CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

A. INTRODUCTION

Chapter 4 discusses the environmental consequences and effects of the alternatives. Using Chapter 3 information as the baseline for comparison, the projected environmental effects of the alternatives are addressed in terms of the issues identified in Chapter 1 and for which existing conditions were provided in Chapter 3:

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

This chapter is organized by alternative for each of the identified issues and shows the changes that can be expected from either reissuing term grazing permits to continue authorizing cattle grazing or discontinuing cattle grazing. The consequences are based on existing conditions in the project area, which are represented by Alternative A – Proposed Action (continuing grazing). Changes from existing conditions in the project area, which are represented by Alternative B (no grazing), can be compared to Alternative A. The consequences that would result from Alternative A – Proposed Action (continuing grazing) are described first, followed by a separate evaluation for the No Grazing alternative. Where consequences are the same from one alternative to the other, there will be a reference to a preceding alternative discussion.

Environmental effects are described in sufficient detail for the decision-maker and the public to have accurate expectations as to the environmental consequences of each alternative. NEPA does not require an exhaustive review of every ecosystem component or every piece of scientific literature. The purpose of this EIS is not a rigorous analysis of every facet of the environment, but a diligent "hard look" is made to conclude, with foundation, whether there will, or may be, a "significant" environmental impact resulting from livestock grazing.

Direct and indirect effects and cumulative effects are described under each major issue:

Direct and Indirect Effects of Each Alternative: This section describes the direct effects, those effects occurring at the same time and place, and indirect effects, those effects that occur at a later time or at a different place.

Cumulative Effects of Each Alternative: This section describes the cumulative effects, those impacts or effects on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes the action. Cumulative effects or impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

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. SPECIFICALLY REQUIRED DISCLOSURES

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with…other environmental review laws and executive orders." This section discloses how the alternatives comply/do not comply with major laws, regulations, policies, and Executive Orders governing rangeland management.

1. **Short-term Uses and Long-term Productivity.** NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Short-term uses are those uses that generally occur annually (i.e., grazing livestock). Long- term productivity refers to the ability of the land to produce a continuous supply of a resource. Grazing available forage under the Proposed Action is not expected to affect the long-term productivity of soils, except in isolated areas around water developments and trails along fences.

2. Irreversible or Irretrievable Commitments of Resources. Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irreversible applies primarily to the use of non-renewable resources, such as minerals or cultural resources, or to those factors that are renewable over long time spans, such as soil productivity. Irreversible also includes the loss of future options.

Irretrievable effects apply to losses of production or commitment of renewable natural resources. For example, some or all of the forage production from an area is irretrievably lost during the time it is used for a winter recreation event. If the use is changed, forage production can be resumed. The production lost is irretrievable, but the action is not irreversible.

No resources would be irreversibly committed under the proposed action. The main resource involved is forage, which is used by both wildlife and domestic livestock. Forage is renewable and when managed under FLRMP standards and guides, adequate amounts of forage would return the following growing season.

3. Energy Requirements and Conservation Potential. Grazing management requires very limited amounts of energy use for installation of improvements and the management and monitoring of livestock. Forest-wide, energy requirements are not great. For the allotments within the project area, expected energy requirements will be small. No conflicts with other jurisdictions are anticipated because of the proposed action or alternatives.

4. Possible Conflicts With Plans and Policies of Other Jurisdictions. No conflicts with other jurisdictions are anticipated because of the proposed action or alternatives.

5. Probable Adverse Environmental Effects That Cannot Be Avoided. Potential adverse impacts are identified in all the areas addressed in this analysis. However, most are minor and all could be mitigated through either the alternatives considered in the analysis or the cited mitigation requirements.

6. Critical Elements of the Human Environment. Elements that are subject to requirements specified in statute, regulation or executive order that are addressed throughout Chapter III include cultural resources, water quality, American Indian religious concerns, threatened or endangered species, and wetlands/riparian zones.

Because no wetlands or floodplains will be altered, the goal and intent of Executive Order 11988 (Floodplain Management) and 11990 (Protection of Wetlands) would be met. Riparian ecosystems located within the planning area would be protected through compliance with FLRMP standards and guides. Other elements that would not be affected because they do not exist in the study area include Wilderness or designated Areas of Critical Environmental Concern. Effects on the human environment are documented in Chapter 4 of this FEIS. The civil rights of any American citizens, including women and minorities, would not be differentially affected by implementation of any alternative.

7. Environmentally Preferred Alternative. Alternative B (No Grazing) is the environmentally preferred alternative. This alternative causes the least damage to the biological and physical environment and best protects, preserves and enhances historic, cultural, and natural resources.

8. Prime Farmland, Rangeland, and Forestland. All alternatives associated with this proposal are in accordance with Secretary of Agriculture Memorandum 1827 and Department Regulation 9500-3 for prime farmland, rangeland and forest land.

9. Research Natural Areas. No Research Natural Areas would be affected by the Proposed Action or its alternative.

10. Environmental Justice (E.O. 12898). During the course of this analysis, none of the alternatives considered resulted in any identifiable effects or issues specific to any minority or low-income population or community. The agency considered all public input from persons or groups regardless of age, race, income status, or other social/economic characteristics. Examination of community composition, as required under E.O. 12898, found no minority or low- income communities to be disproportionately affected under any of the alternatives. This was not raised as an issue during scoping.

11. National Forest Management Act. The Proposed Action is consistent with direction in the 1986 FLRMP and the National Forest Management Act of 1976.

12. Federal Licenses and Permits.
No federal licenses or permits would be required.

E. ALTERNATIVES & CONSEQUENCES BY ISSUE

1. Issue – Riparian Function

The major deterrent to recovery[1] in riparian ecosystems has been the historical abuse of these ecosystems by a variety of resource use activities and the failure of commonly used grazing strategies to work because of the relative differential in palatability and microclimates between upland and riparian sites. The elevation extent and geographical positioning between upland and riparian types, within the allotments in the Tushar mountain range, generally dictates that riparian areas be included with upland grassland and forested sites within the same pasture. Consequently, within these common riparian/upland units, cattle will continue to prefer riparian vegetation over the more xeric species of uplands. It is expected that cattle use will continue to concentrate on riparian ecosystems since the forage is often highly palatable and the microclimate is conducive to extended use into the summer months. The use of residual stubble height forage use criteria in riparian areas, as opposed to utilization criteria on uplands, is intended to reflect this use preference dichotomy and provide an indicator of when there has been enough use and that the cattle should be moved.

Important riparian functionality includes providing food, nutrients and habitat for aquatic and terrestrial plants and animals, maintaining appropriate stream channel dimensions, bank stability and pattern, dissipating stream energy, storing water and sediments in the floodplain, filtering upland sediments, and maintaining the ability of the riparian system to resist and recover from disturbance. Based on current research, the existing riparian forage utilization standards[2] (as revised and incorporated through an amendment to the Forest Plan) are adequate for providing this functionality. However, in order to fully address the desired conditions of a site, annual indicators such as stubble height must be used in

[1] In Grider, Harris and Boshell (1995): Much of the research literature compares the effect of no grazing with effects of severe (even destructive) overgrazing, with the desired effect being recovery. The lack of abundant comparisons with grazing at proper use does not answer with clarity that no grazing is more beneficial than proper grazing. Buckhouse (1981) states, "What is less clear, however, is what constitutes overgrazing on any given system; to what degree geologic events are operating independent of grazing; and what ameliorating effects might grazing systems, season of grazing, and animal behavior modification have".

[2] In Grider et.al. (1995): The Proposed Action focuses on the effects of cattle grazing at proper use. However, most research and field studies compare over-use with no use at all. The difference is always dramatic. Platts (1982) concluded that many study sites were chosen in the most degraded areas and do not represent the overall range condition. He noted that many of these studies do not identify whether the grazing strategy and intensity of use were being either properly or improperly managed. Heady (1984) (in Valentine 1990, pg. 17) stated "The current penchant for describing the bad effects of overgrazing far over-shadows descriptions of successful...grazing programs and the good results from proper grazing." Vallentine (1990) concludes that even scientists, sometimes knowingly but probably more often unknowingly, report comparisons of the impact of "no livestock grazing" with "livestock grazing", when often all that was compared was severe livestock use, much beyond the pale of proper use but with no qualification made as to this aspect. The reviewer is cautioned to avoid making the mistake of judging proper grazing by the results of overgrazing. May and Sommes (1981) concluded that livestock grazing either by sheep or cattle is not inherently bad. Streamside areas have historically been grazed by herbivores with varying degrees of impact, both positive and negative. They found that the critical element influencing effects of grazing is the management of grazing activities.

combination with long-term effectiveness monitoring such as green-line vegetation composition, streambank stability and woody species regeneration (University of Idaho Stubble Height Study Team 2004). The Proposed Action, the No Grazing Alternative and the SMU-G Alternative will be evaluated by how they address or affect these important components of riparian function briefly outlined below.

- **Providing Food, Nutrients, and Habitat**. Riparian vegetation houses and feeds a wide variety of aquatic and terrestrial plants and animals (including insects). Therefore, it is important that the potential natural riparian community be aptly represented and maintained. Vegetation at the stream margins is particularly essential for this purpose. Clary and Webster (1989) and Clary and Leininger (2000) recommend a minimum 4 to 6 inches of stubble height to prevent adverse changes in riparian vegetation composition and structure.

Table 4-1 Providing Food, Nutrients, and Habitat	
Alternative A Proposed Action	Proper use criteria, when correctly applied, should maintain vegetative composition and structure on sites in mid to late seral stages, to provide sufficient food, nutrients and habitat. Taller stubble heights or complete rest may be needed on degraded sites to restore desired riparian characteristics (Platts 1991, Clary and Webster 1989, Clary and Leininger 2000). However, that determination is made at the project level during the development of proper use criteria for individual AMPs
Alternative B No Grazing	Riparian composition and structure would be maintained in properly functioning areas and degraded sites would trend towards the potential natural riparian community in the quickest timeframe possible, providing the maximum benefits to aquatic and terrestrial plants and animals.[3] [4]
Alternative C SMU - G	The SMU-G alternative requires a 6 inch stubble height along the riparian greenline in all cases, which should maintain sufficient vegetative composition and structure to provide food, nutrients and habitat. In addition to stubble height, the additional criteria related to streambank trampling, riparian graminoids above the greenline and riparian shrubs should maintain and improve overall vegetative composition and structure. The potential to reduce the duration and concentration of grazing (70% reduction from current permitted numbers) with this alternative could further benefit riparian communities and accelerate the recovery of degraded sites.

Maintaining Appropriate Stream Channel Width, Depth, Streambank Stability, and Meander Patterns: The importance of riparian vegetation to channel stability, and sensitivity to disturbance vary significantly by stream type (Rosgen 1996). The most sensitive streams are typically low to moderate gradient channels such as Rosgen C, E, and G types where the bed and banks are composed primarily of cobble sized or smaller materials. Higher gradient A and B channels dominated by gravel or smaller particle sizes can also be dependent on vegetation for stability. C channels tend to depend on deep-rooted woody plants for stability, more so than other stream types (Rosgen 1996). Overgrazing and direct trampling or shearing of streambanks can lead to changes in stream dimensions, streambank

[3] In Grider, Harris and Boshell (1995): While there is abundant documentation of positive changes when removing livestock from deteriorated rangelands, a review of research literature indicates that there may be little difference in the effects of no grazing and grazing at proper use (rather than over-grazing). Bryant (1985) states that total exclusion of all human activities from riparian areas, is unlikely to return those areas to pristine conditions. Hall (1985) offers the same conclusion with regard to effects on wildlife: "Even if livestock grazing were excluded from public lands in the Great Basin, the resulting circumstances would not provide optimum habitat conditions". Permanent removal of grazing will not guarantee maximum herbaceous plant production. The accumulation of litter over a period of years seems to retard herbage production in wet meadow areas. Thus, some grazing of riparian areas could have beneficial effects (Clary and Webster 1989).

[4] In Leonard and Karl (1995): range scientists agree that total exclusion of livestock is not necessary to reduce the negative ramifications to functioning conditions (Krueger and Anderson 1985). Livestock grazing can be permitted in riparian areas concomitantly with stream system improvement (Chaney et al. 1990; Elmore 1992; Elmore and Kauffman 1994). Land managers can accomplish both with an increased emphasis on compliance to suitable grazing systems and practices. Awareness of the limitations of livestock grazing for improvement of riparian areas should be emphasized; "... livestock are NOT a 'tool' to improve riparian ecosystems. Rather, they are a cost that may often be accommodated and still enable successional advancement of riparian vegetation and attendant functional values (Krueger and Anderson 1985)."

stability, and location. These alterations can lead to lowered water tables, increased sediment loading, and degradation of water quality and aquatic habitats. Therefore, it is essential that healthy riparian vegetation be maintained. Researchers recommend minimum stubble heights of 4 to 6 inches for the purpose of maintaining channel dimensions, pattern and stability[5]. Taller stubble heights or complete rest may be needed on degraded sites to restore riparian vegetation with deep, dense rooting characteristics (Clary and Webster 1989, Clary and Leininger 2000).

Streambank stability is the cornerstone for proper stream function. Various stream types have different inherent channel stabilities, which must be considered when determining the potential effects of livestock grazing or any other use (Rosgen 1996). Undisturbed bank stability for channels functioning at full potential appears to range from about 70% to near 100%, depending on the type of channel and streamside vegetation. The literature suggests that allowable disturbances may range from less than 10% to as much as 40%, depending on the type of channel and residual vegetation (Leffert 2002, pg 22).

Table 4-2
Maintaining Appropriate Stream Channel Width, Depth, Bank Stability, and Meander Patterns

Alternative A Proposed Action	When proper use criteria are enforced, this alternative meets the needs for this element by prescribing that at least 4 inches of stubble height be present throughout the entire year. Since the 4-6 inch requirement is the trigger to remove cattle (no twice over use), re-growth on grazed units would provide additional benefit for channel form and stability. Excessive channel widening, shallowing and lowering of water tables should be prevented if proper use is attained. However, in order to restore healthy vegetative communities with deep, dense, rooting characteristics, complete rest or reductions in the duration and concentration of grazing may be required at degraded sites. The current standard for bank stability on the Fishlake National Forest is to "maintain 50% or more of total streambank length in stable condition where natural conditions allow" (USDA FS 1986a, pg IV-18). This value is well below the range of natural stabilities that have been observed in undisturbed channels (Leffert 2002), and is likely inadequate to fully protect channel form and stability (Dale Deiter, personal communication). The opportunity to revise this standard exists with the on-going forest plan revision effort. Guidelines related to bank stability can also be developed at the project level for individual allotment plans, particularly when reference reach data is available.
Alternative B No Grazing	The no grazing alternative would allow for optimal recovery of channel form, including appropriate width to depth ratios, water table elevations, bank stability and meander patterns. The process of narrowing and deepening of degraded channels, with associated meander patterns, would occur at the quickest possible rate under this alternative.
Alternative C SMU - G	If the proposed criteria for riparian grazing are met, then channel dimensions, bank stability and meander patterns should be maintained or improved. In addition to stubble height, the SMU-G alternative has other trigger points that move cattle out of riparian areas, including streambank trampling ≥15%, riparian graminoids above greenline (25% of current years growth) and riparian shrubs (30% of current years growth). Monitoring on the Beaverhead-Deerlodge NF has shown that for meandering, alluvial channels such as Rosgen C and E types, streambank alteration is almost always the trigger to move cattle (Bengeyfield and Svoboda 1998). For channels that are less sensitive to grazing such as Rosgen A and B types, forage utilization has usually been the trigger (Bengeyfield and Svoboda 1998). Consequently, the SMU-G streambank trampling criteria could trigger livestock moves from a pasture earlier than the proposed action, particularly in E and C channel types that are sensitive to grazing. This reduction in the duration of grazing, combined with the 70% reduction in permitted numbers could be very beneficial to stream channels that are sensitive to grazing pressure, and could accelerate the recovery of degraded sites. In relation to streambank alteration criteria, it should be noted that currently there are no widely accepted methods available to measure this variable, and the accuracy and repeatability of each method is often debated. However, by using streambank alteration criteria, even though the methods are debated, the potential exists to further protect riparian resources.

- **Dissipating Stream Energy, and Storing Water and Sediments**: This element is most relevant during periods when streamflow approaches or exceeds bankfull. In-channel and floodplain roughness elements that create turbulence, eddies, and resistance to flow help dissipate stream energy. Vegetation plays an important role in creating and maintaining channel roughness. Vegetation also helps sustain the

[5] In Staats (1995): Researchers have shown that stream channel and/or streambank alterations occur at utilization levels of about 60%. Riparian areas in satisfactory condition (mid to late seral greenline) need at least 4 inch stubble to be maintained, and unsatisfactory condition (very early to early seral greenline) need 6 inch stubble to be improved (Clary 1990). With the allowable use components described in Table 2-3, it is very likely that proper use would allow moving toward the desired conditions of mid to late seral community types, stable streambanks, diverse age class structure of woody species, meeting State Water Quality Standards, and not contributing to further impairment of Utah High Priority Watersheds and 303(d) listed waters.

ability of a stream to access its floodplain by maintaining channel width, depth, and elevation. This is important because a stream can dissipate energy, and store water and in-channel sediments by spilling onto the floodplain. The successional colonization of point bars by vegetation on low gradient meandering channels is also important to store sediment and maintain channel form. In regard to trapping and storing sediment, Clary and Webster (1989) and Clary and Leininger (2000) recommend that stubble heights be at least 4 to 6 inches.

Table 4-3 Dissipating Stream Energy and Storing Water and Sediment	
Alternative A Proposed Action	The proposed action meets the needs for this element by prescribing that at least 4 inches of stubble height be present throughout the entire year. Re-growth on early grazed units would provide additional benefit for channel maintenance. However, in order to restore channel and floodplain roughness on degraded sites by attaining taller stubble heights with deep, dense rooting characteristics, complete rest or reductions in duration and concentration of grazing may be required.
Alternative B No Grazing	In-channel and floodplain roughness would be maintained in functioning areas and allowed to recover at the quickest possible rate at degraded sites. The short and long term potential for restoring the ability dissipate stream energy, resist erosion, and store water and sediments is greatest with this alternative.
Alternative C SMU – G	This alternative meets the needs for this element by prescribing that at least 6 inches of stubble height be present throughout the year. Re-growth after livestock have been moved would provide additional benefits to channel maintenance and floodplain development. Additionally, the other criteria that key on riparian function (streambank trampling, riparian graminoids above greenline and riparian shrubs) would further help protect the riparian plant community, maintaining and improving the necessary roughness elements that help dissipate stream energy and store water and sediments.

Filtering and Preventing Sedimentation: Sediment is the major non-point pollution problem from rangelands in the Western United States. Poor management of livestock grazing greatly accelerates erosion and sedimentation, which can cause detrimental increases in total suspended solids (TSS) and turbidity. Increased erosion from heavily grazed lands is caused by increased impact of raindrops that fall directly on soil, reduced trapping of mobilized sediments by plants and plant debris, and reduced infiltration rates that result from soil compaction (USDA FS 1995). Therefore, a critical function of riparian areas is to filter upland runoff and trap sediment before it can enter stream channels. The density, type, height, width and slope of the buffer strip, and the timing and amount of flood flows determine how effectively vegetation can trap and store upland sediments. Clary and Webster (1989) and Clary and Leininger (2000) recommend that stubble heights be at least 4 to 6 inches for this purpose[6].

[6] In Staats (1995): 55% utilization is generally the transition between moderate and heavy grazing intensity which causes a significant decrease in infiltration. Since the proposed actions are for a maximum of between 50-60%, use levels would be right at or near that transition. So infiltration rates would be expected to continue to be from approximately 3/4 to 1/2 the natural rates (at or near existing rates) in grazed areas. With the continuing decrease in infiltration, there would be a corresponding continuation of increased runoff and erosion at or near existing rates. Instream substrate in some areas would continue to not meet the Forest Plan Standard and Guideline of no more than 25 percent inorganic sediment less than 3.2 mm in size. But since all the components of "proper use" are expected to maintain or improve, where needed, riparian health, this alternative is expected to move towards desired riparian and stream conditions.

Table 4-4 Filtering and Preventing Sedimentation	
Alternative A Proposed Action	When proper use criteria are enforced, 4 inch or taller stubble heights would be maintained year round. This would promote trapping of upland soil erosion during summer thunderstorms, which are usually more erosive than spring snowmelt conditions. However, in order to restore the ability to filter and store upland sediments in severely degraded riparian areas, complete rest or reductions in duration and concentration of grazing may be required.
Alternative B No Grazing	Under this alternative, the ability to filter and store upland sediments would be maintained in functioning areas and allowed to recover at the quickest possible rate in degraded areas.
Alternative C SMU – G	This alternative meets the needs for this element by prescribing that at least 6 inches of stubble height be present throughout the year. Re-growth after livestock have been moved would provide additional benefits to the processes of filtering and preventing in-channel sedimentation. Additionally, the other criteria that key on riparian function (streambank trampling, riparian graminoids above greenline and riparian shrubs) would further help protect the riparian plant community, maintaining and improving the ability to filter and prevent sedimentation.

