:** Those species of large mammals normally managed as a sport hunting resources.

**Biomass:** The total amount of living plants and animals above and below ground in an area at a given time.

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

**Bonneville CTT Population: A** geographically, genetically or ecologically distinct group of fish that regularly and freely intermix resulting in successful reproduction and recruitment of young fish to new generations.

**Browse:** Leaf and twig growth of shrubs, woody vines, and trees available for use by animals. Also, to search for or consume browse.

**Canopy Cover:** The percentage of ground covered by a vertical projection of the outermost perimeter of the natural spread by foliage of plants. Canopy cover is measured along a line intercept transect. Small openings within the canopy are included. The sum of canopy cover of several species may exceed 100 percent. (syn. Crown Cover).

**Chaining:** The use of a large ship-anchor chain pulled between two large crawler tractors to pull down or uproot brush.

**Class II Fishery Stream:** These are of great importance for fishing. They are productive streams with high esthetic value. Fishing and other recreational uses should be the primary consideration. They are moderate to large in size and may have some human development along them.

**Commensurability:** Capacity of a grazing permittee's base ranch property to support permitted livestock during the period such livestock are off public land.

**Community:** A general term for an assemblage of plants and/or animals living together and interacting among themselves in a specific location.

**Community Type:** An aggregation of all plant communities with similar structure and floristic composition.

**Critical Deer Winter Range:** That part of the overall range where 90 percent of the individuals are located during the average five winters out of ten from the first heavy snowfall to spring green-up, or during a site-specific period of winter. A subset of this definition would include a "severe winter range" definition to include areas within the winter range where 90% of the individuals are located when annual snow pack is at its maximum and/or temperatures are at a minimum in the two worst winters our of ten.

**Composition.** The proportions of various plant taxa in relation to the total on a given area. It may be expressed in terms of cover, density, or weight. (syn. Species Composition).

**Cover, Percentage:** The area covered by the combined aerial or basal parts of plants and mulch expressed as a percent of the total area

**Cover, Total:** Percentage of ground area covered by aerial parts of live plants, litter, gravel and rocks.

**Cover, Total Vegetative:** Percentage of ground area covered by live aerial parts of plants.

**Critical Area:** A portion of rangeland which has a critical issue related to it, such as a threatened or endangered or sensitive species, a high use recreation area, a key wildlife habitat, or a water quality limited reach. The area serves as a monitoring and evaluation site for the critical issue.

**Critical Value Habitat**: As defined under the Endangered Species Act, Critical Habitat is the area determined necessary for a listed species to make a successful recovery. Within the geographical area constituting critical habitat are the physical or biological features essential for the conservation of a species.

**Drought:** An extended period of below normal precipitation which causes damage to crops and rangelands; diminishes natural stream flow; depletes soil and subsoil moisture; and because of these effects, causes social, environmental, and economic impacts. To further define drought in quantitative terms that can be used to trigger the onset of drought, the use of the Society for Range Management's definition is recommended: "Prolonged dry weather when precipitation is less than 75% of the average amount"

**Dry Meadow:** A meadow dominated by grasses, which become moderately dry by midsummer.

**Ecological Status:** The present state of vegetation of an ecological site in relation to the potential natural community for the site. Vegetation status is the expression of the relative degree to which the kinds, proportions, and amounts of plants in a community resemble that of the potential natural community. Described in ecological terms, which are early seral, mid seral, and late seral.

**Fire Regime :** The characteristics of fire in a given ecosystem, such as the frequency, predictability, intensity, and seasonality of fire.

**Fire Return Interval**: Expressed as a range of years or as the arithmetic average (mean fire return interval) of all fire intervals in a given area over a given time period.

**Fishery:** Habitat that supports some in the propagation and maintenance of fish.

**Graphic Information System (GIS):** An integrated system of software and geo-referenced data with the ability to store, retrieve, modify, analyze, and represent geographic data as useful information. A GIS links map information (spatial data) with tabular information (stored in a relational database) about particular features on the map. Geo-references are the primary means of storing and accessing information

**Habitat Type:** The collective area which one plant association occupies or will come to occupy as succession advances. The habitat type is defined and described on the basis of vegetation and its associated environment. Habitat type is similar in concept to ecological, site depending on how specifically plant associations are defined. Habitat is commonly misused to refer to classification of vegetation or wildlife habitat rather than a land classification.