- **Maintaining Riparian and Stream Channel Resistance and Resilience**: The importance of slope and channel processes, sensitivity to disturbance, and recovery potential all vary depending on morphological characteristics and conditions of the stream, riparian system and watershed (Rosgen 1996). Restoring and maintaining the functionality of riparian systems, promotes resistance and resilience to disturbance (Platts 1991, Kauffman and Krueger 1984). The starting point for maintaining riparian functionality is a residual stubble height of at least 4-6 inches (Clary and Webster 1989, Clary and Leininger 2000), but this should also be coupled with long term effectiveness monitoring such as green-line vegetation composition, streambank stability and woody species regeneration (University of Idaho Stubble Height Study Team 2004).[7]

Table 4-5 Maintaining the Ability of the Riparian System to Resist and Recover from Disturbance	
Alternative A Proposed Action	When proper use criteria are enforced, the ability to resist and recover from disturbances should be maintained in functioning areas, and allowed to recover in degraded sites. In addition to stubble height, a more direct indicator for bank stability and alteration, as well as measurable woody browse utilization criteria, would further benefit the maintenance and protection of riparian conditions and functionality. Widely accepted methods to measure streambank alteration and woody browse utilization are currently unavailable.
Alternative B No Grazing	The ability to resist and recover from various disturbances would be maintained in properly functioning areas and allowed to recover at the quickest possible rate in degraded areas.[8]
Alternative C SMU - G	The proposed criteria, if properly enforced, would maintain riparian functionality and should maintain the ability to resist and recover from disturbance. Since the proposed SMU-G criteria monitor a broader range of riparian conditions, the overall functionality, resistance and resilience of riparian

[7] Research literature suggests that riparian areas be grazed in early spring, or fall, in order to reduce grazing impacts on riparian areas (Myers 1989, Clary and Webster 1989, Skovlin 1984). Grazing under deferred-rotation systems will allow grazing to occur early, mid, and late season. This will vary the timing of plant exposure to grazing each year. Thus, species favored one year may be less favored another year. While this will maintain species diversity, density, and productivity within riparian/meadow areas, the mid-season grazing which these areas would periodically sustain would limit the shift towards more deeply rooted perennial plants and the opportunity for rapid successional change to desired conditions.

[8] Lacey and VanPoolen (1981) compared 11 studies throughout the west and found that protected areas produced an average of 68% more herbage than comparable areas grazed at a "moderate" rate. However, permanent removal of grazing will not guarantee maximum herbaceous plant production. Volland (1978) found that a protected Kentucky bluegrass meadow reached peak production in 6 years and then declined until production was similar to the adjacent area grazed season-long. Similar results were reported by Bryant (1988) in northeastern Oregon. Clary and Webster (1989) report that the accumulation of litter over a period of years seems to retard herbage production in wet meadow areas. Thus, some grazing of riparian areas could have beneficial effects. This is a response similar to that documented by Kauffman et. al. (1983). Heady (1984) contends that some defoliation often promotes greater plant vigor than no defoliation at all. From their studies on the Edwards Plateau of Texas, Reardon and Merrill (1976) suggested that even decreaser plants need some grazing in order to remain vigorous and productive.

Table 4-5 Maintaining the Ability of the Riparian System to Resist and Recover from Disturbance	
	systems could be adequately maintained in functioning areas and improved at an accelerated rate in degraded sites. The 70% reduction in permitted numbers combined with the potential for livestock to spend less time in one area because of additional criteria (streambank trampling, graminoids and riparian shrubs), could decrease the overall magnitude of grazing related impacts to riparian systems.[9]

Riparian Function Cumulative Effects:

(See Water Quality and Quantity Cumulative Effects)

2. Issue – Water Quality and Quantity

Direct and Indirect Effects

Water temperature, nutrients (total phosphorus, DO and pH), noxious aquatic plants and riparian habitat alteration were identified as water quality pollutants of concern in the Beaver River Watershed TMDL (Utah DEQ 2000). Riparian issues and sedimentation were discussed in the previous section. Issues related to water quality and quantity are discussed below. As with the effects on riparian function, the effects on water quality and quantity can be decreased and/or mitigated by applying proper use criteria.

Important water quality functionality includes controlling water temperatures, nutrient loading and bacteria input. In regards to water quantity, it is important to control adverse effects to streamflow response and erosion potential. Based on current research, the existing riparian forage utilization standards (as revised and incorporated through an amendment to the Forest Plan) are adequate for providing this functionality. The Proposed Action, the No Grazing Alternative and the SMU-G Alternative will be evaluated by how they address or affect the important components of water quality and quantity briefly outlined below.

- **Controlling Water Temperatures**: Riparian vegetation, especially woody plants, help maintain cool water temperatures in the summer by maintaining narrow channels that are less exposed to solar radiation and warm air. Conversely, herbaceous and woody plants help prevent the formation of potentially damaging anchor ice in the winter by maintaining narrow channels that are less exposed to or more insulated from the cold environment. Bank trampling (channel widening and shallowing), loss of woody plants, and conversion to early seral species caused by overgrazing can lead to conditions that create water temperatures that are too warm to support cold water fisheries in the summer and cause ice formation in the winter. How the alternatives relate to channel characteristics such as width and depth, which can affect water temperatures, has already been addressed in the riparian function section. Therefore, the following table focuses on how the alternatives relate to maintenance of willows and woody plants. In small to medium-size streams, (predominant streams on the Forest) woody vegetation is usually sufficient to moderate water temperatures but grasses and forbs have little effect.

[9] Livestock grazing on federal lands is not the only factor that affects rangeland vegetation. Climate, recreation and wildlife use, management practices on adjoining lands, and the introduction and spread of alien weeds are also key considerations. Vegetation condition and status cannot be predicted by considering changes in livestock management alone. Most public ranges in the United States are managed under a multiple-use philosophy in which an attempt is made to accommodate all legitimate rangeland use demanded by society. Heady et al. (1974) stated that livestock grazing is being managed and integrated with other uses of federal lands and that there is no evidence that well-managed grazing of domestic livestock is incompatible with a high-quality environment.

Table 4-6 Controlling Water Temperatures: Woody Vegetation	
Alternative A Proposed Action	The retention of at least 4 inches of standing crop will normally detour significant feeding on willows and most other riparian woody plants (Clary and Webster 1989). Consequently, assuming proper use is achieved, willow and woody plant communities should be maintained or allowed to develop. However, if proper use criteria are not enforced, it is likely that critical willow and woody vegetation components will be decreased or eliminated completely. In areas where the woody component is lacking, complete rest or a reduction in the duration and concentration of grazing may be required to restore woody vegetation.
Alternative B No Grazing	The woody riparian components that are critical to controlling stream temperatures would be maintained in properly functioning areas and allowed to recover at the quickest possible rate in degraded areas.
Alternative C SMU - G	The SMU-G riparian shrub criteria (30% of current years growth) is more directly responsive to the development and maintenance of woody riparian vegetation. In addition, the required 6 inches of stubble height should deter significant feeding on willows and most other riparian woody plants (Clary and Webster 1989 suggest a minimum of 4 inches). The combination of these factors should maintain woody riparian vegetation in functioning areas and accelerate the recovery of sites lacking a woody component. The potential for reduced duration and concentration of grazing with this alternative could also ease pressure on woody browse species, ensuring a healthy and persistent woody component. In relation to woody browse criteria, it should be noted that currently there are no widely accepted methods available to measure this variable, and the accuracy and repeatability of each method is often debated. However, by using a woody browse criteria, even though the methods are debated, the potential exists to further protect riparian resources.

Controlling Nutrient Loading and Bacteria Input: The Utah Division of Water Quality has set standards for the amount of certain nutrients and bacteria (fecal coliform) according to beneficial use designations. The Beaver River Watershed TMDL identified total phosphorus, dissolved oxygen, noxious aquatic plants and pH as nutrient related pollutants of concern (Utah DEQ 2000). Nutrients may stimulate algae and aquatic plant growth. At excessive levels, aquatic plant growth may contribute to low dissolved oxygen levels during nighttime respiration and high pH during the day which may be detrimental to beneficial uses of water, especially in lakes and reservoirs. Fecal coliform bacteria counts have been shown to increase over natural amounts in grazed areas (USDA FS 1995). The impact of grazing on nutrient loading and bacteria input is a function of livestock waste concentration, opportunity for runoff of waste into the receiving stream, and increased sediment delivered to a stream. The risk of nutrient loading and bacteria input from waste is low in arid rangelands where animal wastes are distributed and runoff is comparatively light. However, the risk is high where cattle have direct access to lakes, reservoirs and riparian areas. Sufficient riparian vegetation is essential to filter, store and prevent excess nutrient and bacteria input to streams. Vegetation buffers the stream from direct waste input and can assimilate the nutrients into plant tissue (USDA FS 1995).

Table 4-7 Controlling Nutrient Loading and Bacteria Input	
Alternative A Proposed Action	When proper use criteria are monitored and enforced, at least 4-6 inches of vegetation will be present to minimize runoff of livestock waste into adjacent water bodies. However, it should be noted that in areas where water quality is a significant concern, this alternative will not completely stop the delivery of excess nutrients and bacteria to stream channels. In degraded riparian areas where nutrient loading and/or bacteria input from livestock use is a problem, complete rest or a reduction in the duration and concentration of grazing may be required.
Alternative B No Grazing	This alternative would provide the maximum and quickest protection from nutrient loading and bacteria input by completely removing livestock wastes. Excess nutrient levels and the associated effects on DO and pH previously described, would be expected to decrease.

Table 4-7 Controlling Nutrient Loading and Bacteria Input	
Alternative C SMU - G	The proposed SMU-G criteria, if properly enforced, would maintain at least 6 inches of riparian vegetation along the greenline, which should help minimize runoff of livestock waste into adjacent water bodies. Additionally, the other criteria that monitor riparian shrubs, graminoids and bank stability would help maintain or improve a riparian system that is able to filter and prevent livestock wastes from entering water bodies. The potential for reduced duration and concentration of grazing with this alternative could lessen the magnitude of nutrient loading to streams and lakes and accelerate the recovery of degraded water bodies.

Water Quantity: Historically, both agencies and communities have been interested in increasing water quantity (yield) through management actions. However, our ability to appreciably change the amount and timing of water is limited by many constraints, and the practical physical reality is, we are not able to make significant changes on a large scale (USDA FS 2002b). Additionally, yield increases have been shown to come during flood events, when the increased runoff is least useful to water users, and most damaging to watersheds and stream channels. Consequently, the most effective management of National Forest System Lands emphasizes "optimal" water yield rather than "maximum" water yield. Optimum water yield implies healthy vegetative and aquatic ecosystems, which supply clean water for all beneficial uses of that water, both consumptive and non-consumptive (USDA FS 2002b).

Livestock grazing can affect water quantity, including peak storm flows and late season base flows. On upland slopes, overgrazing can decrease vegetative cover, change species composition, increase soil compaction and decrease infiltration rates. Each of these factors can cause greater erosion potential leading to the development of rill and gully networks. This increases the rate and severity of streamflow response to snowmelt and storm runoff as well as increasing sediment production and delivery. If riparian areas are degraded water tables can be lowered, allowing for less aquifer storage and decreased late season base flows (Chase 2001).

Table 4-8 Water Quantity	
Alternative A Proposed Action	Once again, the key to this alternative's ability to address this issue lies in the enforcement of proper use criteria, in both riparian and upland sites. When the proper use criteria are met in both riparian and upland areas there should be sufficient vegetation to prevent the negative effects to streamflow response and sediment delivery described above. However, in severely degraded riparian and upland areas with decreased vegetation cover, evident soil compaction and decreased infiltration rates; complete rest or a reduction in the duration and concentration of grazing may be required to fully restore the sponge and filter processes that healthy watersheds and riparian areas provide. .
Alternative B No Grazing	This alternative would provide the maximum and quickest protection from the negative effects to water quantity described above.
Alternative C SMU - G	The proposed criteria in the SMU-G alternative, if properly enforced, should allow sufficient vegetative cover and structure both in the uplands and riparian areas, which would prevent the negative effects to streamflow response and erosion potential described above. The potential for a reduction in the duration and concentration of grazing with this alternative could accelerate the recovery of degraded areas.

Water Quality & Quantity Cumulative Effects[10]:

Alternative A – Proposed Action. The cumulative effects area for the riparian and water quality/quantity issues includes the entire Beaver Ranger District, except for those watersheds that have no portion of the allotments in this proposed action. Most of the streams in the project area either do not reach the Forest Boundary, or are diverted for irrigation shortly afterwards. A detectable effect from this proposed action is not expected to be measurable beyond the Forest Boundary, particularly given the diversions and agricultural use that occurs off forest, which masks the effects of upstream inputs.

Past, present, and reasonably foreseeable activities within the cumulative effects area include private land ownership (construction activities), grazing, recreation, timber and thinning operations, reforestation and seeding of burned areas, chaining, seeding of native and non-native species, fire suppression, natural and prescribed fire, pesticide application, noxious weed control, and other special uses such as mining, hydroelectric operations, firewood and post cutting, municipal water developments, and irrigation diversion. Recreation-related activities include hunting, camping, day/picnic use, hiking, horseback riding, all-terrain vehicle (ATV & OHV) use, and campground/roads/trails maintenance and development.

Reissuing grazing permits in combination with chaining, seeding, fires, timber operations, irrigation diversion/development, and noxious weed control have and continue to alter riparian and upland vegetation composition and densities. Re-issuance of grazing permits in combination with timber/thinning operations, fire suppression/wildfire/prescribed fire, firewood and post cutting, and mining have affected watershed capabilities and stream corridors (USDA FS 2003b) through increased erosion and changes in vegetation. Increased erosion from grazing in combination with recreational activities and recreational infrastructure (roads, trails, structures, and campground development) may cause sedimentation, habitat alteration and further degradation of riparian aquatic systems.

Strict adherence to proper use criteria for grazing, as outlined in the proposed action, would mitigate some of the impacts and interacting effects maintaining vegetation diversity, composition, structure, and density. However, the proposed action in combination with the past, present, and reasonably foreseeable activities listed above may still impact sensitive riparian areas, water quality and quantity.

Cumulative effects for the multi-resource management authorized by the Fishlake Forest Plan were also assessed in the Forest Plan Final Environmental Impact Statement (USDA FS 1986b). Compared to previous standards, the modified proper use criteria (USDA FS 2001) are easier to implement and are intended to increase the ability of the Forest Service and permittees to monitor and protect riparian resources. The current proper use riparian standards indicate maximum allowable use and are by definition programmatic. Site-specific cumulative effects related to grazing are addressed by project

[10] Livestock grazing on federal lands is not the only factor that affects rangeland vegetation. Increasing human activities and a growing demand for resources multiply impacts on the environment and create cumulative effects of multiple activities such as timber harvest and road-building, watershed and water quality, recreation activities, and grazing. Busby (1978) noted that livestock use on public lands is lower than it ever has been in this century and therefore concluded that resource managers must look more and more to range uses other than livestock as causes of range deterioration. He recommends considering the impacts of off-road vehicles, camping, hunting, fishing, boating, back-packing, improved roads and highways, improvised trails, and recreational housing. He emphasizes that the trends of each of these is exactly opposite that of livestock grazing—up and not down…"Each of these uses is at its highest level ever and is growing every year. And each of these uses has an impact on the environment." Holecheck et al. (1989) reported that recreational use of rangelands in the Western United States increased 500% between 1965 and 1980.

level assessments. It is in these analyses that specific management criteria and proper use standards can be developed and are evaluated for individual allotments.

Alternative B – No Grazing. The cumulative effects area for the riparian and water quality/quantity issues addressed in this report includes the entire Beaver Ranger District, except for those watersheds that have no portion of the allotments in this proposed action. Most of the streams in the project area either do not reach the Forest boundary, or are diverted for irrigation shortly afterwards. A detectable effect from this project area is not expected to be measurable beyond the Forest Boundary, particularly given the diversions and agricultural use that occurs off forest, which masks the effects of upstream inputs.

Past, present, and reasonably foreseeable activities within the cumulative effects area include private land ownership (construction activities), grazing, recreation, timber and thinning operations, reforestation and seeding of burned areas, chaining, seeding of native and non-native species, fire suppression, natural and prescribed fire, pesticide application, noxious weed control, and other special uses such as mining, hydroelectric operations, firewood and post cutting, municipal water developments, and irrigation diversion. Recreation-related activities include hunting, camping, day/picnic use, hiking, horseback riding, all-terrain vehicle (ATV & OHV) use, and campground/roads/trails maintenance and development.

The removal of livestock grazing would reduce the cumulative impacts to riparian function, water quality and water quantity. The cumulative effects from the other activities described above would continue. These impacts, however, would be greatly reduced, as livestock grazing is a major contributor to effects on riparian function, water quality and water quantity. The effects of livestock grazing were occurring well before the Utah Anti-degradation Policy was set to maintain the Beneficial Uses of water as of 1975. To be in compliance with the Clean Water Act and Utah Anti-degradation Policy, the Forest must maintain the Beneficial Uses in the streams, use Best Management Practices for all activities, and share implementation monitoring results with Utah Division of Water Quality.

No grazing would result in rapid restoration of watershed stability and proper functioning riparian resources. In the short term, meadow plant vigor would rapidly increase in response to livestock removal. The amount of bare soil would decrease. Structural complexity of all the vegetation would increase, and the amount of plant material in the ecosystem as litter and decaying organic material would increase. Water infiltration rates would increase in response to increased root production by more vigorous grasses. Livestock removal should also result in decreased soil compaction and thus increased infiltration rates. Vegetation and seed plant reproduction would increase in the short term. The additional litter and standing plant matter would help stabilize the system, be incorporated into the meadow soil-building process, and lead to more increases in water storage capacity and plant growth and reproduction. In addition, no grazing would allow for some riparian-wetland resources historically lost to be restored, where a potential for such recovery still exists.

Alternative C – SMU-G. The cumulative effects area for the riparian and water quality/quantity issues includes the entire Beaver Ranger District, except for those watersheds that have no portion of the allotments in this proposed action. Most of the streams in the project area either do not reach the Forest Boundary, or are diverted for irrigation shortly afterwards. A detectable effect from this proposed action is not expected to be measurable beyond the Forest Boundary, particularly given the diversions and agricultural use that occurs off forest, which masks the effects of upstream inputs.

Past, present, and reasonably foreseeable activities within the cumulative effects area include private land ownership (construction activities), grazing, recreation, timber and thinning operations, reforestation and seeding of burned areas, chaining, seeding of native and non-native species, fire suppression, natural and prescribed fire, pesticide application, noxious weed control, and other special uses such as mining, hydroelectric operations, firewood and post cutting, municipal water developments, and irrigation diversion. Recreation-related activities include hunting, camping, day/picnic use, hiking, horseback riding, all-terrain vehicle (ATV & OHV) use, and campground/roads/trails maintenance and development.

The implementation of the SMU-G alternative, in combination with chaining, seeding, fires, timber operations, irrigation diversion/development, and noxious weed control could continue to alter riparian and upland vegetation composition and densities. The SMU-G alternative, in combination with timber/thinning operations, fire suppression/wildfire/prescribed fire, firewood and post cutting, mining, recreational activities and recreational infrastructure (roads, trails and campground development) may cause sedimentation, habitat alteration and further degradation of riparian aquatic systems. If properly enforced, the SMU-G alternative would mitigate some of the impacts and interacting effects maintaining vegetation diversity, composition, structure, and density. However, this alternative in combination with the past, present, and reasonably foreseeable activities listed above may still impact sensitive riparian areas, water quality and quantity.

The SMU-G alternative includes additional criteria that are different from the proposed action (streambank trampling, riparian graminoids above the green-line and riparian shrub browse). Monitoring on the Beaverhead-Deerlodge NF has shown that for meandering, alluvial channels such as Rosgen C and E types, streambank alteration (trampling) is almost always the trigger to move cattle (Bengeyfield and Svoboda 1998). Consequently, the SMU-G streambank trampling criteria could trigger livestock moves from a pasture earlier than the proposed action, particularly in E and C channel types that are sensitive to grazing. This potential to reduce the duration of grazing combined with the 70% reduction in permitted numbers could decrease the magnitude of cumulative effects on riparian resources over time. Recovery at sites degraded by the cumulative impacts of livestock grazing and other forest uses, could be accelerated under the SMU-G alternative.

3. Issue – TEPCS and MIS Species[11]

A. Threatened, Endangered, Proposed, and Candidate (TEPC) Plant Species.

No 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. For a full disclosure of effects on Threatened and Endangered plant species and sensitive plant species, resulting from the selected alternative, please refer to the Biological Assessment and Biological Evaluation prepared for this analysis.

[11] For a complete description of potential effects to TEPCS and MIS wildlife and plant species see the *Vertebrate Wildlife, Plant, & Management Indicator Species (MIS) Specialist Report* (Madsen, et al 2006) and the *Life History and Analysis of Endangered Threatened, Candidate, Sensitive, and Management Indicator Species of the Fishlake National Forest, Version 4.0* (Rodriguez 2005). These documents contain potential effects documentation and summarized population trend and monitoring information.

Shown in Table 4-9 are the names, status, and occurrence of suitable habitat for endangered, threatened, and candidate species known or suspected to occur on the Fishlake National Forest within the analysis area. Habitat characteristics for each of the following species were reviewed and based on information found within Rodriguez (2005), Madsen (2003), Atwood et al. (1991), and Spahr et al. (1991).

Table 4-9

SPECIES	STATUS	SUITABLE	HABITAT UNSUITABLE BASED ON THE FOLLOWING
San Rafael Cactus ***Pediocactus despainii***	Endangered		Only known to occur on the Fremont River RD. Endemic to Emery and Wayne counties. No suitable habitat in the analysis area.
Maguire's Daisy ***Erigeron maguirei***	Threatened		No suitable habitat within the analysis area. Strongly associated with Wingate, Chinle, and Navajo sandstone not present in the analysis area. Only known to occur on the Fremont River RD.
Last Chance Townsendia ***Townsendia aprica***	Threatened		No suitable habitat within the analysis area. Strongly associated with Arapien and Mancos shale not present in the analysis area. Only known to occur on the Fremont River and Richfield RDs.
Rabbit Valley Gilia ***Gilia caespitosa***	Candidate		No suitable habitat within the analysis area. Strongly associated with Carmel and Navajo sandstone not present in the analysis area. Only known to occur on the Fremont River Ranger District.

Direct, Indirect, and Cumulative Effects:

Alternative A – Proposed Action. The proposed livestock grazing would not have any effect on TEPC species or their critical habitats. Such grazing activities will not result in an irreversible or irretrievable commitment of resources that would foreclose the formulation or implementation of reasonable and prudent alternatives in the future. The Proposed Action would have no direct effects on TEPC plant species; however, increases in the health and vigor of upland and riparian areas is expected.

Alternative B – No Grazing. Suitable habitat for proximity TEPC plant species is strongly associated with soil types that are not found on the Tushar Mountain Range. It is unlikely that even with improved rangeland conditions that potentially suitable habitat for these species would be provided.

Alternative C – SMU-G. Livestock grazing permitted under the SMU-G Alternative would not have any effect on TEPC species or their critical habitats. Such grazing activities will not result in an irreversible or irretrievable commitment of resources that would foreclose the formulation or implementation of reasonable and prudent alternatives in the future. The SMU-G Alternative would have no direct effects on TEPC plant species; however, increases in the health and vigor of upland and riparian areas is expected.

B. Sensitive Plant Species

Direct and Indirect Effects:

Alternative A – Proposed Action. For the 4 sensitive species known to occur on the Fishlake National Forest, Beaver Ranger District (Elsinore buckwheat, Tushar paintbrush, creeping draba, and beaver Mountain groundsel), the determination of "no impact" was made for creeping draba and Beaver Mountain groundsel. For Elsinore buckwheat and Tushar paintbrush a determination of "may impact but not likely to cause a trend to federal listing" was made. Livestock grazing activities (consumption and/or trampling) may impact individual sensitive plants or their habitats, but will not likely contribute to a trend towards federal listing or loss of viability to any population or species.

Alternative B – No Grazing. Under this alternative, livestock grazing would be phased out over a three-year period greatly reducing or removing livestock impacts within sensitive plant species occupied or potential habitat. A staggered reduction system from current stocking levels would allow for marked habitat improvement over time.

This alternative would most benefit the long-term population viability of sensitive plant species. Direct impacts such as trampling, herbivory, and disruption of seed bank stability and indirect impacts associated with livestock use and associated activities could still occur within the occupied and potential habitat for sensitive plant species but would be consistently reduced over time. As a result, incidence of soil compaction, introduction of noxious weeds by livestock, decreased soil moisture, alpine community composition conversion, and invasion of woody or tree-species will be reduced and/or eliminated. Implementation of this alternative may benefit populations in the long-term.

Alternative C – SMU-G. For the 4 sensitive species known to occur on the Fishlake National Forest, Beaver Ranger District (Elsinore buckwheat, Tushar paintbrush, creeping draba, and beaver Mountain groundsel), the determination of "no impact" was made for creeping draba and Beaver Mountain groundsel. For Elsinore buckwheat and Tushar paintbrush a determination of "may impact but not likely to cause a trend to federal listing" was made. Livestock grazing activities (consumption and/or trampling) may impact individual sensitive plants or their habitats, but will not likely contribute to a trend towards federal listing or loss of viability to any population or species.

The Biological Evaluation suggested the presence of Arizona willow habitat within the 8 allotments. Currently Arizona willow is not known to occur on the Beaver district. The reduction of cattle pressure in the riparian areas as suggested in the SMU-G alternative may promote willow establishment. However, there is no way of knowing if this will promote this species specifically as there is no indication of its presence currently or historically.

Sensitive Plant Species Cumulative Effects:

Under all three alternatives, recreational impacts and uses will likely remain the same or increase, given current recreational use trends. Thus, recreational impacts including ORV use, trail use, and riparian degradation, may be or may continue to be exacerbated under all alternatives given that potential sensitive plant species habitat conditions may already be degraded through livestock use and associated impacts.

Indirect impacts from livestock, recreational, and other authorized land uses may increase conditions for noxious weed establishment and spread within sensitive plant species populations. Current management practices attempt to eradicate or contain such infestations. Herbicide applications could also threaten known populations of these species if coordination with range management is not ensured to prevent accidental application or drift. Such impacts can also affect pollinators within these areas. The risk of spread from vectors such as livestock, vehicles and ORVs for these aggressive and invasive species under the grazing alternatives may be high.

Past mining activities and fire suppression within the analysis area has occurred for the past 100 years, but no information is available on how sensitive plant species responds to these types of activities. Although historical mining sites have been closed and old mining sites are recovering, local populations could have been impacted in past years if they occurred within the influence zones of mining projects.

No foreseeable mining activities have been identified at this time. However, activities associated with mining reclamation may have downstream impacts for potential sensitive plant species habitats.

Although these restoration efforts may be beneficial in the long-term, short-term (3 to 5 years) impacts may pose threats to habitats.

The cumulative effects described above have or will occur in the future regardless of which alternative of this grazing proposal is implemented. As discussed in the direct and indirect effects section above for two of the sensitive plant species, implementation of any of the alternatives in this proposal may impact individuals or their habitat, but would not have significant adverse effects on populations, and thus would not add significant, adverse cumulative effects to those that already exist as a result of other projects that have or will occur within the analysis area.

Table 4-10

Species	Status	Effects of the Proposed Action Determination	Effects of the No Grazing Alternative Determination	Effects of the SMU-G Alternative Determination
Tushar Paintbrush	Sensitive	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE PS)	No Impact / Beneficial Effect	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE PS)
Creeping Draba	Sensitive	No Impact (Refer to BE PS)	No Impact	No Impact (Refer to BE PS)
Elsinore Buckwheat	Sensitive	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE PS)	No Impact / Beneficial Effect	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE PS) / Beneficial Effect
Ward's Beardtongue	Sensitive	No Impact (Refer to BE PS)	No Impact	No Impact (Refer to BE PS)
Arizona Willow	Sensitive	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE PS)	No Impact / Beneficial Effect	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE PS) / Beneficial Effect
Beaver Mountain Groundsel	Sensitive	No Impact (Refer to BE PS)	No Impact	No Impact (Refer to BE PS)

C. Management Indicator Species (MIS)

1. Elk and Mule Deer

Direct and Indirect Effects:

- **Alternative A – Proposed Action.** Implementation of this proposed action would reduce forage and cover for elk and mule deer within the analysis area through livestock use. Permitting grazing livestock on these allotments would cause competition for forage resources, especially on winter forage availability for elk. Further effects on elk and mule deer include a change in vegetation composition/structure, introduction of noxious weeds which may out-compete local floras, the flow reduction of streams/seeps/springs into troughs and stock ponds, trampling of vegetation and compaction of soils all of which may affect elk and mule deer habitat. Direct audio/visual disturbance from grazing livestock on summer range and winter range (Junction Allotment) may result in elk and mule deer not utilizing suitable habitat, habitat fragmentation, and disruption of travel corridors. Re-issuing term grazing permits for these 8 allotments may have an impact on aspen vegetation types in some areas. A decline in high forage value aspen vegetation types resulting from the proposed action may impact elk and mule deer habitat where these vegetation types occur in the analysis area. However, strict adherence to proper use criteria (a minimum of 40-50% on upland browse species such as aspen),

as specified in the proposed action, would alleviate some of this impact on aspen within the analysis area and actually move habitat conditions to be more effective.

Maintenance of vegetation conversions (included as range improvements) provided for in the proposed action would increase forage values and palatable vegetation in sagebrush and pinyon-juniper dominated cover types. This increase in vegetation forage productivity on these rangelands may affect the availability of suitable forage for elk and mule deer and increase their productivity and numbers. Maintenance of these vegetation conversions, in many cases, have improved habitat for mule deer and elk in the analysis area. All this being said, it is important to note that as was stated above, elk numbers have increased to 95% of objective despite the recent drought conditions and with the current grazing system. Deer have also increased recently to 86% of objective with the State focusing on winter range improvement and predator removal to increase survival. Though grazing can affect deer summer range and fawning habitat effectiveness, this kind of competition is not currently considered limiting to deer populations on the west side of the Fishlake National Forest (Sean Kelly, DWR -Pers. Comm.). Impacts from grazing to critical winter ranges is much more worry-some, yet elk are nearly at carrying capacity and only 7% of the winter range identified for deer is on the Forest. Therefore, some individual elk and mule deer and their habitat may be impacted, however this proposed action would not adversely impact the viability of these populations.

- **Alternative B – No Grazing.** Forage availability and cover for many terrestrial wildlife species would increase. Vegetation densities and plant vigor would increase. This increase in vegetation would contribute to increased organic material and soil-building capabilities and increase water retention of these watersheds. As a result, there would be less potential for erosion and sediment loading into aquatic systems. Vegetation composition may change. Plant species that are decreasers under grazing pressure would stabilize and may increase. Invasive species that have a tendency to pioneer into areas disturbed by grazing would receive more competition from the local palatable flora that is usually reduced to a stubble height by grazing. These plant species may be more vigorous and productive throughout their life cycles. Vegetation and soil trampling and compaction from grazing livestock would cease. This would also contribute to increased plant vigor and water retention in the soil. In riparian areas, these changes would lead to improved bank stability, undercut banks, decreased sedimentation into the stream channels, increased pool volume, decreased width/depth ratios, decreased water temperatures, and an increase in desirable bank stabilizing vegetation such as willows and sedges.

Under this alternative, vegetation conversions aimed at providing livestock forage may not be maintained. Many of these vegetation conversions provide suitable foraging habitat (high forage value) for elk and mule deer. During recent years, many conversions have been maintained and others created with hazardous fuels reduction revenue and/or wildlife habitat improvement cost share money from conservation organizations. If these habitats are not maintained in early seral grass/sagebrush communities, much of their forage value may be lost. However, the forage usually consumed by domestic livestock throughout the analysis area would be available for elk and mule deer use throughout the year. This would also increase forage on usable winter range which is limiting for both of these species. Furthermore, wintering elk and mule deer would distribute more evenly over the landscape and achieve a more even utilization of the vegetation resource. Big game numbers would likely be allowed to increase beyond current population objective levels as carrying capacity would allow. Therefore, individual elk and mule deer and their habitats may be impacted, however this alternative would not adversely impact the viability of these populations.

Range improvements such as stock ponds, troughs, pipelines, fences, cattle guards, and vegetation conversions would not be maintained. Deterioration of stock ponds, troughs, and pipelines may adversely affect elk and deer. Stock ponds and troughs provide catchments for many wildlife vertebrate species to use as a water source. These catchments and pipelines also de-water streams, seeps, and springs that are critical to many wildlife species. This water would eventually return to its native streamcourse if these improvements are allowed to deteriorate over a long enough period of time. These streamcourses often have natural catchment basins and pools that would still be available for wildlife use. These natural catchments may only be available as an ephemeral water source in some cases, and a perennial water source in others. If water from seeps and springs were allowed to return to its natural stream channel, watershed function and dynamics would improve for these stream channels. This available water would also reach further down into the lower elevation fringes of the analysis area where it would further enhance and improve habitat for wildlife species. A deterioration of livestock fences and cattleguards would probably have little effect on elk and deer. Generally, livestock fences are not high enough to impede elk or mule deer movement throughout the analysis area.

The 85% decline of aspen (BRWA 2002-2003) within the Beaver River Watershed Assessment portion of the analysis area may improve with implementation of this no action – no grazing alternative. Conifer encroachment into aspen stands has been documented and defined as a substantial ecological change in the Beaver River Watershed from historical times (BRWA 2002-2003). Much of this change can be attributed to fire suppression. However, aspen regeneration projects involving prescribed fire and timber/thinning operations have been affected by grazing livestock and wildlife (BRWA 2002-2003). The Beaver River Watershed Assessment identifies a local study regarding aspen regeneration treatment success. Thirty three sites were surveyed to monitor the success of aspen regeneration following a variety of treatments. This study states: "In most cases, sites fenced to preclude all cattle and wildlife browsing produced the greatest number of aspen suckers compared to adjacent, unfenced, or cattle-excluded sites...it is also important for terminal shoots of the young aspen to grow beyond the reach of browsing ungulates before treatments can be deemed successful. Further analysis showed that under low densities of elk, deer, and cattle, their cumulative utilization may ultimately doom restoration efforts to failure unless relief from excessive browsing can be guaranteed." Implementation of this alternative would decrease the impacts to regenerating aspen by eliminating browsing livestock from the analysis area. Therefore, this alternative would improve aspen growth and more diverse vegetation understories often associated with it. This would improve habitats for all the terrestrial wildlife species that use this habitat during some portion of their life cycle.

- **Alternative C – SMU-G.** Following the parameters of this alternative results in an estimated 50-70% reduction in grazing capacity. Part of this reduction is due to a provision for deeming "core" mule deer fawning habitat as unsuitable for grazing. Core mule deer habitat has not been delineated within the analysis area nor on the Forest as such. Rather, the Utah Division of Wildlife Resources has placed more importance on delineating winter habitats for both deer and elk as an attempt to recognize an important limiting factor of endemic big game populations—winter survival and subsequent recruitment of young (UDWR 2003). Mule deer fawn and elk calf rearing areas are important, but are not as limiting to big game populations on the Fishlake National Forest as winter range is. Mule deer use a variety of habitats at a variety of elevations for fawning and rearing, a fact that would make delineating "core" fawning habitat very difficult. This is demonstrated in the statewide deer management plan developed for Utah and adopted by the Utah Wildlife Board in November of 2003 where such importance is put on winter range that a map of "critical mule deer winter ranges in need of improvement" is included in the plan and nearly all references to carrying capacities are in relation to winter range trends.

Implementation of SMU-G alternative would reduce forage and cover for elk and mule deer within the analysis area but these reductions would be in lower proportions due to reduced grazing. Other impacts of livestock grazing identified under the Proposed Action would also be applicable to this alternative but to a lesser degree. Because of livestock behavior to concentrate in the cooler, lushly vegetated riparian areas, it is expected that there would be some relief but that concentrated use would still occur in riparian areas. Marked improvement of some upland areas might result from less use. Strict adherence to the SMU-G alternative relating to limiting livestock use in areas with young aspen sprouts would reduce impacts on aspen but aspen regeneration would still be impacted by big game use.

Discontinuing maintenance of vegetation conversions could decrease forage values and palatable vegetation in sagebrush and pinyon-juniper dominated cover types. This decrease in vegetation forage productivity may affect the availability of suitable forage for elk and mule deer and decrease their productivity and numbers. Pinyon-juniper encroachment and decadent sagebrush and other disclimax and late seral species may eventually dominate sites where vegetation conversions have been done and maintained in these cover types. Maintenance of these vegetation conversions, in many cases, have improved habitat for mule deer and elk in the analysis area. A lack of maintenance of these vegetation conversions in this alternative may cause the early seral seeded grass sites to revert to the later seral cover types. This would cause a decline in forage values for elk and mule deer. In heavily dominated pinyon-juniper woodlands, there would also be an increased susceptibility for erosion resulting from a generally depauperate understory. The productivity of the sites is often low. Site capability of these areas may be increased through vegetation conversion, however productivity may still be stifled because of terrain, poor soil conditions, and geologic features of the substrata. Therefore, individual elk and mule deer and their habitat may be impacted, however the implementation of the SMU-G alternative would not adversely impact the viability of these populations. Elk and mule deer habitat effectiveness would improve over time under decreased grazing pressure from domestic livestock and result in increased forage availability.

Cumulative Effects:

Past, present, and reasonably foreseeable activities within the cumulative effects area include big game management, private land ownership (subdivision construction activities), grazing, recreation, timber and thinning operations, reforestation and aerial seeding of burned areas, chaining, seeding of native and non-native species, natural and prescribed fire, pesticide application, noxious weed control, and other special uses such as small mine claims, firewood and post cutting, municipal water developments, and irrigation diversion. Recreation-related activities include hunting, camping, day/picnic use, hiking, horseback riding, all-terrain vehicle (ATV & OHV) use, and campground/roads/trails maintenance and development.

Big game management by the Utah Division of Wildlife Resources is the primary factor affecting elk and mule deer population numbers throughout the analysis area. Grazing, chaining, seeding, fires, timber operations, irrigation diversion/development, and noxious weed control has altered riparian and upland vegetation composition and densities, which has reduced habitat for elk and mule deer in some cases and created habitat in others. Habitat improvement projects (i.e. seeding, pinyon/juniper chainings and thinnings, prescribed burning, and water developments) across the Forest have helped to double the estimated elk population since 1986 (Rodriguez 2005). Recreational activities and recreational infrastructure (roads, trails, structures, and campground development) may contribute to elk and mule deer habitat fragmentation, habitat loss, air pollution, audio and visual disturbance, and other disturbances caused by wildlife/public interactions. These roads and trails may also create travel corridors for mule deer and elk that improve connectivity within and between habitats.

The effects of the past, present, and reasonably foreseeable activities listed above in combination with the action alternatives may impact elk and mule deer individuals but these cumulative effects would not adversely impact the viability of these populations and would likely result in an increase in habitat effectiveness.

2. Northern Goshawk

Direct and Indirect Effects

- **Alternative A – Proposed Action.** Direct effects to goshawk territories and nesting habitat may occur as a result of the proposed action, but these impacts would be minimal in closed conifer forests. Studies of nesting habitat show that goshawks nest in older age forest with variable tree species and high percent canopy closure (Rodriguez 2005). Studies on habitat characteristics at goshawk nest sites have reported average canopy closure measurements ranging from 60% to 94% (Rodriguez 2005). Understory forage production for livestock drops considerably in closed canopy conifer forests. Thus, livestock will not often be present foraging in closed canopy conifer forests because of the general lack of available forage unless water is present. Open meadows, aspen, sagebrush, oakbrush, mahogany, and other cover types where more livestock forage is available will be visited more frequently by livestock.

Many of the goshawk nests in Utah do occur in aspen stands. The Beaver River Watershed Assessment (BRWA) references a study on the response to aspen restoration treatments near the Beaver River Watershed in part of the analysis area. Thirty three sites were surveyed to monitor the success of aspen regeneration following a variety of treatments. This study states : "In most cases, sites fenced to preclude all cattle and wildlife browsing produced the greatest number of aspen suckers compared to adjacent, unfenced, or cattle-excluded sites...it is also important for terminal shoots of the young aspen to grow beyond the reach of browsing ungulates before treatments can be deemed successful. Research would indicate that re-issuing term grazing permits for these 8 allotments may have an impact on aspen vegetation types in some areas. A decline in aspen resulting from the proposed action may impact goshawk nesting habitat over a long period of time. However, strict adherence to proper use criteria (a minimum of 40-50% on upland browse species such as aspen), as specified in the proposed action would alleviate much of this impact on aspen within the analysis area and maintain sufficient aspen regeneration to provide effective habitat for goshawks.

Furthermore, it has been documented by Reynolds et al. 1992 that livestock grazing may affect forage and cover resources for goshawk prey. Thus, implementation of the proposed action may affect habitat for some mammalian and avian prey species. These effects would however, also be dependent upon other factors like precipitation levels, and not just ungulate use on grasses, forbs and shrubs. As riparian and upland vegetative health and vigor change (BRWA), resulting from the proposed action, habitat for goshawk prey may fluctuate. At proper use grazing levels, these effects would be minimized within the analysis area and maintain effective goshawk prey abundance and availability.

Therefore, this proposed action may impact some northern goshawk individuals and/or their habitat but is not likely to cause a trend toward federal listing or a loss of viability.