**Hardpan**. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

**Highland Climate:** Complex pattern of climate conditions associated with mountains. Highland climates are characterized by large differences that occur over short distances.

**Humified**--Pertains to soil that has decomposed organic matter (humus) within its profile. (See humus.)

**Humus**: That more or less stable fraction of the soil organic matter remaining after most added plant and animal residues have decomposed. Usually it is dark colored. Total of the organic compounds in soil exclusive of undecayed plant and animal tissues, their "partial decomposition" products, and the soil biomass. The term is often used synonymously with soil organic matter.

**Hydric plant**: See hydrophytic vegetation.

**Hydric soil:** A soil that is saturated or flooded long enough during the year to develop an anaerobic condition in the upper part of the soil profile.

**Hydric species**: See hydrophytic vegetation.

**Hydrologic function:** The ability of a stream to transport water and sediment in a balanced condition. The degree and rate of transport is the result of the natural watershed characteristics, including precipitation, geology, landforms, and vegetation. These characteristics have defined over time, average conditions of streamflow, quantity and character of sediment moving through the system, and composition of the materials forming the bed and banks of the channels. Stream systems that are in a balanced condition exhibit a relatively stable channel structure with only minor annual changes.

**Hydrophytic vegetation**—Plants growing in water or in a substrate that is at least periodically deficient in oxygen during a growing season as a result of excessive water content. They tend to be more water-tolerant than "water loving". Hydrophytic species, due to morphological, physiological, and/or reproductive adaptation(s), have the ability to grow, effectively compete, reproduce, and/or persist in anaerobic soil conditions.

**Indirect effects**: Secondary effects which occur in locations other than the initial action, significantly later in time, or to one resource that in turn, affects another resource. i.e.: effects to vegetation that may reduce prey species for a raptor.

**Indurate:** Indurate (hard) layers in subsoils are well recognized and occur as a result of heat, pressure and cementation. These naturally occurring layers can be impenetrable to water, air and plant roots and are sometimes found at the junction of two horizons, where a clay layer retards mobilization of water and solutes.

**Key Area:** A relatively small portion of rangeland which because of its location, grazing or browsing value, and/or use, serves as a monitoring and evaluation site. (A key area guides the general management of the entire area of which it is a part, and will reflect the overall acceptability of current grazing management over the range.)

**Key Wildlife Area:** Key areas are defined as those areas "where deer or other big game have demonstrated a definite pattern of use during normal climatic conditions over a long period."

**Key Species:** Forage species whose use serves as an indicator to the degree of use of associated species. Or, those species which must, because of their importance, be considered in the management program.

**Keystone Species**: Keystone Species are **s**pecies that enrich ecosystem function in a unique and significant manner through their activities, and the effect is disproportionate to their numerical abundance. Their removal initiates changes in ecosystem structure and often loss of diversity.

**Landscape Scale:** A scale of ecological evaluation that includes multiple habitats, ecosystems, and land uses.

**Litter.** The uppermost layer of organic debris on the soil surface, essentially the freshly fallen or slightly decomposed vegetal material.

**Long-Term Trend:** Trend is a quantitative assessment of change based on repeated measurements at the same location over time of the kind, proportion, and/or amount of plant species and soil surface properties. It provides quantitative data for interpreting the direction of change, often before it is detectable by repeated photographs over time. Trend provides feedback to indicate if management objectives are being reached. It occurs over an extended period of time to determine if management practices are effective in meeting Forest Plan, NEPA, or biological opinion goals, standards, and objectives. The question being asked is "Did the management practices do what we wanted them to do over time, or in other words - did they meet the objectives?"

**Nested Frequency:** Frequency is defined as the number of times a plant species is present within a given number of sample quadrats of uniform size placed repeatedly across a stand of vegetation. Only species presence within the bounds of the sample quadrat is recorded, with no regard to size or number of individuals. Plant frequency is a function of quadrat size and reflects both plant density and dispersion. The sensitivity of frequency data to density and dispersion make frequency a useful parameter for monitoring and documenting changes in plant communities.

**Parker 3-Step Study:** A "point" sampling procedure used extensively by land management agencies for monitoring trends in range condition. The basic concept behind this procedure is essentially the same as that of quadrat frequency except that a point is used as the sample or sub-sample unit rather than a quadrat. In fact, data collected with point sampling methods can be evaluated as frequency data; i.e. the number of hits on a plant species as a percentage of the total number of points read. However, because a point is essentially dimensionless, the data are usually used as absolute measures of cover, basal area or whatever the criteria used for determining "hits".

**Potential Natural Communities (PNC):** The stable biotic community that would become established on an ecological site if all successional stages were completed without human interference under present environmental conditions.

**Pristine.** Of, relating to, or typical of the earliest time or condition; primitive or original. Belonging to the earliest period or state, not spoiled, corrupted, or polluted (as by civilization. "Pristine" gives the idea of no human interaction.

**Proper Functioning Condition** (PFC): Refers to riparian or wetland areas. A riparian or wetland area is considered to be in proper functioning condition when adequate vegetation, landform, or large woody debris is present to: 1) dissipate stream energy; 2) filter sediment, capture bedload, aid in floodplain development; 3) improve flood-water retention and ground-water recharge; 4) develop root masses that

stabilize streambanks; 5) develop diverse ponding and channel characteristics to provide habitat for wildlife; and 6) support greater biodiversity.

**Pure Remnant Population of Bonneville Cutthroat Trout: T**he exact description of pure BCT has shifted as new technology and information has been acquired over the past 50 years. References to 'pure' BCT from 30 years ago was based primarily on physical identification. More recently, genetic characteristics are used to evaluate purity. Criteria are developed on which managers rate purity in the absence of having all information. For purposes of this report, pure BCT are those populations designated as pure according to the State's criterion for purity.

**Range Of Variability (Also called the historic range of variability or natural range of variation.)**- The components of healthy ecosystems fluctuate over time. The range of sustainable conditions in an ecosystem is determined by time, processes (such as fire), native species, and the land itself. For instance, ecosystems that have a 10 year fire cycle have a narrower range of variation than ecosystems with 200-300 year fire cycle. Past management has placed some ecosystems outside their range of variability. Future management should move such ecosystems back toward their natural, sustainable range of variation.

**Range Site Analysis:** A plot-by-plot check of vegetation and cover on an area based on a combination of measurements and estimates. Measurable factors include plant composition, forage production, percent vegetal and litter cover, bare ground, and soil erosion. Range condition and apparent trend are determined from data collected. A range site analysis is not intended to be a permanent study plot and generally is not established with permanent location markers.

**Remnant Population of Bonneville CT**: Any population that has naturally persisted and currently occurs within its historically occupied stream or locale. Remnant populations do not include populations that have been introduced or reintroduced through transplanting or stocking.

**Repeat Photography:** A technique of making a photograph that has an image that is, except for the date of exposure, as nearly identical as possible to the image of an earlier photograph. Comparing the original and contemporary photographs makes it possible to see changes over time. Minimally, rephotography places a camera at the same location of the original to recreate the original vantage point. Rephotography may also consider the time of day and time of year to ensure that natural light conditions are the same.

**Sinuosity:** The relative number of curves or bends within a stream reach. Usually expressed as the ratio of the stream channel length divided by the valley length.

**Species of Concern:** Species of concern are "species for which the Responsible Official determines that management actions may be necessary to prevent listing under the Endangered Species Act." The plan for a species of concern must provide for habitats that are of sufficient quality, distribution, and abundance to allow species populations to be well distributed and interactive, within the bounds of life history, distribution, and natural population fluctuations of the species and the capability of the landscape.

**Species of Interest:** This category includes state-listed threatened and endangered species; birds on the U.S. Fish and Wildlife Service Birds of Conservation Concern National Priority list; and other species of regional or local concern due to significant threats, declining populations, or rarity. For these species, as well as game species like deer, the directives give broad discretion to the responsible official to provide protection "to the degree determined appropriate."