- **Alternative B -- No Grazing.** A study on the San Pedro Riparian National Conservation Area in Arizona suggest that removing cattle from riparian areas can benefit breeding bird populations (Krueper et al. 2003), including northern goshawk. The number of individuals of all avian species detected on surveys increased each year from 103/km in 1986 (1 year before grazing removal) to 221/km in 1991 (4

years after grazing removal) (Krueper et al. 2003). This is an average annual increase of 23% (Krueper et al. 2003). The largest increases occurred in riparian species, open-cup nesters, Neotropical migrants, and insectivores (Krueper et al. 2003). This study suggests that these increases in breeding bird populations were caused by a change in local conditions (livestock removal), not by regional effects. This study suggests that factors influenced by livestock grazing depress breeding bird populations. Therefore, the removal of livestock grazing within the analysis area will have beneficial effects to breeding bird individuals and/or their habitat analyzed in this report.

- **Alternative C – SMU-G.** Direct effects to goshawk territories and nesting habitat may occur as a result of the SMUG alternative, but these impacts would be minimal in closed conifer forests and at the stocking rates recommended. Studies of nesting habitat show that goshawks nest in older age forest with variable tree species and high percent canopy closure (Rodriguez 2005). Studies on habitat characteristics at goshawk nest sites have reported average canopy closure measurements ranging from 60% to 94% (Rodriguez 2005). Understory forage production for livestock use drops considerably in closed canopy conifer. The livestock will not often be present foraging in closed canopy conifer forest because of the general lack of available forage unless water is present. Open meadows, aspen, sagebrush, oakbrush, mahogany, and other cover types where more livestock forage is available will be visited more frequently by livestock.

Many of the goshawk nests in Utah do occur in aspen stands. The Beaver River Watershed Assessment (BRWA) references a study on the response to aspen restoration treatments near the Beaver River Watershed in part of the analysis area. Thirty three sites were surveyed to monitor the success of aspen regeneration following a variety of treatments. This study states : "In most cases, sites fenced to preclude all cattle and wildlife browsing produced the greatest number of aspen suckers compared to adjacent, unfenced, or cattle-excluded sites...it is also important for terminal shoots of the young aspen to grow beyond the reach of browsing ungulates before treatments can be deemed successful. Continued grazing, but at far reduced levels under SMUG, may improve aspen regeneration in some areas but impacts to small treatments and by other grazers would likely continue.

Furthermore, it has been documented by Reynolds et al. 1992 that livestock grazing may affect forage and cover resources for goshawk prey. Implementation of the proposed action may affect habitat for some mammalian and avian prey species. These effects would however be dependent upon other factors, and not just ungulate use on grasses, forbs and shrubs. Other factors such as precipitation can be an important influence on goshawk prey. As riparian and upland vegetative health and vigor improves, resulting from the SMU-G alternative, habitat for goshawk prey may fluctuate but should improve in effectiveness over time. Therefore, this SMU-G alternative may impact some northern goshawk individuals and/or their habitat but is not likely to cause a trend toward federal listing or a loss of viability.

Cumulative Effects

Past, present, and reasonably foreseeable activities within the cumulative effects area include private land ownership (subdivision construction activities), grazing, recreation, timber and thinning operations, reforestation and seeding of burned areas, chaining, seeding of native and non-native species, fire suppression, natural and prescribed fire, pesticide application, noxious weed control, and other special uses such as mining, hydroelectric operations, firewood and post cutting, municipal water developments, and irrigation diversion. Recreation-related activities include hunting, camping, day/picnic use, hiking, horseback riding, all-terrain vehicle (ATV & OHV) use, and campground/roads/trails maintenance and development.

The action alternatives in combination with past, present, and reasonably for-seeable future actions may affect habitat conditions for goshawks and their prey. Past actions have had various effects to vegetation across the cumulative effects area. In many areas where livestock grazing was permitted in riparian habitat, horizontal and vertical structure has been significantly altered and structure is minimal. Past actions such as timber harvest and thinning has led to a decline of habitat quality and quantity, through the immediate loss of nesting and foraging habitat, as well as decreased habitat for prey species. While some of these past timber harvest and thinning actions have also improved goshawk habitat by aiding in the reestablishment of aspen as the dominant cover type. Past, present, and reasonably for-seeable livestock grazing may impact the goshawk and their prey populations through continued modification of habitats but grazing according to proper use under the proposed action will move these habitat variables towards improvement for goshawks and their prey. Therefore, livestock grazing in combination with past, present, and reasonably for-seeable future actions may impact some northern goshawk individuals and/or their habitat but are not likely to cause a trend toward federal listing or a loss of viability.

3. Cavity Nesters (Hairy Woodpecker, Western Bluebird, & Mountain Bluebird)

Direct and Indirect Effects

- **Alternative A – Proposed Action.** Direct effects of the proposed action to hairy woodpecker, western bluebird, and mountain bluebird individuals would be minimal. These species are cavity nesters that build their nest sites in the hollows of trees, branches, stumps, or logs. The hairy woodpecker often excavates its own nest site. The mountain bluebird occasionally will nest in rocks and crevices (Rodriguez 2005). Individuals of these species forage primarily on insects. The hairy woodpecker also eats mast, sap, and cambium (Rodriguez 2005). Direct effects to individuals from grazing livestock would be minimal, since their nests are often inaccessible. Foraging opportunities would be the same around livestock. Range improvements such as stock ponds and troughs may even benefit these species by offering an available water source where there may be no other. However, indirect effects to individuals from fluctuations in insect populations and effects to vegetation composition and structure of suitable habitat may affect these species.

All of these species are largely insectivorous. This prey base population could possibly be affected by changes in the riparian aquatic corridors and upland vegetation. Sediment loading into the stream from erosion (i.e. compaction from trampling), percent of stream shading (i.e. understory vegetation loss), and organic matter (i.e. cattle manure), forage reduction, vegetation composition change, and vegetation conversions are just a few factors that may alter the composition and density of various insect populations. Some types of insects may increase while others decline. Grazing at proper use levels under this proposed action would move toward more effective habitat for these species.

Changes brought on by alterations in vegetation composition and density as a result of the proposed action may increase foraging opportunities and nest sites in some cases and reduce it in others. A change in composition in the understory of forested landscapes may alter structure, cover, and nest site availability for these bird species while largely not affecting any nests themselves. Therefore, some individual hairy woodpeckers, western bluebirds, mountain bluebirds and their habitats may be impacted, however this proposed action would not adversely impact the viability of these populations.

- **Alternative B – No Grazing.** A study on the San Pedro Riparian National Conservation Area in Arizona suggest that removing cattle from riparian areas can benefit breeding bird populations (Krueper et al. 2003), including cavity nesters (see discussion under northern goshawk). Therefore, the removal of

livestock grazing within the analysis area will have beneficial effects to breeding bird individuals and/or their habitat analyzed in this report.

Alternative C – SMU-G. Direct effects of the SMU-G alternative to hairy woodpecker, western bluebird, and mountain bluebird individuals would be minimal and similar to those described under the Proposed Action. Reduced domestic livestock grazing pressure to Forest vegetation under SMU-G would result in increased habitat effectiveness for these species. These species are cavity nesters that build their nest sites in the hollows of trees, branches, stumps, or logs. Direct effects to individuals from grazing livestock would be minimal since their nests are often inaccessible.

Cumulative Effects

The action alternatives in combination with past, present and reasonably foreseeable future actions may cause changes in riparian and upland health and vigor. As the vertical and horizontal vegetation diversity of riparian and upland areas change, insect populations, distribution, and species diversity would fluctuate. This may alter prey species for the hairy woodpecker, western bluebird, and mountain bluebird on the uplands and riparian areas where these species forage. Past actions have had long-term effects to vegetation across the analysis area. Prescribed grazing under the action alternatives should increase habitat effectiveness for these species by subjecting fewer areas to over utilization. Therefore, the effects of the past, present, and reasonably foreseeable activities listed above in combination with the action alternatives may impact hairy woodpecker, western bluebird, and mountain bluebird individuals and their habitats, however this proposed action would not adversely impact the viability of these populations. Reduced domestic livestock grazing pressure to Forest vegetation would result in increased habitat effectiveness for these species.

4. Sage Nesters (Brewer's Sparrow, Vesper Sparrow, Sage Thrasher)

Direct and Indirect Effects

- **Alternative A – Proposed Action.** All three of these MIS birds nest either on or low to the ground under some kind of foliage cover (Rodriguez 2005). Direct effects to nest sites from trampling livestock may lower nest success and productivity of these MIS birds. Reduction of forage and cover resulting from this proposed action may directly affect these MIS sage nester birds and their habitat. Maintenance of vegetation conversions (specified in this proposed action) may also have effects on Brewer's sparrow, vesper sparrow, and sage thrasher disturbance and potentially suitable habitat. Maintenance through the use of Dixie Harrow, Brush Hogs, hand thinning, and others may cause destruction of nests yet maintain sagebrush on a given site rather than allow encroachment by pinyon/juniper. These mechanical treatments may also cause alterations in the tall, decadent nature of sagebrush which may reduce suitable habitat in some cases and increase it in others. These MIS birds feed on insects and fruits/seed (i.e. grass/forb seed and berries) (Rodriguez 2005). The vegetation conversion maintenance may provide more vegetation diversity (more early seral grasses) for feeding needs of these MIS birds and maintain sagebrush-steppe habitats on the landscape rather than pinyon/juniper dominated. Various treatments may also help to maintain needed sage structure and age diversity to meet the needs of these various species. For example, the sage thrasher requires some foliage for cover above the nest (ground nests are common where shrub canopy is low) (Rodriguez 2005). Vesper sparrows also often nest on the ground beneath the cover of shrubs, grasses or forbs (Rodriguez 2005). The Brewer's sparrow forages on the ground and builds its nest in shrubs or a low tree (Rodriguez 2005).

All of these species are partly insectivorous. Theses prey base populations could possibly be affected by changes in the riparian aquatic corridors and upland vegetation. Sediment loading into the stream from erosion (i.e. compaction from trampling), percent of stream shading (i.e. understory vegetation loss), and organic matter (i.e. cattle manure), forage reduction, vegetation composition change, and vegetation conversions are just a few factors that may alter the composition and density of various insect populations. Some types of insects may increase while others decline. These fluctuations in insect populations may affect these MIS sage nesters' prey availability and overall energy base. Strict adherence to proper use criteria, as specified in the proposed action, would help to preserve vegetation composition, density, structure, and diversity. The adherence to these standards would offset the impacts to vegetation and, subsequently, soils. Therefore, some individual Brewer's sparrows, vesper sparrows, and sage thrashers and their habitats may be impacted, however this proposed action would not adversely impact the viability of these populations.

- **Alternative B – No Grazing.** A study on the San Pedro Riparian National Conservation Area in Arizona suggest that removing cattle from riparian areas can benefit breeding bird populations (Krueper et al. 2003), including sage nesters (see discussion under northern goshawk). Therefore, the removal of livestock grazing within the analysis area will have beneficial effects to breeding bird individuals and/or their habitat analyzed in this report.

Alternative C – SMU-G. Livestock grazing under the SMU-G alternative would generally result in the same direct effects as the Proposed Action. Reduced livestock grazing pressure under SMU-G would help to preserve vegetation composition, density, structure, and diversity resulting in an increase in habitat effectiveness. Since the SMU-G alternative would preclude maintenance of vegetation conversions, adverse disturbance to potentially suitable habitat would be minimized. Alterations in tall, decadent stands of sagebrush would not occur as an indirect result of livestock grazing and therefore changes in suitable nesting and feeding habitat (reduction or increase) would be attributed to other factors.

Cumulative Effects

The action alternatives in combination with chaining, seeding, fires, timber operations, irrigation diversion/development, and noxious weed control may alter riparian and upland vegetation composition and densities, which may reduce potentially suitable habitat for TEC, MIS and migratory bird species and their prey in some cases while creating or enhancing habitat in others. Livestock grazing in combination with timber/thinning operations, fire suppression/wildfire/prescribed fire, firewood and post cutting, and mining has affected watershed capabilities and stream corridors (BRWA 2002-2003) due to increased erosion and changes in vegetation. Livestock grazing in combination with recreational activities and recreational infrastructure (roads, trails, structures, and campground development) may contribute to TEC, MIS and migratory bird habitat fragmentation, habitat loss, alteration of travel corridors, air pollution, audio and visual disturbance, and other disturbances caused by wildlife/human interactions. Also, erosion from grazing in combination with recreational activities may cause sediment loss and further degradation of riparian systems. However, strict adherence to proper use criteria for grazing, as outlined in the proposed action, would eliminate many of these impacts by maintaining vegetation diversity, composition, structure, and density. Through proper management of livestock, adequate habitat would be maintained to support viable populations of all species discussed in this report within the analysis area. Therefore, the action alternatives in combination with these past, present, and reasonably foreseeable activities

listed above may impact some TEC, MIS and migratory bird individuals and their habitat, however they would not adversely impact the viability of these populations.

5. Riparian Guild (Lincoln's Sparrow, Song Sparrow, Yellow Warbler, and MacGillivray's Warbler)

Direct and Indirect Effects

- **Alternative A – Proposed Action.** Direct effects to Lincoln's sparrow, song sparrow, yellow warbler, and MacGillivray's warbler resulting from the proposed action would be limited to audio and visual disturbance and possible trampling of ground nests by grazing livestock in riparian areas. This may affect the nesting success and productivity of some or all of these MIS birds.

Utilization by livestock and wildlife, coupled with the tendency of cattle to concentrate in riparian areas, may cause declines in desirable species in riparian areas such as willow. These types of vegetation changes may contribute to a loss of multi-layered riparian understories the loss of access to the floodplain, which concentrates flood energies and reduces riparian area. These changes may affect the overall suitability of riparian habitats for these four MIS birds. Several smaller watersheds within the Greater Beaver River Watershed area document overstocking rates in reference to livestock stocking rates in comparison to suitable watershed area and AUM stocking in comparison to riparian AUM production (BRWA 2002-2003). This would indicate that current grazing management practices may be exceeding watershed and riparian capabilities in some areas. This may affect suitable habitats for these four MIS birds.

All of these MIS riparian bird species commonly feed on insects (Rodriguez 2005). This prey base population could possibly be affected by changes in the riparian aquatic corridors. Sediment loading into the stream from increased erosion (i.e. compaction from trampling), percent of stream shading (i.e. understory vegetation loss), and increased organic matter (i.e. cattle manure) are just a few factors that may alter aquatic biota and, consequently, composition and density of various insect populations. Some types of insects may increase while others decline. However, strict adherence to proper use criteria guidelines, as specified in the proposed action, would halt these trends and move towards more effective habitat for these bird species and their prey. Therefore, some individual Lincoln's sparrows, song sparrows, yellow warblers, and MacGillivray's warblers and their habitats may be impacted, however this proposed action would not adversely impact the viability of these populations.

- **Alternative B – No Grazing.** A study on the San Pedro Riparian National Conservation Area in Arizona suggest that removing cattle from riparian areas can benefit breeding bird populations (Krueper et al. 2003), including the riparian guild (see discussion under northern goshawk). Therefore, the removal of livestock grazing within the analysis area will have beneficial effects to breeding bird individuals and/or their habitat analyzed in this report.

- **Alternative C – SMU-G.** Direct effects of livestock grazing to Lincoln's sparrow, song sparrow, yellow warbler, and MacGillivray's warbler would be limited to audio and visual disturbance and possible trampling of ground nests by grazing livestock in riparian areas. This may affect the nesting success and productivity of some or all of these MIS birds. The dramatic reduction in stocking rates under SMU-G and riparian avoidance criteria would help to reverse downward trends and may benefit suitable habitats for these four MIS birds. Reduced grazing under SMU-G would contribute to better functioning riparian areas and increased habitat effectiveness for these species.

Cumulative Effects

The Cumulative Effects discussion under Sage Nesters in this section also applies to the riparian guild.

6. Bonneville Cutthroat Trout

For a full disclosure and analysis of existing condition and effects to the Bonneville Cutthroat Trout from implementing the SMU-G alternative, see the disclosure of effects under the Region IV sensitive species section.

Direct and Indirect Effects

• **Alternative A – Proposed Action.** Direct effects to Bonneville cutthroat trout from the action alternative will be generally unlikely but may occur in uncommon situations. The most likely example of direct effects would include direct injury of eggs in spawning redds by livestock in the stream for watering or trailing across the creek. Other direct effects are very unlikely and would occur only from trampling of spawning eggs during herding operations or accidental introduction of toxic materials such as gasoline into the stream from an OHV upset during allotment operations.

Indirect effects to Bonneville cutthroat trout would be those effects that impact water quality. The primary potential for indirectly impacting fish, aquatic macroinvertebrates, or aquatic habitats would be from the introduction of fine sediment to the streams. Fine sediment can change the species composition, diversity, and abundance of macroinvertebrates as well as suffocate trout eggs and fry. It also can reduce pool volume, reducing suitable habitat for adults during low flow stream periods, as well as reducing wintering habitat carrying capacity. Finally, it can carry harmful nutrients and chemicals into the streams.

Watershed and riparian vulnerabilities caused by overstocking are documented in some areas of the Beaver River Watershed (BRWA) and in the 2003 Fishlake National Forest Level II Riparian Inventories. Some of these areas occur on the North-Indian Creek, Pine Creek/Sulphur Beds, and South Beaver Allotments within the same riparian areas where Bonneville cutthroat trout are known to occur. These populations may be impacted because these vulnerabilities indicate that current grazing management practices may be exceeding watershed and riparian capabilities. These aquatic riparian habitats provide suitable habitat for known Bonneville cutthroat trout populations that may be affected by re-issuing term grazing permits in these 8 allotments on the Beaver Ranger District.

The re-issuance of grazing permits on these 8 allotments may result in a reduction of vegetation (especially desirable species i.e. sedges, willows) along the stream channel. Alterations in riparian plant composition resulting from overuse (as described in the BWRA) may cause vegetation conversions to less desirable species such as Kentucky bluegrass and redtop. Continued over-utilization and reduction of stubble heights may also change rooting depths that affect bank stability. A reduction in vegetation and an increased concentration of livestock use in these riparian areas would have several indirect effects on the aquatic habitat. These effects include damage to streambanks from trampling, soil compaction, and shearing which often leads to increased width/depth ratios and a loss of undercut banks. Undercut banks provide cover for Bonneville cutthroat trout. Damage to streambanks also cause increased sediment in the stream that decrease pool volume and cover spawning gravels. Increased width/depth ratios and a loss of stabilizing vegetation such as willows could lead to changes in stream shading. Both of these factors contribute to increased water temperatures. Furthermore, increased organic matter in the stream from livestock manure and direct effects such as cattle trampling spawned

eggs may impact Bonneville cutthroat trout individuals and potentially suitable habitat for both sensitive fish species.

These effects may cause changes to aquatic biota diversity in these habitats. Fluctuations in water temperature and macro-invertebrate composition and density may impact Bonneville cutthroat trout individuals feeding and spawning success. Bonneville cutthroat trout require relatively cool, well oxygenated, water and the presence of clean, well-sorted gravels with minimal fine sediments for successful spawning (Rodriguez 2005). These effects may also impact potentially suitable habitat spread throughout the analysis area.

The two Bonneville cutthroat trout populations most heavily impacted by the proposed action will be Pine Creek and Birch Creek West (personal comm. with Jim Whelan). Grazing (the proposed action) and roads in Pine Creek may be impacting habitat and depressing populations but are not likely causing a trend to federal listing or a loss of viability.

A combination of prolonged drought, low flows, marginal habitat, and grazing (proposed action) have caused the Birch Creek West population to decline substantially since 1994. Maintenance of range improvements (as provided for in this proposed action) will be critical on exclosures that exclude livestock from parts of this drainage where the Bonneville cutthroat trout occurs.

Riparian exclosures can serve to improve water quality in streams by protecting the streambank from livestock grazing reducing sediment inputs and creating a vegetative buffer between grazed areas and the water to trap overland flow of sediment and nutrients. Small riparian exclosures exist on Pine Creek. A large percentage of Birch Creek West is within livestock exclosures. Maintenance levels were generally inadequate in the late 1990s and exclosures were only partially functional, but maintenance levels have increased in recent years.

Observations of riparian conditions by fisheries personnel and riparian contractors (see Petty 2003) are that riparian grazing standards were often exceeded on portions of these creeks. Coordinated and continued diligent effort to manage livestock appropriately and provide proper administration of livestock use so that grazing standards are met could result in reduced impacts from grazing compared to the current situation and a gradual improvement of habitat conditions on some portions of these streams.

Therefore, this proposed action may impact the Bonneville cutthroat trout individuals and/or their habitat but is not likely to cause a trend to federal listing or a loss of viability.

- **Alternative B – No Grazing.** Riparian vegetation that grazing cattle have a greater tendency to over-utilize (as demonstrated in the BRWA and Level II Riparian Inventories) would improve in all stream courses and drainages in the analysis area. David Krueper, Jonathan Bart, and Terrell D. Rich performed a study down on the San Pedro River of Arizona (Krueper et al. 2003). They found that the density of herbaceous vegetation in riparian areas had a four to six fold increase following the removal of grazing livestock from the San Pedro Riparian National Conservation Area. A potential increase such as this for native and naturalized vegetation in riparian areas within these eight allotments would improve riparian habitats that are used by all species analyzed in this document. This kind of increase would contribute to increased bank stability and decreased sedimentation into these aquatic systems.

Under this alternative, vegetation densities and plant vigor for many species in these eight allotments would increase. This increase in vegetation would contribute to increased organic material and soil-building capabilities and increase water retention of these watersheds. As a result, there would be less

potential for erosion and sediment loading into aquatic systems. Vegetation composition may change. Plant species that are decreasers under grazing pressure would stabilize and may increase. Invasive species that have a tendency to pioneer into areas disturbed by grazing would receive more competition from the local palatable flora that is usually reduced to a stubble height by grazing. These plant species may be more vigorous and productive throughout their life cycles. Vegetation and soil trampling and compaction from grazing livestock would cease. This would also contribute to increased plant vigor and water retention in the soil. In riparian areas, these changes would lead to improved bank stabilities, undercut banks, decreased sedimentation into the stream channels, increased pool volume, decreased width/depth ratios, decreased water temperatures, and an increase in desirable bank stabilizing vegetation such as willows and sedges.

Furthermore, the deterioration and reduction of range improvements that manipulate spring, seep, and stream flows in the analysis area (a result of this alternative) may also benefit these aquatic sensitive and management indicator species. This would provide potentially suitable habitat in drainages where it did not previously occur. The implementation of this no action – no grazing alternative, would have beneficial effects on Bonneville cutthroat trout, resident trout, and macroinvertebrate individuals and/or their habitats.

• **Alternative C – SMU-G.** Direct effects to Bonneville cutthroat trout from the SMU-G alternative will be generally unlikely but may occur in uncommon situations. The most likely example of direct effects would include direct injury of eggs in spawning redds by livestock in the stream for watering or trailing across the creek. Other direct effects are very unlikely and would occur only from trampling of spawning eggs during herding operations or accidental introduction of toxic materials such as gasoline into the stream from an OHV upset during allotment operations.

Indirect effects to Bonneville cutthroat trout would be those effects that impact water quality. The primary potential for indirectly impacting fish, aquatic macroinvertebrates, or aquatic habitats would be from the introduction of fine sediment to the streams. Fine sediment can change the species composition, diversity, and abundance of macroinvertebrates as well as suffocate trout eggs and fry. It also can reduce pool volume, reducing suitable habitat for adults during low flow stream periods, as well as reducing wintering habitat carrying capacity. Finally, it can carry harmful nutrients and chemicals into the streams.

Watershed and riparian vulnerabilities caused by overstocking are documented in some areas of the Beaver River Watershed (BRWA) and in the 2003 Fishlake National Forest Level II Riparian Inventories. Some of these areas occur on the North-Indian Creek, Pine Creek/Sulphur Beds, and South Beaver Allotments within the same riparian areas where Bonneville cutthroat trout are known to occur. These populations may be impacted because these vulnerabilities indicate that current grazing management practices may be exceeding watershed and riparian capabilities. Impacts from grazing under the SMU-G alternative should be lessened due largely to the reduction in stocking rates across the analysis area and riparian exclusion provision. However, these aquatic riparian habitats provide suitable habitat for known Bonneville cutthroat trout populations that may be affected by grazing in these 8 allotments on the Beaver Ranger District.

Grazing on these 8 allotments may result in a reduction of vegetation (especially desirable species i.e. sedges, willows) along the stream channel. Alterations in riparian plant composition resulting from overuse (as described in the BWRA) may cause vegetation conversions to less desirable species such as Kentucky bluegrass and redtop. Continued over-utilization and reduction of stubble heights may also change rooting depths that affect bank stability. A reduction in vegetation and an increased

concentration of livestock use in these riparian areas would have several indirect effects on the aquatic habitat. These effects include damage to streambanks from trampling, soil compaction, and shearing which often leads to increased width/depth ratios and a loss of undercut banks. Undercut banks provide cover for Bonneville trout. Damage to streambanks also cause increased sediment in the stream that decrease pool volume and cover spawning gravels. Increased width/depth ratios and a loss of stabilizing vegetation such as willows could lead to changes in stream shading. Both of these factors contribute to increased water temperatures. Furthermore, increased organic matter in the stream from livestock manure may impact Bonneville cutthroat trout individuals and potentially suitable habitat for this sensitive fish species.

These effects may cause changes to aquatic biota diversity in these habitats. Fluctuations in water temperature and macro-invertebrate composition and density may impact Bonneville cutthroat trout individuals feeding and spawning success. Bonneville cutthroat trout require relatively cool, well oxygenated, water and the presence of clean, well-sorted gravels with minimal fine sediments for successful spawning (Rodriguez 2005). These effects may also impact potentially suitable habitat spread throughout the analysis area.

The two likely Bonneville cutthroat trout populations most heavily impacted by grazing the analysis area are the Pine Creek and Birch Creek West (personal comm. with Jim Whelan). Past grazing and roads in Pine Creek may be impacting habitat and depressing populations but are not likely causing a trend to federal listing or a loss of viability.

A combination of prolonged drought, low flows, marginal habitat, and past grazing have caused the Birch Creek West population to decline substantially since 1994. Maintenance of range improvements (fencing) as provided for under the SMU-G alternative to protect this sensitive species' habitat will minimize impacts to Bonnevilles in this area.

Riparian exclosures can serve to improve water quality in streams by protecting the streambank from livestock grazing, reducing sediment inputs and creating a vegetative buffer between grazed areas and the water to trap overland flow of sediment and nutrients. Small riparian exclosures exist on Pine Creek and a large percentage of Birch Creek West is within livestock exclosures. Maintenance levels were generally inadequate in the late 1990s and exclosures were only partially functional, but maintenance levels have increased in recent years.

Observations of riparian conditions by fisheries personnel and riparian contractors (see Petty 2003) are that riparian grazing standards were often exceeded on portions of these creeks. Coordinated and continued diligent effort to manage livestock appropriately and provide proper administration of livestock use so that SMU-G grazing standards are met could result in reduced impacts from grazing compared to the current situation and a gradual improvement of habitat conditions on some portions of these streams. There will still be some impacts, however – SMU-G would likely reduce upland impacts more than riparian due to cattle use patterns. Therefore, this proposed action may impact the Bonneville cutthroat trout individuals and/or their habitat but is not likely to cause a trend to federal listing or a loss of viability.

Cumulative Effects

The cumulative effects analysis area for Bonneville cutthroat trout in the project area is the Beaver Ranger District or each BCT watershed from pour points upstream. Past, present, and reasonably foreseeable activities within the cumulative effects area include introduction of native and non-native

fish species, fish stocking, private land ownership (subdivision construction activities), grazing, recreation, timber and thinning operations, reforestation and seeding of burned areas, chaining, seeding of native and non-native plant species, fire suppression, natural and prescribed fire, pesticide application, noxious weed control, and other special uses such as mining, hydroelectric operations, firewood and post cutting, municipal water developments, and irrigation diversion. Recreation-related activities include hunting, fishing, camping, day/picnic use, hiking, horseback riding, all-terrain vehicle (ATV & OHV) use, and campground/roads/trails maintenance and development. The introduction of non-native fish, fish diseases, stocking of hatchery fish, grazing, fires, fire management activities (drafting water from streams/lakes), timber/thinning operations, hydroelectric development, irrigation diversion/development, and noxious weed control has altered riparian and upland vegetation composition and densities and riparian environments, which has reduced habitat for Bonneville cutthroat trout in some cases.

Water manipulation, drought, hydroelectric/municipal water development, mining activities, fishing, introduction of non-native fish, fish stocking, and the accidental introduction of fish diseases within the cumulative effects area has likely affected these sensitive fish populations. A few drainages within the analysis area are infected with whirling disease (i.e. Beaver River). These kinds of fish diseases along with competition from non-native fish species and water manipulation are major factors affecting potentially suitable habitats for Bonneville cutthroat trout populations. Water manipulation from the maintenance of range improvements (required under SMU-G to manage livestock) may contribute to these major factors within the cumulative effects area. Other management activities listed above that contribute to erosion and sediment loading into streams (i.e. thinning/timber operations, mining, recreation, fire, etc.) may affect these sensitive fish species and/or habitat when coupled with grazing. Riparian conditions and water quality related to grazing impacts will improve over time as result of the implementation of prescribed grazing use. Therefore, the effects of the past, present, and reasonably foreseeable activities listed above in combination with livestock grazing may impact Bonneville cutthroat trout individuals and/or their habitats but is not likely to cause a trend toward federal listing or a loss of viability.

Reasonably foreseeable future activities – There are two classes of reasonably foreseeable future activities that are likely in the cumulative effects area for this project. First is an increased level of upland vegetation treatments to reduce fire fuel loading, sanitize spruce bark beetle infestations, salvage dying timber, and restore a more natural fire regime. These projects are part of the national Healthy Forests Initiative. Increased vegetation treatment levels could increase sedimentation impacts to these streams in the short-term, further reducing carrying capacity. Use of Best Management Practices (BMPs) should minimize impacts from these activities. The Forest Plan General Direction of "special protection and management" within 100 feet of a stream should further reduce impacts. Long-term this project work may reduce the risk of catastrophic fire, reducing the risk of loss of these populations from wildfire.

The second reasonably foreseeable future activity is continued Bonneville cutthroat trout reintroductions within the project area as a cooperative project between the Utah Division of Wildlife Resources and the Fishlake National Forest. Additional reintroduction work could put the Birch Creek West stock in much better habitat, reducing the risk to this genetic stock while at the same time facilitating necessary vegetation treatments in the Birch Creek watershed. In fact, future vegetation treatments and reintroductions may go hand in hand to reduce fire risk before reintroductions, while new introductions reduce the risk of vegetation treatments to established populations.

Therefore, the effects of the past, present, and reasonably foreseeable activities listed above in combination with livestock grazing may impact Bonneville cutthroat trout individuals and/or their habitats but is not likely to cause a trend toward federal listing or a loss of viability.

7. Resident Trout (Rainbow, Brown, Brook, Cutthroat, and Lake) and Macroinvertebrates

Direct and Indirect Effects

- **Alternative A – Proposed Action.** Watershed and riparian vulnerabilities caused by overstocking are documented in some areas of the Beaver River Watershed (BRWA) and in the 2003 Fishlake National Forest Level II Riparian Inventories. Populations of resident trout and macroinvertebrates may be impacted because these vulnerabilities indicate that current grazing management practices may be exceeding watershed and riparian capabilities. These aquatic riparian habitats provide suitable habitat for resident trout and macroinvertebrate populations that may be affected by re-issuing term grazing permits in these 8 allotments on the Beaver Ranger District.

The re-issuance of grazing permits on these 8 allotments may result in a reduction of vegetation (especially desirable species i.e. sedges, willows) along the stream channel. Alterations in riparian plant composition resulting from overuse (as described in the BWRA) may cause vegetation conversions to less desirable species such as Kentucky bluegrass and redtop. Continued over-utilization and reduction of stubble heights may also change plant rooting depths that affect bank stability. A reduction in vegetation and an increased concentration of livestock use in these riparian areas would have several indirect effects on the aquatic habitat. These effects include damage to streambanks from trampling, soil compaction, and shearing which often leads to increased width/depth ratios and a loss of undercut banks. Undercut banks provide cover for resident trout. Damage to streambanks also cause increased sediment in the stream that decrease pool volume and cover spawning gravels. Increased width/depth ratios and a loss of stabilizing vegetation such as willows could lead to changes in stream shading. Both of these factors contribute to increased water temperatures. Furthermore, increased organic matter in the stream from livestock manure and direct effects such as cattle trampling spawned eggs may impact resident trout and macroinvertebrate populations throughout the analysis area.

These effects may cause changes to aquatic biota diversity in these habitats. In some cases, fluctuations in water temperature may cause changes in macroinvertebrate composition and density. This may affect macroinvertebrate populations and resident trout. Since resident trout are dependent upon macroinvertebrates for feeding, an increase or decrease in macroinvertebrate populations would affect resident trout populations accordingly. However, strict adherence to proper use criteria guidelines, as specified in the proposed action, would minimize alterations in vegetation and a change in the character of aquatic environments that would contribute to some of these impacts. Therefore, individual resident trout (rainbow, brown, brook, cutthroat, lake) and macroinvertebrates and their habitats may be impacted, however this proposed action would not adversely impact the viability of these populations.

Alternative B – No Grazing. Riparian vegetation that grazing cattle have a greater tendency to over-utilize (as demonstrated in the BRWA and Level II Riparian Inventories) would improve in all stream courses and drainages in the analysis area. David Krueper, Jonathan Bart, and Terrell D. Rich performed a study down on the San Pedro River of Arizona (Krueper et al. 2003). They found that the density of herbaceous vegetation in riparian areas had a four to six fold increase following the removal of grazing livestock from the San Pedro Riparian National Conservation Area. A potential increase such

as this for native and naturalized vegetation in riparian areas within these eight allotments would improve riparian habitats that are used by all species analyzed in this document. This kind of increase would contribute to increased bank stability and decreased sedimentation into these aquatic systems.

Under current grazing management strategies, the Riparian Level II Inventories (2003) document that the upland slopes in some riparian areas (i.e. South Creek – South Beaver Allotment) have poor herbaceous species composition and low ground cover. Annuals dominate the uplands adjacent to the lower reaches, which lowers the soils ability to resist erosion. This increases sediment delivery into the stream and shortens the storm response time and increases peak flows, which have more erosive power on the stream channel. Therefore, a drastic change in livestock grazing as described in this no action – no grazing alternative, may affect vegetation composition on the uplands by providing for perennial, soil-stabilizing, vegetation. This kind of vegetation change in the uplands may prevent further degradation in the aquatic systems.

Under this alternative, vegetation densities and plant vigor for many species in these eight allotments would increase. This increase in vegetation would contribute to increased organic material and soil-building capabilities and increase water retention of these watersheds. As a result, there would be less potential for erosion and sediment loading into aquatic systems. Vegetation composition may change. Plant species that are decreasers under grazing pressure would stabilize and may increase. Invasive species that have a tendency to pioneer into areas disturbed by grazing would receive more competition from the local palatable flora that is usually reduced to a stubble height by grazing. These plant species may be more vigorous and productive throughout their life cycles. Vegetation and soil trampling and compaction from grazing livestock would cease. This would also contribute to increased plant vigor and water retention in the soil. In riparian areas, these changes would lead to improved bank stability, undercut banks, decreased sedimentation into the stream channels, increased pool volume, decreased width/depth ratios, decreased water temperatures, and an increase in desirable bank stabilizing vegetation such as willows and sedges.

Furthermore, the deterioration and reduction of range improvements that manipulate spring, seep, and stream flows in the analysis area (a result of this alternative) may also benefit these aquatic sensitive and management indicator species. This would provide potentially suitable habitat in drainages where it did not previously occur. The implementation of this no action – no grazing alternative, would have beneficial effects on Bonneville cutthroat trout, resident trout, and macroinvertebrate individuals and/or their habitats.

- **Alternative C – SMU-G.** Watershed and riparian vulnerabilities caused by overstocking are documented in some areas of the Beaver River Watershed (BRWA) and in the 2003 Fishlake National Forest Level II Riparian Inventories. Populations of resident trout and macroinvertebrates may be impacted because these vulnerabilities indicate that current grazing management practices may be exceeding watershed and riparian capabilities. These aquatic riparian habitats provide suitable habitat for resident trout and macroinvertebrate populations that may be affected by grazing at nearly any level in these 8 allotments on the Beaver Ranger District.

Grazing on these 8 allotments may result in a reduction of vegetation (especially desirable species i.e. sedges, willows) along the stream channel. Alterations in riparian plant composition resulting from overuse (as described in the BWRA) may cause vegetation conversions to less desirable species such as Kentucky bluegrass and redtop. Continued over-utilization and reduction of stubble heights may also change plant rooting depths that affect bank stability. A reduction in vegetation and an increased concentration of livestock use in these riparian areas would have several indirect effects on the aquatic

habitat. These effects include damage to streambanks from trampling, soil compaction, and shearing which often leads to increased width/depth ratios and a loss of undercut banks. Undercut banks provide cover for resident trout. Damage to streambanks also cause increased sediment in the stream that decrease pool volume and cover spawning gravels. Increased width/depth ratios and a loss of stabilizing vegetation such as willows could lead to changes in stream shading. Both of these factors contribute to increased water temperatures. Furthermore, increased organic matter in the stream from livestock manure and direct effects such as cattle trampling spawned eggs may impact resident trout and macroinvertebrate populations throughout the analysis area.

These effects may cause changes to aquatic biota diversity in these habitats. In some cases, fluctuations in water temperature may cause changes in macroinvertebrate composition and density. This may affect macroinvertebrate populations and resident trout. Since resident trout are dependent upon macroinvertebrates for feeding, an increase or decrease in macroinvertebrate populations would affect resident trout populations accordingly. However, reduced grazing pressure under the SMU-G alternative should help to reduce or even negate some of these impacts mentioned above and improve riparian conditions and eventually water quality. Therefore, individual resident trout (rainbow, brown, brook, cutthroat, lake) and macroinvertebrates and their habitats may be impacted, however this SMU-G alternative would not adversely impact the viability of these populations and should improve habitat effectiveness over time.

Cumulative Effects

Past, present, and reasonably foreseeable activities within the cumulative effects area include introduction of native and non-native fish species, fish stocking, private land ownership (subdivision construction activities), grazing, recreation, timber and thinning operations, reforestation and seeding of burned areas, chaining, seeding of native and non-native plant species, fire suppression, natural and prescribed fire, pesticide application, noxious weed control, and other special uses such as mining, hydroelectric operations, firewood and post cutting, municipal water developments, and irrigation diversion. Recreation-related activities include hunting, fishing, camping, day/picnic use, hiking, horseback riding, all-terrain vehicle (ATV & OHV) use, and campground/roads/trails maintenance and development. The introduction of non-native fish, fish diseases, stocking of hatchery fish, grazing, fires, fire management activities (drafting water from streams/lakes), timber/thinning operations, hydroelectric development, irrigation diversion/development, and noxious weed control has altered riparian and upland vegetation composition and densities and riparian environments, which has reduced habitat for resident trout and macroinvertebrates in some cases and created habitat in others.

Water manipulation, drought, hydroelectric/municipal water development, mining activities, fishing, introduction of non-native fish, fish stocking, and the accidental introduction of fish diseases within the cumulative effects area may have affected these resident trout and macroinvertebrate populations. A few drainages within the analysis area are infected with whirling disease (i.e. Beaver River). These kinds of fish diseases along with competition from non-native fish species and water manipulation are major factors affecting resident trout and macroinvertebrate populations. Water manipulation from the maintenance of range improvements (specified in the proposed action) may contribute to these major factors within the cumulative effects area. Other management activities listed above that contribute to erosion and sediment loading into streams (i.e. thinning/timber operations, mining, recreation, fire, etc.) may affect these resident trout and macroinvertebrate species and/or habitat when coupled with livestock grazing. Therefore, the effects of the past, present, and reasonably foreseeable

activities listed above in combination with the action alternatives may impact resident trout and macroinvertebrate individuals and their habitats, however these action alternatives would not adversely impact the viability of these populations but should instead improve habitat effectiveness over time.

8. **Rydberg's Milkvetch**

Direct, Indirect, and Cumulative Effects

- **Alternative A – Proposed Action.** Since grazing livestock will not occur on open, barren, volcanic hillsides with little vegetation cover, there will be no direct, indirect, and/or cumulative effects to Rydberg's milkvetch individuals and/or its habitat as a result of this proposed action.

Alternative B – No Grazing. Since grazing livestock will not occur on open, barren plant communities with little vegetation cover and geologic substrata where these plant species occur, there will be no direct, indirect, and/or cumulative impacts to Rydberg's milkvetch individuals and/or their habitats as a result of this no action no grazing alternative.

- **Alternative C – SMU-G.** Since grazing livestock will not occur on open, barren, volcanic hillsides with little vegetation cover, there will be no direct, indirect, and/or cumulative effects to Rydberg's milkvetch individuals and/or its habitat as a result of this proposed action.

9. Migratory Birds

Direct, Indirect, and Cumulative Effects

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. The effects and determination of the action alternatives to the additional 34 migratory bird species of concern will be the same as those effects and determination disclosed for cavity nester, sage nester, riparian guild bird species in this report if foraging, nesting, and/or breeding habitat occur in the project area for these migratory species.

- **Cumulative Effects.** Past, present, and reasonably foreseeable activities within the cumulative effects area include private land ownership (subdivision construction activities), grazing, recreation, timber and thinning operations, reforestation and seeding of burned areas, chaining, seeding of native and non-native species, fire suppression, natural and prescribed fire, pesticide application, noxious weed control, and other special uses such as mining, hydroelectric operations, firewood and post cutting, municipal water developments, and irrigation diversion. Recreation-related activities include hunting, camping, day/picnic use, hiking, horseback riding, all-terrain vehicle (ATV & OHV) use, and campground/roads/trails maintenance and development.