**Stable:** The condition of little or no perceived change in plant communities that are in relative equilibrium with existing environmental conditions; describes persistent but not necessarily culminating stages (climax) in plant succession. Implies a high degree of resilience to minor perturbations.

**Stability**: The ability of the channel banks and bottom to resist the erosive powers of flowing water. Inherent stability refers to the potential stability of a riparian system.

**Stream bed / stream bottom:** The substrate plane, bounded by the streambanks, over which the stream water flows.

**Streambank alteration:** Physical alteration of the streambank. As used in the Lewis and Clark National Forest handbook direction, the amount of damage caused by livestock during the current season. The overriding concept behind the measure is making sure that the integrity of the streambank remains. Most often, the best indicator of the reduction in bank integrity is the hoof prints of livestock along the bank/water interface.

**Streambank morphology:** Form and structure of streambank which is that portion of the channel bank crosssection that controls the lateral movement of water. Includes channel dimensions, patterns, and profile.

**Stream type:** A system used to categorize streams based on physical characteristics. These characteristics include entrenchment, bankfull width and depth, sinuosity, slope, and substrate composition.

**Substantial Value Habitat:** An area that provides for "frequenbt" use by a wildlife species.

**Suspended AUMs:** A Bureau of Land Managekent (BLM) term denoting those AUMs that are held in suspension mainly because of production surveys that stated that these AUMs were not present. They cannot be used by the BLM permittee. Total BLM preference is active plus suspended.

**Tall Forb:** The tall forb type is unique to the Rocky Mountains and is characterized by a large array of luxuriant, rather tall 16 to 48 inches mesic forbs. Its geographic distribution ranges from near the Montana/Idaho border on the north to the southern Wasatch range in Utah. The tall forb type occurs at elevations between 6,300 and 11,000 feet where yearly precipitation ranges between 30 to 40 inches. This community type has most likely historically been referred to as open mountain meadows or woodlands, occurring on cool and moist or poorly drained sites with a dense population of herbs and grasses, dominated by Richardson's geranium and slender wheatgrass.

**Total Maximum Daily Load (TMDL):** The sum of the individual waste load allocations for point sources and load allocations for both nonpoint sources and natural background sources established at a level necessary to achieve compliance with applicable water quality standards [75-5-103(32) MCA]. In practice, TMDLs are water quality restoration targets for both point and nonpoint sources that are contained in a water quality restoration plan or in a permit.

**Tundra Climate:** Generally, the climate that produces tundra vegetation with a small yearly temperature range and very little precipitation, supporting low-growing vegetation such as lichens, mosses, dwarf shrubs and stunted trees. It is too cold for the growth of trees but does not have a permanent snow–ice cover. Alpine tundra is located at high altitude on mountains around the world. The growing season in the alpine tundra is approximately 180 days and the temperature is usually well below freezing after dark.

**Type Conversion**: The conversion of the dominant vegetation in an area from forested to non-forested or from one species to another.

**Waterbar**: A cross drainage diversion ditch and/or hump in a trail or road for the purpose of diverting surface water runoff into roadside vegetation, duff, ditch, or dispersion area to minimize the volume and velocity which can cause soil movement and erosion.

**Watershed:** The total area above a given point on a stream that contributes surface or ground water to the streamflow at that point.

**Watershed Resource Value Rating** (WRVR): A rating of the value of vegetation present on an ecological site for protection of the watershed. WRVR's may be established for each plant community capable of being produced in an ecological type, including exotic and cultivated species.

**Water quality:** The physical, biological and chemical components of stream or lake waters and the degree to which their combined characteristics support beneficial uses.

**Water table:** The upper surface of groundwater. Below it, the soil is saturated with water.

**Wet Meadow:** A meadow where the surface remains wet or moist throughout the growing season, usually characterized by sedges and rushes.

**Woody debris:** The residue left on the ground after a fire, storm, timber cutting, or other event. Woody debris includes unused logs, uprooted stumps, broken or uprooted stems, branches, bark, etc.

**Xeric Plant:** See Xerophytic Plant.

**Xerophytic Plant:** A plant adapted to a xeric or dry environment; for life with a limited supply of water.