Livestock grazing in combination with chaining, seeding, fires, timber operations, irrigation diversion/development, and noxious weed control have and continue to alter riparian and upland vegetation composition and densities, which may reduce potentially suitable habitat for these TEC, MIS and migratory bird species and their prey in some cases while creating or enhancing habitat in others. Livestock grazing in combination with timber/thinning operations, fire suppression/wildfire/prescribed fire, firewood and post cutting, and mining has affected watershed capabilities and stream corridors (BRWA 2002-2003) due to increased erosion and changes in vegetation. Livestock grazing in combination with recreational activities and recreational infrastructure (roads, trails, structures, and campground development) may contribute to TEC, MIS and migratory bird habitat fragmentation, habitat loss, alteration of travel corridors, air pollution, audio and visual disturbance, and other disturbances caused by wildlife/human interactions. Also, erosion from grazing in combination with recreational activities may cause sediment loss and further degradation of riparian systems. However, strict adherence to proper use criteria for grazing, as outlined in the proposed action, would eliminate many of these impacts by maintaining vegetation diversity, composition, structure, and density. Through proper management of livestock, adequate habitat would be maintained to support viable populations of all species discussed in this report within the analysis area. Therefore, the action alternatives in combination with these past, present, and reasonably foreseeable activities listed above may impact some TEC, MIS and migratory bird individuals and their habitat, however livestock grazing would not adversely impact the viability of these populations.

10. MIS Determinations

Determinations for implementation of Alternative A--the proposed action (Re-issuance of Term Grazing Permits on Eight Cattle Allotments on the Beaver Mountain-Tushar Range), Alternative B--no action/no grazing, and for Alternative C-- the Sustained Multiple Use Grazing alternative are summarized below (Table 4-11). These determinations were made considering Alternative A, largely as a continuation or re-issuance of current conditions, while the other alternatives are made in reference to Alternative A considering effects to species discussed herein.

Key: MIS = Management Indicator Species for the Fishlake National Forest; BA = Biological Assessment for Threatened, Endangered, Proposed, and Candidate Species prepared specifically for this project; BE VS = Biological Evaluation for Sensitive Vertebrate Species prepared specifically for this project; BE PS = Biological Evaluation for Sensitive Plant Species prepared specifically for this project.

Table 4-11 MIS Species Effects Determinations

Species	Status	Alternative A (Proposed Action)	Alternative B (No grazing)	Alternative C (SMU-G)
Elk	MIS	May impact individuals and habitat but will not adversely impact viability of this population	May impact individuals and habitat but will not adversely impact viability of this population	Increased habitat effectiveness
Mule Deer	MIS	May impact individuals and habitat but will not adversely impact viability of this population	May impact individuals and habitat but will not adversely impact viability of this population	Increased habitat effectiveness
Northern Goshawk	MIS/S	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE VS)	Beneficial Effect	Increased habitat effectiveness
Cavity Nesters (hairy woodpecker, mountain & western bluebirds	MIS	May impact individuals and habitat but will not adversely impact viability of these populations	Beneficial Effect	Increased habitat effectiveness

Sage Nesters (Brewer's sparrow, vesper sparrow, sage thrasher)	MIS	May impact individuals and habitat but will not adversely impact viability of these populations	Beneficial Effect	Increased habitat effectiveness
Riparian Guild (song & Lincoln's sparrow, yellow & MacGillivray's warbler	MIS	May impact individuals and habitat but will not adversely impact viability of these populations	Beneficial Effect	Increased habitat effectiveness
Rydberg's Milkvetch	MIS	No Impact	No Impact	No Impact
Migratory Birds	NA	May impact individuals and habitat but will not adversely impact viability of these populations	Beneficial Effect	Increased habitat effectiveness
Bonneville Cutthroat Trout	MIS/S	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE VS	Beneficial Effect	Increased habitat effectiveness
Resident Trout (rainbow, brown, brook, cutthroat, lake)	MIS	May impact individuals and habitat but will not adversely impact viability of these populations	Beneficial Effect	Increased habitat effectiveness
Macroinvertebrates	MIS	May impact individuals and habitat but will not adversely impact viability of these populations		
Rydberg's Milkvetch	MIS	No Impact	No Impact	No Impact

D. Threatened, and Endangered Wildlife Species.

For a full disclosure of effects on threatened and endangered wildlife species (bald eagle, Mexican spotted owl, Utah prairie dog, western yellow-billed cuckoo), resulting from the selected alternative, please refer to the Biological Assessment prepared for this analysis.

Direct and Indirect Effects:

Alternative A - Proposed Action. During the formal consultation process, the Fishlake National Forest and the U.S. Fish and Wildlife Service concurred that the Utah prairie dog, bald eagle, and yellow-billed cuckoo are not likely to be adversely affected by the degree of forage utilization proposed. The Mexican spotted owl is not recognized by the USFWS as occurring in Beaver, Paiute, or Millard Counties.

Implementation of proper use standards in spring and summer pastures which are in satisfactory and unsatisfactory condition would be expected to be maintained or improve. Rationale for this conclusion is based on the assumption of herbaceous forage removal to levels of no more than a 4-inch stubble. Spring and summer pastures presently in satisfactory condition that have been grazed at 50-60% utilization following standards in the Fishlake Forest Plan (USDA Forest Service 1986a), are apparently able to withstand this amount of use. It should be noted that pastures described here as "satisfactory condition" are generally those with stable banks and greenline vegetation and not necessarily the desired condition for woody species (i.e., willows, cottonwoods or other riparian trees or shrubs). Proper use standards in fall pastures that are in satisfactory condition would be expected to maintain desired riparian tree/shrub habitat conditions. Since riparian habitats would be maintained or improved with proper use, the LRMP goal to maintain or enhance the terrestrial habitat for all wildlife species that presently occur on the Forest would be met.

- **Bald Eagle.** During the winter months when migrating bald eagles may be found in the analysis area, livestock are generally not present. The exception to this is in the Junction allotment where winter cattle use is allowed from November 1 through February 15. In this 6,172 acre allotment, there are currently 35 cow-calf pairs permitted for winter use. Direct effects from permitting grazing cattle to individual wintering bald eagles would not occur. However, direct and indirect effects to bald eagle foraging habitat and, consequently, prey species for the bald eagle would occur as a result of the proposed action. Reduced forage and cover for prey species as a result of permitting cattle grazing in these eight allotments may reduce the productivity of small prey animals that provide an energy base for wintering bald eagles. The reduction in forage base and cover in these allotments would increase the bald eagles' ability to locate and capture individual prey species. The proposed action requires adherence to proper use criteria. Under these criteria (outlined in Table 1-2), stubble heights (or % use) specified in riparian and upland environments would not allow over-utilization of the vegetation resource. Therefore, habitat effectiveness for prey species of the bald eagle would not be compromised substantially.

- **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 (Rodriguez 2004). 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 (Rodriguez 2004).

Since there are no Utah prairie dogs known to occur within the analysis area, direct and indirect effects of reissuing grazing permits to Utah prairie dog individuals would not occur. However, effects to potentially suitable habitat within the analysis area may occur. At a Utah Prairie Dog Recovery Team Meeting in Springville, UT on 2/3/2004, Dr. Mark Richie disclosed findings that the shorter the vegetation, the better the vigilance (feeding) of Utah prairie dogs because they are able to more effectively watch for predators. The reissuance of grazing permits on these 8 allotments may affect potentially suitable Utah prairie dog habitat by creating shortened stubble heights (shorter vegetation) and increase the ability of the Utah prairie dog to watch for predators. This effect to habitat would reduce the risk of predation for Utah prairie dogs.

- **Western yellow-billed cuckoo.** There are 4,226 acres of potentially suitable western yellow-billed cuckoo habitat on the Fishlake National Forest. Potentially suitable habitat includes riparian habitats below 7,000 feet, with a cottonwood/willow overstory, dense brushy understories, and slopes less than 10% (Rodriguez 2004). The proposed action analysis area contains 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 streamcourses 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.

Since there are no western yellow-billed cuckoos known to exist in the proposed action analysis area, there will be no direct or indirect effects to western yellow-billed cukoo individuals. However, since there is potentially suitable habitat for this species, reissuing grazing permits may effect potentially suitable habitat.

Alternative B – No Grazing. Under this Alternative, all existing allotments would be closed and livestock grazing would be eliminated from National Forest System lands. This action would be expected to remove most of the potential for adverse affects of livestock grazing on National Forest System lands and thus significantly reduce the potential for adverse effects on threatened or endangered species or their habitats over the long term. Therefore, implementation of the No Grazing Alternative would be expected to have no impact on the Utah prairie dog, bald eagle, and yellow-billed cuckoo or their habitats.

T&E Wildlife Species Cumulative Effects:

Past, present, and reasonably foreseeable activities within the cumulative effects area include private land ownership (subdivision construction activities), grazing, recreation, timber and thinning operations, reforestation and seeding of burned areas, chaining, seeding of native and non-native species, fire suppression, natural and prescribed fire, pesticide application, noxious weed control, and other special uses such as mining, hydroelectric operations, firewood and post cutting, municipal water developments, and irrigation diversion. Recreation-related activities include hunting, camping, day/picnic use, hiking, horseback riding, all-terrain vehicle (ATV & OHV) use, and campground/roads/trails maintenance and development.

Reissuing grazing permits in combination with chaining, seeding, fires, timber operations, irrigation diversion/development, and noxious weed control have and will continue to alter riparian and upland vegetation composition and densities, which may reduce potentially suitable habitat for T&E Wildlife species in some cases and create habitat in others. Reissuing grazing permits in combination with recreational activities and recreational infrastructure (roads, trails, structures, and campground development) may contribute to T&E Wildlife species habitat fragmentation, habitat loss, creation of travel corridors, air pollution, audio and visual disturbance, and other disturbances caused by wildlife/public interactions. Also, increased erosion from grazing in combination with recreational activities may cause sediment loss and further degradation of aquatic systems.

- **Bald Eagle.** Grazing at proper use levels as described in the proposed action would offset many of the above described impacts. By retaining a standard for vegetation structure, density, and composition as allowed for by these proper use criteria, many of these impacts may be alleviated

- **Yellow Billed Cuckoo.** Grazing at proper use levels as described in the proposed action would offset many of the above described impacts. By retaining a standard for vegetation structure, density, and composition as allowed by these proper use criteria, many of these impacts will be alleviated.

- **Utah Prairie Dog.** Maintenance of vegetation-type conversions as specified in the proposed action may increase colony-building and forage potential in pinyon-juniper and sagebrush cover types. The proposed action of reissuing grazing permits would then reduce the forage and cover available in these conversions which, in turn, increases vigilance (feeding) (Utah Prairie Dog Recovery Team Meeting – Richie 2/3/2004). Grazing at proper use levels, as described in the proposed action, would help to mitigate vegetation changes that contribute to these impacts. The effects of the past, present, and reasonably foreseeable activities listed above in combination with this proposed action may affect but is not likely to adversely affect the Utah prairie dog and/or its habitat.

TEPC Determinations

Determinations for implementation of Alternative A--the proposed action (Re-issuance of Term Grazing Permits on Eight Cattle Allotments on the Beaver Mountain-Tushar Range), Alternative B--no action/no grazing, and for Alternative C-- the Sustained Multiple Use Grazing alternative are summarized below (Table 4-12). These determinations were made considering Alternative A, largely as a continuation or re-issuance of current conditions, while the other alternatives are made in reference to Alternative A considering effects to species discussed herein.

Table 4-12 TEPC Species Effects Determinations

Species	Status	Alternative A (Proposed Action)	Alternative B (No grazing)	Alternative C (SMU-G)
Bald Eagle	T	May affect but is not likely to adversely affect (Refer to BA)	Beneficial Effect	May affect but is not likely to adversely affect
Utah Prairie Dog	T	May affect but is not likely to adversely affect (Refer to BA)	May affect but is not likely to adversely affect	May affect but is not likely to adversely affect
Western Yellow-Billed Cuckoo	C	May affect but is not likely to adversely affect (Refer to BA)	Beneficial Effect	May affect but is not likely to adversely affect

E. **Sensitive Wildlife Species.**

For a full disclosure of effects on sensitive wildlife species, resulting from the selected alternative, please refer to the Biological Evaluation prepared for this analysis. There are six sensitive wildlife species known to occur on allotments, which may be influenced by grazing. These sensitive species occurring on the Fishlake National Forest include: peregrine falcon, northern goshawk, spotted bat, western big-eared bat, flammulated owl, and three-toed woodpecker. A determination of "may affect – but not likely to adversely affect" was made for all of these species.

1. Peregrine Falcon

Direct and Indirect Effects:

- **Alternative A – Proposed Action.** Because peregrine falcons have increased in population numbers and productivity under current management, it is determined that each alternative reviewed in this analysis would maintain habitat to sustain viable populations of peregrines. Grazing would have no effects to the large tree, snag or down wood habitat components for northern goshawk. Utilization standards of all of the alternatives considered in this EA are consistent with the direction in the Utah Northern Goshawk Amendment. Grazing at proper use would maintain suitable grasses, shrubs and forbs necessary for prey species and thereby maintain foraging habitat. None of the Alternatives considered in this EA would affect goshawks or goshawk viability, meeting the intent of the Management Recommendations for the Northern Goshawk in the Southwestern United States, Forest Service NFMA requirements and the LRMP.

- **Alternative B – No Grazing.** Under this Alternative, all existing allotments would be closed and livestock grazing would be eliminated from National Forest System lands. This action would be expected to remove most of the potential for adverse affects of livestock grazing on National Forest System lands and thus significantly reduce the potential for adverse effects on prey species for the peregrine falcon over the long term. Therefore, implementation of the No Grazing Alternative would be expected to have no impact on the peregrine falcon or its habitat.

- **Alternative C – SMU-G.** Suitable habitat for peregrine falcons may be divided into three parts: 1) cliff or substrata upon which nesting occurs, 2) surrounding territory that serve as hunting sites, and 3) migration and wintering areas (Rodriguez 2005). Most peregrine eyries (nest sites) in Utah are situated on high ledges on mountain cliff faces and river gorges. As a result, direct and indirect effects to peregrine falcon nesting habitat would not occur from this proposed action. Direct conflicts between grazing livestock and nesting peregrine falcons would not occur.

However, direct and indirect effects to foraging, migration, and wintering habitat may occur as a result of implementing this SMU-G alternative. Prey species include primarily small to medium-sized terrestrial birds and waterfowl that are normally found within 10 miles of the eyrie (Rodriguez 2005). Implementation of the proposed action may affect habitat for some mammalian and avian prey species. These effects would however be dependent upon other factors, and not just ungulate use on grasses forbs and shrubs. Other factors such as precipitation can be an important influence on peregrine falcon prey. As riparian and upland vegetative health and vigor changes (BRWA), resulting from grazing, habitat for peregrine falcon prey may fluctuate. SMU-G utilization criteria will allow for increased habitat effectiveness for these prey base populations. This alternative may impact some peregrine falcon individuals and/or their habitat but is not likely to cause a trend toward federal listing or a loss of viability.

Cumulative Effects

Past, present, and reasonably foreseeable activities within the cumulative effects area include private land ownership (subdivision construction activities), grazing, recreation, timber and thinning operations, reforestation and seeding of burned areas, chaining, seeding of native and non-native species, fire suppression, natural and prescribed fire, pesticide application, noxious weed control, and other special uses such as mining, hydroelectric operations, firewood and post cutting, municipal water developments, and irrigation diversion. Recreation-related activities include hunting, camping, day/picnic use, hiking, horseback riding, all-terrain vehicle (ATV & OHV) use, and campground/roads/trails maintenance and development.

Livestock grazing in combination with chaining, seeding, fires, timber operations, irrigation diversion/development, and noxious weed control have and continue to alter riparian and upland vegetation composition and densities, which may reduce potentially suitable habitat for these TEC, MIS and migratory bird species and their prey in some cases while creating or enhancing habitat in others. Livestock grazing in combination with timber/thinning operations, fire suppression/wildfire/prescribed fire, firewood and post cutting, and mining has affected watershed capabilities and stream corridors (BRWA 2002-2003) due to increased erosion and changes in vegetation. Livestock grazing in combination with recreational activities and recreational infrastructure (roads, trails, structures, and campground development) may contribute to TEC, MIS and migratory bird habitat fragmentation, habitat loss, alteration of travel corridors, air pollution, audio and visual disturbance, and other disturbances caused by wildlife/human interactions. Also, erosion from grazing in combination with recreational activities may cause sediment loss and further degradation of riparian systems. However, strict adherence to proper use criteria for grazing, as outlined in the proposed action, would eliminate many of these impacts by maintaining vegetation diversity, composition, structure, and density. Through proper management of livestock, adequate habitat would be maintained to support viable populations of all species discussed in this report within the analysis area. Therefore, this proposed action in combination with these past, present, and reasonably foreseeable activities

listed above may impact some TEC, MIS and migratory bird individuals and their habitat, however this proposed action would not adversely impact the viability of these populations.

2. Northern Goshawk

See effects analysis under MIS Species. **L**ivestock grazing in combination with past, present, and reasonably for-seeable future actions may impact some northern goshawk individuals and/or their habitat but are not likely to cause a trend toward federal listing or a loss of viability.

3. Spotted Bat and Western Big-eared Bat

- **All Alternatives.** Since neither of these bat species are known to occur within the analysis area, direct and indirect effects to individuals would not occur as a result of this no action –no grazing alternative. Direct and indirect effects to potentially suitable habitat would be limited. Since these bats require caves, mines, rock crevices, abandoned buildings, and other largely undisturbed places, there would be no effects to potential roosting habitat from this alternative. However, foraging habitat and prey species (insects) may be affected by the removal of livestock in these allotments.

Cumulative Effects

The action alternatives in combination with chaining, seeding, fires, timber operations, irrigation diversion/development, and noxious weed control may alter riparian and upland vegetation composition and densities, which may reduce potentially suitable habitat for spotted and western big-eared bat and their prey in some cases while creating or enhancing habitat in others. Livestock grazing in combination with timber/thinning operations, fire suppression/wildfire/prescribed fire, firewood and post cutting, and mining has affected watershed capabilities and stream corridors (BRWA 2002-2003) due to increased erosion and changes in vegetation. Livestock grazing in combination with recreational activities and recreational infrastructure (roads, trails, structures, and campground development) may contribute to habitat fragmentation, habitat loss, alteration of travel corridors, air pollution, audio and visual disturbance, and other disturbances caused by wildlife/human interactions. Also, erosion from grazing in combination with recreational activities may cause sediment loss and further degradation of riparian systems. However, strict adherence to proper use criteria for grazing, as outlined in the proposed action, would eliminate many of these impacts by maintaining vegetation diversity, composition, structure, and density. Through proper management of livestock, adequate habitat would be maintained to support viable populations of all species discussed in this report within the analysis area. Therefore, the action alternatives in combination with these past, present, and reasonably foreseeable activities listed above may impact some spotted and western big-eared bat individuals and their habitat, however they would not adversely impact the viability of these populations.

4. Flammulated Owl

- **Alternative A – Proposed Action.** Flammulated owls are nocturnal obligate cavity nesters that typically nest in the hollows of trees and perform much of their foraging at night. Having grazing livestock, that are most active during the day, in their nesting and foraging areas would not cause direct conflicts with flammulated owl individuals. However, indirect effects to individuals from fluctuations in insect populations and effects to potentially suitable habitat would have minimal direct effects to this species.

Flammulated owls are almost exclusively insectivorous and feed on small to medium-sized insects such as moths, beetles, caterpillars, crickets, spiders, and other arachnids (Rodriguez 2005). These prey base populations could possibly be affected by changes in the riparian aquatic corridors and upland vegetation. Sediment loading into the stream from erosion (i.e. compaction from trampling), percent of stream shading (i.e. understory vegetation loss), and organic matter (i.e. cattle manure), forage reduction, vegetation composition change, and vegetation conversions are just a few factors that may alter the composition and density of various insect populations. Some types of insects may increase while others decline but grazing according to proper use will increase habitat effectiveness for owls and their prey.

Therefore, this proposed action may impact some flammulated owl individuals and/or their habitat but is not likely to cause a trend toward federal listing or a loss of viability.

- **Alternative B – No Grazing.** A study on the San Pedro Riparian National Conservation Area in Arizona suggest that removing cattle from riparian areas can benefit breeding bird populations (Krueper et al. 2003), including flammulated owls (see discussion under northern goshawk). Therefore, the removal of livestock grazing within the analysis area will have beneficial effects to breeding bird individuals and/or their habitat analyzed in this report.

- **Alternative C – SMU-G**. Direct effects from grazing under the SMU-G alternative to flammulated owl individuals would be minimal. Flammulated owls are nocturnal obligate cavity nesters that nest in the hollows of trees and perform much of their foraging at night. Having grazing livestock, that are most active during the day, in their nesting and foraging areas would not cause direct conflicts with the flammulated owl individuals. However, indirect effects to individuals from fluctuations in insect populations and effects to potentially suitable habitat may affect this species.

Flammulated owls are almost exclusively insectivorous. They feed on small to medium-sized insects such as moths, beetles, caterpillars, crickets, spiders, and other arachnids (Rodriguez 2005). This prey base population could possibly be affected by changes in the riparian aquatic corridors and upland vegetation. Sediment loading into the stream from erosion (i.e. compaction from trampling), percent of stream shading (i.e. understory vegetation loss), and organic matter (i.e. cattle manure), forage reduction, vegetation composition change, and vegetation conversions are just a few factors that may alter the composition and density of various insect populations. Some types of insects may increase while others decline. SMU-G will allow for increased habitat effectiveness for these prey base populations. Therefore, this SMU-G alternative may impact some flammulated owl individuals and/or their habitat but is not likely to cause a trend toward federal listing or a loss of viability.

Cumulative Effects

Past, present, and reasonably foreseeable activities within the cumulative effects area include private land ownership (subdivision construction activities), grazing, recreation, timber and thinning operations, reforestation and seeding of burned areas, chaining, seeding of native and non-native species, fire suppression, natural and prescribed fire, pesticide application, noxious weed control, and other special uses such as mining, hydroelectric operations, firewood and post cutting, municipal water developments, and irrigation diversion. Recreation-related activities include hunting, camping, day/picnic use, hiking, horseback riding, all-terrain vehicle (ATV & OHV) use, and campground/roads/trails maintenance and development.

Livestock grazing in combination with past, present and reasonably for-seeable future actions may cause changes in riparian and upland vegetation composition and vigor. As the vertical and horizontal vegetation diversity of riparian and upland areas change, insect populations, distribution, and species diversity fluctuate. These dynamics affect prey species composition and abundance for flammulated owls within the forested landscape where these owls forage. Past actions along with grazing have had long-term impacts on vegetation across the analysis area and habitat conditions will move towards improvement under proper use grazing. Therefore, livestock grazing in combination with past, present, and reasonably for-seeable future actions may impact some flammulated owl individuals and/or their habitats but are not likely to cause a trend toward federal listing or a loss of viability.

5. Three-toed Woodpecker

- **Alternative A – Proposed Action.** Direct effects of the proposed action to three-toed woodpecker individuals would be minimal in coniferous forest vegetation types. Three-toed woodpecker habitat requirements on the Beaver Ranger District are higher elevation spruce-fir, mixed conifer, and aspen vegetation types with snags available for foraging. Three-toed woodpeckers are largely dependent on down logs, snags, and stumps for feeding and nesting opportunities. Down logs, snags, and stumps would not be affected by livestock grazing.

Understory forage production for livestock drops considerably in closed canopy conifer. The livestock will not often be present foraging in closed canopy conifer forest because of the general lack of available forage unless there is water available. Open meadows, aspen, sagebrush, oakbrush, mahogany, and other cover types where more livestock forage is available will be visited more frequently by livestock. Direct conflicts between three-toed woodpeckers and grazing livestock would not occur.

There are nest locations and detection records of three-toed woodpeckers in aspen stands. The Beaver River Watershed Assessment (BRWA) references a study on the response to aspen restoration treatments near the Beaver River Watershed in part of the analysis area. Thirty three sites were surveyed to monitor the success of aspen regeneration following a variety of treatments. This sudy states : “In most cases, sites fenced to preclude all cattle and wildlife browsing produced the greatest number of aspen suckers compared to adjacent, unfenced, or cattle-excluded sites...it is also important for terminal shoots of the young aspen to grow beyond the reach of browsing ungulates before treatments can be deemed successful. This research would indicate that re-issuing term grazing permits for these 8 allotments may have an impact on aspen vegetation types in some areas. A decline in aspen resulting from the proposed action may impact three-toed woodpecker habitat in some areas over a long period of time. However, strict adherence to proper use criteria (a minimum of 40-50% on upland browse species such as aspen), as specified in the proposed action would alleviate some of this impact on aspen within the analysis area and move three-toed woodpecker habitat toward improvement.

Three-toed woodpeckers feed on wood-boring insect larvae, beetles, moth larvae and ocassionally sap at sapsucker pits. They are major predators of spruce bark beetle and may contribute to its control (Rodriguez 2005). These prey base populations are minimally affected by changes in the riparian aquatic corridors and grass/forb vegetation as they are chiefly forest dwelling species. Grazing will contribute to sediment loading into streams from erosion (i.e. compaction from trampling), percent of stream shading (i.e. understory vegetation loss), and organic matter (i.e. cattle manure), forage reduction, vegetation composition change, and vegetation conversions are many of the factors that may alter the composition and density of various insect populations. Some types of insects may increase while others decline. However, indirect effects to individuals from fluctuations in insect populations and effects to potentially suitable habitat would have minimal impacts to this species because of their

focus in forested habitats while cattle typically graze in more open terrain. Therefore, this proposed action may impact some three-toed woodpecker individuals and/or their habitat but is not likely to cause a trend toward federal listing or a loss of viability.

- **Alternative B – No Grazing.** A study on the San Pedro Riparian National Conservation Area in Arizona suggest that removing cattle from riparian areas can benefit breeding bird populations (Krueper et al. 2003), including the three-toed woodpecker (see discussion under northern goshawk). Therefore, the removal of livestock grazing within the analysis area will have beneficial effects to breeding bird individuals and/or their habitat analyzed in this report.

- **Alternative C – SMU-G.** Direct effects of the SMU-G alternative to three-toed woodpecker individuals would be minimal in coniferous forest vegetation types. Three-toed woodpecker habitat requirements on the Beaver Ranger District are higher elevation spruce-fir, mixed conifer, and aspen vegetation types with snags available for foraging. Three-toed woodpeckers are largely dependent on down logs, snags, and stumps for feeding and nesting opportunities. Down logs, snags, and stumps would not be affected by livestock grazing.

Understory forage production for livestock use drops considerably in closed canopy conifer. The livestock will not often be present foraging in closed canopy conifer forest because of the general lack of available forage. Open meadows, aspen, sagebrush, oakbrush, mahogany, and other cover types where more livestock forage is available will be visited more frequently by livestock. Direct conflicts between three-toed woodpeckers and grazing livestock would not occur.

There are nest locations and detection records of the three-toed woodpecker in aspen stands. The Beaver River Watershed Assessment (BRWA) references a study on the response to aspen restoration treatments near the Beaver River Watershed in part of the analysis area. Thirty three sites were surveyed to monitor the success of aspen regeneration following a variety of treatments. This study states : "In most cases, sites fenced to preclude all cattle and wildlife browsing produced the greatest number of aspen suckers compared to adjacent, unfenced, or cattle-excluded sites...it is also important for terminal shoots of the young aspen to grow beyond the reach of browsing ungulates before treatments can be deemed successful. This research would indicate that grazing on these 8 allotments may have an impact on aspen vegetation types in some areas. SMU-G classifies areas containing young aspen sprouts susceptible to grazing as unsuitable for livestock use and thus would help to improve past aspen utilization problems. However, aspen sprouts will still be impacted by big game.

Three-toed woodpeckers feed on wood-boring insect larvae, beetles, moth larvae and occasionally sap at sapsucker pits. They are major predators of spruce bark beetle and may contribute to its control (Rodriguez 2005). This prey base population could possibly be affected by changes in the riparian aquatic corridors and upland vegetation. Sediment loading into the stream from erosion (i.e. compaction from trampling), percent of stream shading (i.e. understory vegetation loss), and organic matter (i.e. cattle manure), forage reduction, vegetation composition change, and vegetation conversions are just a few factors that may alter the composition and density of various insect populations. Some types of insects may increase while others decline. SMU-G will allow for increased habitat effectiveness for these prey base populations. Therefore, the implementation of this SMU-G alternative may impact three-toed woodpecker individuals and/or their habitat but is not likely to cause a trend toward federal listing or a loss of viability.

Cumulative Effects

The action alternatives in combination with chaining, seeding, fires, timber operations, irrigation diversion/development, and noxious weed control may alter riparian and upland vegetation composition and densities, which may reduce potentially suitable habitat for TEC, MIS and migratory bird species and their prey in some cases while creating or enhancing habitat in others. Livestock grazing in combination with timber/thinning operations, fire suppression/wildfire/prescribed fire, firewood and post cutting, and mining has affected watershed capabilities and stream corridors (BRWA 2002-2003) due to increased erosion and changes in vegetation. Livestock grazing in combination with recreational activities and recreational infrastructure (roads, trails, structures, and campground development) may contribute to TEC, MIS and migratory bird habitat fragmentation, habitat loss, alteration of travel corridors, air pollution, audio and visual disturbance, and other disturbances caused by wildlife/human interactions. Also, erosion from grazing in combination with recreational activities may cause sediment loss and further degradation of riparian systems. However, strict adherence to proper use criteria for grazing, as outlined in the proposed action, would eliminate many of these impacts by maintaining vegetation diversity, composition, structure, and density. Through proper management of livestock, adequate habitat would be maintained to support viable populations of all species discussed in this report within the analysis area. Therefore, the action alternatives in combination with these past, present, and reasonably foreseeable activities listed above may impact some TEC, MIS and migratory bird individuals and their habitat, however they would not adversely impact the viability of these populations.

Sensitive Wildlife Species Cumulative Effects:

The cumulative effects of unauthorized livestock grazing from private and State lands on tall shrub habitats for small nesting bird species is likely localized and insignificant to the overall prey base for the peregrine. Under all alternatives, limited amounts of unauthorized use is likely to continue in the long term, but implementation of any of the alternatives would not be expected to cause additive, adverse, cumulative effects beyond those that already exist.

Sensitive Wildlife Species Determinations

Determinations for implementation of Alternative A--the proposed action (Re-issuance of Term Grazing Permits on Eight Cattle Allotments on the Beaver Mountain-Tushar Range), Alternative B--no action/no grazing, and for Alternative C-- the Sustained Multiple Use Grazing alternative are summarized in Table 4-13. These determinations were made considering Alternative A, largely as a continuation or re-issuance of current conditions, while the other alternatives are made in reference to Alternative A considering effects to species discussed herein.

Key: MIS = Management Indicator Species for the Fishlake National Forest; BA = Biological Assessment for Threatened, Endangered, Proposed, and Candidate Species prepared specifically for this project; BE VS = Biological Evaluation for Sensitive Vertebrate Species prepared specifically for this project; BE PS = Biological Evaluation for Sensitive Plant Species prepared specifically for this project.

Table 4-13 Sensitive Wildlife Species Effects Determinations

Species	Status	Alternative A (Proposed Action)	Alternative B (No grazing)	Alternative C (SMU-G)
Spotted Bat	S	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE VS)	Beneficial Effect	May impact but not likely to cause a trend to federal listing or a loss of viability

Townsend's Big-Eared Bat	S	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE VS)	Beneficial Effect	May impact but not likely to cause a trend to federal listing or a loss of viability
Flammulated Owl	S	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE VS)	Beneficial Effect	May impact but not likely to cause a trend to federal listing or a loss of viability
Three-Toed Woodpecker	S	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE VS)	Beneficial Effect	May impact but not likely to cause a trend to federal listing or a loss of viability
Peregrine Falcon	S	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE VS)	Beneficial Effect	May impact but not likely to cause a trend to federal listing or a loss of viability
Northern Goshawk	MIS/S	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE VS)	Beneficial Effect	Increased habitat effectiveness
Greater Sage Grouse	S	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE VS)	Beneficial Effect	Increased habitat effectiveness
Pygmy Rabbit	S	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE VS)	Beneficial Effect	Increased habitat effectiveness

F. **Sensitive Fish Species.**

For a full disclosure of effects on sensitive fish species, resulting from the selected alternative, please refer to the Biological Evaluation prepared for this analysis. Sensitive fish species include Bonneville cutthroat trout and Colorado cutthroat trout. A determination of "may impact, but not likely to to cause a trend to federal was made for Bonneville Cutthroat trout.

The only known populations of Colorado River cutthroat trout on the Fishlake National Forest occur in streams on the Loa Ranger District (Rodriguez 2004). There are no Colorado River cutthroat trout known to occur within the analysis area. The analysis area is outside of the native range of the Colorado River cutthroat trout. Direct and indirect effects to Colorado River cutthroat trout individuals would not occur because they are not found in the analysis area. A determination of "no impact" was made for Colorado River Cutthroat trout.

Essentially, fish are one of the life forms that can be affected when their physical habitats within streams are altered. The effects of livestock grazing on listed fish and critical habitat are related, in part, to the biophysical attributes of each specific area (watersheds vulnerability, climate, vegetation, etc). Effects of livestock grazing on stream habitat and fish populations can be separated into direct and indirect (chronic) effects. Direct effects are those that contribute to the immediate loss of individual fish, and loss of specific habitat features (undercut banks, spawning substrate, etc) or localized reductions in habitat quality (sedimentation, loss of riparian vegetation, etc.). Chronic effects are those, which, over a period of time, result in loss or reductions of entire populations of fish, or widespread reductions in habitat quantity and/or quality. Chronic effects of grazing result when upland and riparian areas are exposed to activity and disturbance levels that exceed the assimilative abilities of a given watershed. Both direct and indirect fish mortality are possible, and the potential for mortality extends to all life cycle phases.

Direct and Indirect Effects:

- **Alternative A – Proposed Action.** Direct effects to Bonneville cutthroat trout from the action alternative will be generally unlikely but may occur in uncommon situations. The most likely example of direct effects would include direct injury of eggs in spawning redds by livestock in the stream for watering or trailing across the creek. Other direct effects are very unlikely and would occur only from trampling of spawning eggs during herding operations or accidental introduction of toxic materials such as gasoline into the stream from an OHV upset during allotment operations.

Indirect effects to Bonneville cutthroat trout would be those effects that impact water quality. The primary potential for indirectly impacting fish, aquatic macroinvertebrates, or aquatic habitats would be from the introduction of fine sediment to the streams. Fine sediment can change the species composition, diversity, and abundance of macroinvertebrates as well as suffocate trout eggs and fry. It also can reduce pool volume, reducing suitable habitat for adults during low flow stream periods, as well as reducing wintering habitat carrying capacity. Finally, it can carry harmful nutrients and chemicals into the streams.

Watershed and riparian vulnerabilities caused by overstocking are documented in some areas of the Beaver River Watershed (BRWA) and in the 2003 Fishlake National Forest Level II Riparian Inventories. Some of these areas occur on the North-Indian Creek, Pine Creek/Sulphur Beds, and South Beaver Allotments within the same riparian areas where Bonneville cutthroat trout are known to occur. These populations may be impacted because these vulnerabilities indicate that current grazing management practices may be exceeding watershed and riparian capabilities. These aquatic riparian habitats provide suitable habitat for known Bonneville cutthroat trout populations that may be affected by re-issuing term grazing permits in these 8 allotments on the Beaver Ranger District.

The re-issuance of grazing permits on these 8 allotments may result in a reduction of vegetation (especially desirable species i.e. sedges, willows) along the stream channel. Alterations in riparian plant composition resulting from overuse (as described in the BWRA) may cause vegetation conversions to less desirable species such as Kentucky bluegrass and redtop. Continued over-utilization and reduction of stubble heights may also change rooting depths that affect bank stability. A reduction in vegetation and an increased concentration of livestock use in these riparian areas would have several indirect effects on the aquatic habitat. These effects include damage to streambanks from trampling, soil compaction, and shearing which often leads to increased width/depth ratios and a loss of undercut banks. Undercut banks provide cover for Bonneville and Colorado cutthroat trout. Damage to streambanks also cause increased sediment in the stream that decrease pool volume and cover spawning gravels. Increased width/depth ratios and a loss of stabilizing vegetation such as willows could lead to changes in stream shading. Both of these factors contribute to increased water temperatures. Furthermore, increased organic matter in the stream from livestock manure and direct effects such as cattle trampling spawned eggs may impact Bonneville cutthroat trout individuals and potentially suitable habitat for both sensitive fish species.

These effects may cause changes to aquatic biota diversity in these habitats. Fluctuations in water temperature and macro-invertebrate composition and density may impact Bonneville cutthroat trout individuals feeding and spawning success. Bonneville cutthroat trout require relatively cool, well oxygenated, water and the presence of clean, well-sorted gravels with minimal fine sediments for successful spawning (Rodriguez 2004). These effects may also impact potentially suitable habitat spread throughout the analysis area.

The two Bonneville cutthroat trout populations most heavily impacted by the proposed action will be Pine Creek and Birch Creek West (personal comm. with Jim Whelan). Grazing (the proposed action) and roads in Pine Creek may be impacting habitat and depressing populations but are not likely causing a trend to federal listing or a loss of viability.

A combination of prolonged drought, low flows, marginal habitat, and grazing (proposed action) have caused the Birch Creek West population to decline substantially since 1994. Maintenance of range improvements (as provided for in this proposed action) will be critical on exclosures that exclude livestock from parts of this drainage where the Bonneville cutthroat trout occurs.

Riparian exclosures can serve to improve water quality in streams by protecting the shoreline from livestock grazing reducing sediment inputs and creating a vegetative buffer between grazed areas and the water to trap overland flow of sediment and nutrients. Small riparian exclosures exist on Pine Creek. A large percentage of Birch Creek West is within livestock exclosures. Maintenance levels were generally inadequate in the late 1990s and exclosures were only partially functional, but maintenance levels have increased in recent years.

Observations of riparian conditions by fisheries personnel and riparian contractors (see Petty 2003) are that riparian grazing standards were often exceeded on portions of these creeks. Coordinated and continued diligent effort to manage livestock appropriately and provide proper administration of livestock use so that grazing standards are met could result in reduced impacts from grazing compared to the current situation and a gradual improvement of habitat conditions on some portions of these streams. Therefore, this proposed action may impact the Bonneville cutthroat trout individuals and/or their habitat but is not likely to cause a trend to federal listing or a loss of viability. Direct and indirect effects to Colorado River cutthroat trout individuals would not occur because they are not found in the analysis area. Normally streams outside of the native range of a species/sub-species are not considered for or counted for recovery objectives.

Direct and Indirect Effects:

- **Alternative B – No Grazing.** Fish habitat across the analysis area will improve significantly with elimination of livestock grazing and subsequent recovery of degraded riparian habitats. These improvements will be most dramatic in non-functioning and at risk reaches. Restoration of stable, vegetated streambanks with deeper, narrower channels and lower sediment loads will improve conditions for fish reproduction and survival. Although these benefits will be particularly meaningful to the isolated cutthroat trout populations competing with non-native brook trout, the impact of Alternative B would be beneficial to all cutthroat trout populations in reaches currently affected by grazing.

Recovery of impaired, low to moderate gradient, response channels, if not severely entrenched in their floodplains, generally follows a predictable progression (Bengeyfield and Svoboda 1998). The level of impairment, at the time in which the disturbance ends, determines the starting point in the recovery sequence.

- Existing vegetation along the stream margin increases in both vigor and density.
- Vegetation begins to trap sediments, causing deposition and building of the stream banks.
- As streambank deposition continues, the stream narrows, causing a decrease in width/depth ratio. In the coming years, as the channel continues to narrow, floods are no longer contained in the channel, but, instead, spread out on the floodplain. This serves to reduce channel erosion, and also results in greater exchange of water between the channel, floodplain, and riparian soils, eventually establishing a local

water table that is more resilient to seasonal fluxes in streamflow and climate. The narrow channel also becomes more efficient in transporting sediments, and excess in-channel deposition is reduced.

- The maintenance of these physical riparian functions eventually leads to the soil/water conditions necessary for the reestablishment of native streamside vegetation, such as willows and sedges, in the composition and densities necessary to assure long-term maintenance of the entire suite of physical, chemical, and biological riparian functions, that is, the desired condition.

However, where channels have become severely entrenched, stream recovery follows a much different initial response, and requires a much greater period to achieve pre-entrenched desired conditions. The vertical walls of an entrenched gully fully contain substantial floods and are subject to their full energies. As a result the gully walls first give way and widen until an energy balance is achieved – essentially a new floodplain width is shaped. At this point the sequence described above occurs within this inner floodplain and the gully floor rises through annual deposition until, many decades later, it may achieve the elevation of the former valley floor. Entrenchment is a catastrophic event in that it establishes a new sequence of events that must occur, over many years, before returning to a former state. Sediment quantities and the overall magnitude and duration of effects are considerably greater than non-entrenched conditions.

Sensitive Fish Species Cumulative Effects:

The cumulative effects analysis area for Bonneville cutthroat trout in the project area is the Beaver Ranger District or each BCT watershed from pour points upstream. Past, present, and reasonably foreseeable activities within the cumulative effects area include introduction of native and non-native fish species, fish stocking, private land ownership (subdivision construction activities), grazing, recreation, timber and thinning operations, reforestation and seeding of burned areas, chaining, seeding of native and non-native plant species, fire suppression, natural and prescribed fire, pesticide application, noxious weed control, and other special uses such as mining, hydroelectric operations, firewood and post cutting, municipal water developments, and irrigation diversion. Recreation-related activities include hunting, fishing, camping, day/picnic use, hiking, horseback riding, all-terrain vehicle (ATV & OHV) use, and campground/roads/trails maintenance and development. The introduction of non-native fish, fish diseases, stocking of hatchery fish, grazing, fires, fire management activities (drafting water from streams/lakes), timber/thinning operations, hydroelectric development, irrigation diversion/development, and noxious weed control has altered riparian and upland vegetation composition and densities and riparian environments, which has reduced habitat for Bonneville cutthroat trout in some cases.

Water manipulation, drought, hydroelectric/municipal water development, mining activities, fishing, introduction of non-native fish, fish stocking, and the accidental introduction of fish diseases within the cumulative effects area has likely affected these sensitive fish populations. A few drainages within the analysis area are infected with whirling disease (i.e. Beaver River). These kinds of fish diseases along with competition from non-native fish species and water manipulation are major factors affecting potentially suitable habitats for Bonneville cutthroat trout populations. Other management activities listed above that contribute to erosion and sediment loading into streams (i.e. thinning/timber operations, mining, recreation, fire, etc.) may affect these sensitive fish species and/or habitat when coupled with this proposed action. Therefore, the effects of the past, present, and reasonably foreseeable activities listed above in combination with this proposed action may impact Bonneville cutthroat trout individuals and/or their habitats but is not likely to cause a trend toward federal listing or a loss of viability.

Sensitive Fish Species Determinations

Determinations for implementation of Alternative A--the proposed action (Re-issuance of Term Grazing Permits on Eight Cattle Allotments on the Beaver Mountain-Tushar Range), Alternative B--no action/no grazing, and for Alternative C-- the Sustained Multiple Use Grazing alternative are summarized in Table 4-14. These determinations were made considering Alternative A, largely as a continuation or re-issuance of current conditions, while the other alternatives are made in reference to Alternative A considering effects to species discussed herein.

Key: MIS = Management Indicator Species for the Fishlake National Forest; BA = Biological Assessment for Threatened, Endangered, Proposed, and Candidate Species prepared specifically for this project; BE VS = Biological Evaluation for Sensitive Vertebrate Species prepared specifically for this project; BE PS = Biological Evaluation for Sensitive Plant Species prepared specifically for this project.

Table 4-14 Sensitive Fish Species Effects Determinations

Species	Status	Alternative A (Proposed Action)	Alternative B (No grazing)	Alternative C (SMU-G)
Colorado River Cutthroat Trout	S	No impact (Refer to BE VS)	No Impact	No Impact
Bonneville Cutthroat Trout	MIS/S	May impact but not likely to cause a trend to federal listing or a loss of viability (Refer to BE VS	Beneficial Effect	Increased habitat effectiveness

4. Issue – Socio-Economic Impacts

The subject to be considered in this section is the economic effect that would be expected if livestock grazing on National Forest System lands were to be significantly limited or eliminated.

Direct and Indirect Effects:

Alternative A – Proposed Action. This alternative provides criteria for a stubble height standard of 4 inches which is compatible with maintaining current permitted numbers and seasons of use. It is anticipated that more intensive livestock management will be required to ensure appropriate monitoring and timely livestock movements and to ensure complete livestock removal from units and that no twice-over use occurs. Timely gathers are defined as being within 5 days after reaching the 4-inch stubble height. Being untimely, which results in stubble heights reaching below 3 inches, would require administrative non-compliance actions, and could have adverse economic impacts on permittees. The effects of effectively implementing the Proposed Action are relative to permittees' cost/benefits from grazing on the allotments, the benefits to rural and county economies from livestock grazing, and revenues/costs to the government. Continuing livestock grazing at currently permitted numbers and seasons of use would sustain the existing National Forest System-dependent ranching industry. Although grazing fees would continue to be charged, and permittees would remain responsible for improvement maintenance and cooperative construction of new improvements, and there would be increased investments relative to management intensity, the net economic benefit is positive. Under the Proposed Action there would not be adverse social or economic effects to either permittees or rural community economies. Under the Proposed Action there would not be adverse effects to rural lifestyles. The Proposed Action meets the intent of the Fishlake National Forest Land and Resource Management Plan and is in compliance with laws permitting the grazing of livestock on National Forest System lands.

The following tables illustrate the economic circumstances created by this alternative. Similar tables are demonstrated for each alternative. Chapter 3 introduced two different approaches to determining economic effects; i.e.: economic multipliers, net values, contributions to local economies, etc. While it

is recognized that economists often agree and/or disagree concerning methods and derived assumptions (and therefore question the validity of differing data), these formulae and resulting data are uniformly applied to each alternative without discretion. These illustrations are for comparison purposes only, are intended to show the difference in social and economic impacts among the alternatives, and provide the Deciding Officer with a relative socio-economic value.

Table 4-15 Nielsen Formula: Proposed Action Grazing Costs Increase Due to More Intensive Management
Cattle permitted = 2531 AUMs permitted = 12,009 Cost = $13.82 non-fee costs + $1.79 fee costs = 15.61 x 12,009 AUMs = $187,460 total cost Assume a 10% increase in operational costs due to more intensive management Then: $187,460 x 1.10 = $206,206 ÷ 12,009 = $17.17/AUM Therefore the increase in cost of grazing = $17.17/AUM - $15.61/AUM = $1.56/AUM $1.56/AUM x 12,009 AUMs = $18,734

Based on this formula and the expected 10% increase in costs due to more intensive management, a total cost increase for the 8-allotment area is $18,734, or an average increase in costs of $1.56/AUM. In addition, a value of $80/AUM is used as the market value of an AUM. It is anticipated that cattle may have to leave the allotments early 33% of the time for as much as 15% of the season. The average loss in AUMs over a 10-year period is estimated at: 10 years x 33% = 3.3 years; 15% x 12,009 = 1,801 AUMs; 3.3 x 1,801 AUMs = 5,943 AUMs ÷ 10 years = an annual loss of 594 AUMs. 594 AUMs x $80/AUM = $47,520 annual loss in permit value. No significant impacts on the calving operation are anticipated.

Table 4-16 Proposed Action Annual Loss Calculations	
Annual Net Increase in Total Cost/AUM	-$18,734
Loss in Permit Value	-$47,520
Annual Loss in Calving Operation	-$0
TOTAL	-$66,254
Annual Loss to Counties (3.5 multiplier)[12]	-$231,889

Table 4-17 Proposed Action Net Value and Contribution to Local Economy

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

Alternative B – No Grazing. The most immediate and direct effect of this alternative would be the complete loss of livestock grazing. Under this alternative, livestock grazing would be eliminated (with the exception of recreation stock use). While a minimum of two years notice would be required prior to cancellation of grazing permits (36 CFR 222.4(a)(1)), grazing use would be reduced over a three-year period resulting in a total cessation of grazing in the 4th year. Required investments related to management and distribution of livestock during this period would decrease as well. However,

[12] 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)

maintenance responsibilities would not decrease proportional to the 20-40-60% decline in authorized grazing use during the three-year phase out period.

This would result in adverse social and economic effects to both permittees and rural community economies. The resulting loss of permitted livestock AUMs would affect the sustainability of ranching enterprises and in turn adversely affect rural lifestyles.

Table 4-18 Nielsen Formula: No Grazing Alternative Costs Increase Due to 100% Reduction
Cattle permitted = 2531
AUMs permitted = 12,009
Cost = $13.82 x 12,009 AUMs = $165,964 total cost
Assume a 100% reduction in AUMs is imposed
$165,964 total cost ÷ 0 AUMs (after reduction) = $0/AUM

Based on this formula and the proposed 100% reduction, no increase in operational costs are determined. In fact, permittees realize the savings of $165,964 in operational costs. In addition, a value of $80/AUM was used as the market value of an AUM. For the proposed 100% reduction of 12,009 AUMs, this tallied a loss in permit value to the permittees of $960,720. Impacts on the calving operation were estimated based on an 85% calf crop. A total reduction of 2531 mother cows at an 85% calf crop yielded a loss of 2,151 calves. The value paid for a calf in May 2005 was $658.88. This calculates a calf crop value lost in just one year of $1,417,251.

Table 4-19 No Grazing Alternative Annual Loss Calculations	
Annual Net Increase in Total Cost/AUM	**+$165,964**
Loss in Permit Value	**-$960,720**
Annual Loss in Calving Operation	**-$1,417,251**
TOTAL	**-$2,212,007**
Annual Loss to Counties (3.5 multiplier)	**-$7,742,025**
No Grazing	

Table 4-20 No Grazing Alternative Net Value and Contribution to Local Economy							
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

Alternative C - Sustainable Multiple Use Grazing (SMU-G). The most immediate and direct effect of this alternative would be the significant reduction of livestock grazing. Under this alternative, livestock grazing would be reduced by 70%. Grazing use would be reduced over a three-year period resulting in a loss of 70% of current by the 4th year. Required investments related to management and distribution of livestock during this period would decrease, but not proportionate to the reduction in permitted AUMs. Likewise, range Improvement maintenance responsibilities would not decrease proportional to the 70% decline in authorized grazing use. This would result in adverse social and economic effects to both permittees and rural community economies. The resulting loss of permitted livestock AUMs would affect the sustainability of ranching enterprises and in turn adversely affect rural lifestyles.

Table 4-21 Nielsen Formula—SMU-G Costs Increase Due to 70% Reduction
Cattle permitted = 2531
AUMs permitted = 12,009
Cost = $13.82 x 12,009 AUMs = $165,964 total cost
Implement a 70% reduction in AUMs (8,406 AUMs)
$165,964 total cost ÷ 3,603 AUMs (after reduction) = $46.06/AUM
If operating costs go down by 50% with a 70% reduction
Then: $165,964 x .50 = $82,982 ÷ 3,603 AUMs = $23.03/AUM
Therefore the increase in cost of grazing for the remaining 30% on the allotment =
If costs do not decrease: $46.06 - $13.82 = $32.24/AUM
If costs decrease by 50%: $23.03/AUM - $13.82/AUM = $9.21/AUM

Based on this formula and the proposed 70% reduction, a total cost increase for the 8-allotment area (assuming no decrease in costs) was $116,161, or an average increase in costs of $32.24/AUM. A value of $80/AUM was used as the market value of an AUM. For the proposed 70% reduction of 8,406 AUMs, this tallied a loss in permit value to the permittees of $672,480. Impacts on the calving operation were estimated based on an 85% calf crop. A total reduction of 1,772 mother cows at an 85% calf crop yielded a loss of 1,506 calves. The value paid for a calf in May 2005 was $658.88. This calculates a calf crop value lost in just one year of $992,237.

Table 4-22 SMU-G Alternative Annual Loss Calculations	
Annual Net Increase in Total Cost/AUM	**-$116,161**
Loss in Permit Value	**-$672,480**
Annual Loss in Calving Operation	**-$992,237**
TOTAL	**-$1,780,878**
Annual Loss to Counties (3.5 multiplier)	**-$6,233,073**

Table 4-23 SMU-G Alternative Net Value and Contribution to Local Economy							
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	-1,360	-13,450	-47,075
Marysvale	6,338	Cattle	147	6/1-9/30	-543	-5,370	-18,795
Ten Mile	12,620	Cattle	200	6/11-10/10	-739	-7,309	-25,582
Circleville	38,019	Cattle	359	6/1-10/15	-1,492	-14,756	-51,646
Pine Creek/Sulphurbeds	29,537	Cattle	600	6/16-9/30	-1,941	-19,196	-67,186
Junction	6,172	Cattle	35	11/1-2/15	-113	-1,118	-3,913
South Beaver	45,596	Cattle	520	6/1-10/15	-2,163	-21,392	-74,872
Cottonwood	500	Cattle	30	6/1-7/31	-55	-544	-1,904
Total Cattle			2531		-8,406	-$83,135	-$290,973

Cumulative Effects.

The area considered in the cumulative effects analysis for social and economic impacts is the two-county area encompassing and adjacent to the project area, consisting of Beaver and Piute Counties. This area was selected on the basis of adjacency with rural communities dependent upon National Forest resources for an economic base. The bi-county area, rather than isolation by county, was selected because of the regional inter-dependency upon the livestock industry as an economic base. There are basically three different economic concepts important for consideration of cumulative effects:

- **Social and Economic Effects:** Ranchers say that they are already on the verge of bankruptcy, that they are extremely important to local economies, and that any significant reductions in grazing will result in economic ruin and ultimately alter lifestyles. On the one hand, arguments are made that cattle operations of under 100 cows are unlikely to have an impact on local economies, since it is likely that these ranchers are ranching only for supplemental income. Power (2002) notes that in Utah less than 1% of Utah's income is derived from grazing federal forage. But there are others who

contend that, in today's world, financial obligations are met and budgets are balanced by combining incomes from several sources. And, through the years, grazing has been one of those pieces of the income pie for hundreds of southern Utah citizens. They argue that grazing on federal lands has played an important role in western culture, county economies, and rancher's survival. Permits and leases for federal lands grazing have taken on an assumed value of their own. The federal government has explicitly stated that private livestock grazing on federal lands is a privilege and not a right nor an interest in property. (See TGA, 43 USC §315b, and Supreme Court decisions *Light* v. *United States* (220 U.S. 523 (1911)), and *Osborne* v. *United States* (145 F.2d 892 (9th Cir. 1944). See also, *Swim* v. *Bergland* (696 F.2d 712 (9th Cir. 1983)). Nonetheless, ranches with access to federal forage often sell for a higher price than they would without access to federal rangelands. The result is that the value of the grazing preference is capitalized into the net worth of the ranch base property and is considered as an asset by the rancher. For decades ranches have been purchased and loans have been made against them with the expectation that permits will be renewed and apparently that grazing fees would remain relatively stable. Whether or not the expectations are justified, many ranches have depended upon permit or lease renewals and made financial decisions as if they were a right.

- **Preservation of Open Space:** One of the most difficult issues facing Utah citizens is managing the development of the state's natural resources to support a growing population while conserving open spaces. Ranches and farmlands situated along the foothills at the base of Utah's mountain ranges are fast disappearing as urban development pushes further into the suburbs. Growing costs, regulations, and urban expansion onto historic farmlands are forcing more farmers off their tractors. The market value of their farmlands and water rights is a strong inducement to sell out. As the urban population consumes the landscape, "urban sprawl" threatens to take all of the open spaces, affecting the very quality of life values modern society strives for. Farmlands have always been part of the open space that distinguished the difference between urban and rural lifestyles. However, declining farmlands and the purchase of water rights for urban development may actually perpetuate urban sprawl. In the more dense urban areas, farmlands have totally disappeared.
- **Recreational Conflicts:** Some local officials and entrepreneurs want to diversify local economies and take advantage of economic opportunities associated with growth in the "New West"; others oppose such change. Paradoxically, increasing tourism and attracting new businesses based on "quality of life" attractions may depend on maintaining the open vistas of traditional ranching. Depending on one's perspective and preferences, the growth in recreational use, passive tourism, or influx of new full- or part-time residents may be viewed as a great success or impending disaster. Utah has several counties listed among the fastest growing in the nation. Urbanization means that citizens will probably see more conflict about how public lands are used. The growing population will increase the demand for recreational use.

Alternative A – Proposed Action.

- **Social and Economic Effects**. Cumulative effects of sustained, permitted grazing would be positive on individual and local community economies and lifestyles. Area residents would be provided with needed products, and would continue to sustain other related, local businesses through their purchases. Profits from local businesses would continue to be retained at home, continuing to work through the community. Counties receive a benefit from tax revenues, production expenses, and higher employment opportunities for low-income individuals. Sustaining permitted grazing operations through improved practices, revised AMPs, and proper stocking would strengthen the practice of grazing on public lands, as favorable responses within rangelands would be viewed as acceptable. Ranches with access to federal forage would continue to sell for a higher price than they would without access to federal rangelands. The value of the grazing preference, capitalized into the net worth of the ranch base property, would continue to be realized as an asset by the rancher.

- **Preservation of Open Space:** Retention of cattle operations helps retain the current rural setting and open space of the associated communities and counties. The private farms and ranches along the base of the mountain ranges would continue to exist largely because of their owner's ability to graze the public rangelands above them. The Proposed Action would be in concert with the Quality Growth Act of 1999 passed by the Utah legislature for the purposes of preserving in or restoring lands to a predominantly natural, open, and undeveloped condition—to be used for: wildlife habitat; cultural or recreational use; watershed protection; or another use consistent with the preservation of the land in or restoration of the land to a predominantly natural, open, and undeveloped condition.
- **Recreational Conflicts:** The steady and rapid urban population growth places an additional strain on the regional and local environments because many of these areas are bounded by mountain ranges and water bodies and include land that is essentially arid. Increasing urbanization will continue to impact air quality, land use, and water supplies. Conflicts between cattle grazing and recreation would be expected to increase under increasing use by recreationists.

Alternative B – No Grazing. Most likely some permittees would sell their property that could then be subdivided. This would result in moving the counties away from a rural atmosphere and increasing the loss of farm acreage and open space. Conflicts between recreation and livestock grazing would be eliminated in the long run. After the three- year phase out period, there would be a need to remove fences and livestock watering facilities. Some ponds or collection pits may be left in place. However, if fences or troughs are left in place, their condition would deteriorate and remaining materials, especially fence wire, would become a hazard for recreation livestock, recreation users, and big game.

- **Social and Economic Effects:** Livestock production is critical to the economies of many rural Utah communities. Utah ranchers depend on 32% of their total livestock forage to come from federal lands (Power 2003). For those ranchers who have a significant financial stake in federal lands grazing, the economic impacts of severe reductions or elimination of federal lands grazing would be substantial enough to eventually lead them to close down their operations and exit the industry. Cattle grazing would be phased out in the short term. As all of the permittees are dependent on the National Forest for summer forage, they would have to go out of business, or significantly change their operation, or find forage somewhere else. It is unlikely that operators would find sufficient forage within a reasonable distance to maintain existing permitted livestock. Those that go out of business would most likely sell their base property or shift more into farming. Those that retain some cattle would most likely reduce their operations to a significantly lower level. This would move counties further away from traditional uses associated with agriculture. Ranching is the dominant agricultural activity in Utah, where livestock production constitutes about 75% of the gross agricultural product (Power 2003). Thus, without grazing, not only would the ranchers suffer, but also would the economy of the state. Jones (1997) reported that 43% of ranchers polled in Utah said that they would quit ranching if grazing costs increased. He determined that a 43% reduction in cattle businesses would cost the Utah economy $24 million per year. If prevented from grazing livestock on federal rangeland, many ranchers would be forced to stop operating. Several small towns in the affected counties depend on the local ranchers to survive. If these grazing permits are revoked, not only will the ranchers suffer but so will the small towns. Without access to federal rangelands, ranches would probably sell for a lower price than they would with attached grazing permits. The result would be that the value of the grazing preference, capitalized into the net worth of the ranch base property, would be de-valued and/or lost, resulting in a decline in total ranch value. Ranchers are the biggest managers of federal lands. If rancher's permits for grazing federal land are removed, more people will have to be paid to manage these lands. Some examples of increase management areas may be weed control and fire control by preventing the buildup of excess biomass using prescribed burns. These expenses will be increased to manage the rangeland, and there will be lost revenue due to the loss of the permit system.

- **Preservation of Open Space.** To prohibit ranchers access to federal rangelands would cause them to lose their farms and ranches and open these areas to development. A continued shift in profits undermines the economic stability of many ranches and contributes to further urbanization of Utah. Faltering cattle ranches are susceptible to sale and transformation from resource production to unintended developments, turning open space into patches of blacktops and rooftops. Conversion of private ranchland into housing subdivisions would increase and become a more critical concern driving a number of environmental and land management problems, including wildland fire policy, water rights conflicts, and critical wildlife habitat.
- **Recreational Conflicts:** Conflicts between recreation and livestock would be eliminated in the short term.

Alternative C – Sustainable Multiple Use Grazing (SMU-G). A 70% reduction in permitted use would most likely result in some permittees selling their property that could then be subdivided. This would result in moving the counties away from a rural atmosphere and increasing the loss of farm acreage and open space.

- **Social and Economic Effects:** The income and employment data available suggest that few families could currently survive on the basis of either 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 would move elsewhere because the income obtained from off-farm employment would not be 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 could cause both the farm and nonfarm sectors to decline. With increased restriction, reduced numbers and limited access to federal rangelands, ranches would probably sell for a lower price than they would without limitations. It would be unlikely that existing permittees would be able to find new operators willing to invest in an area where restrictions make grazing more difficult. The result would be that the value of the grazing preference, capitalized into the net worth of the ranch base property, would be de-valued and/or lost, resulting in a decline in total ranch value. Under this Alternative and in the short term, the cumulative effects of adverse impacts to ranching enterprise sustainability would result in a decline in total ranch value.
- **Preservation of Open Space.** To restrict ranchers access to federal rangelands would cause them to eventually lose their farms and ranches and open these areas to development. A continued shift in profits undermines the economic stability of many ranches and contributes to further urbanization of Utah. Faltering cattle ranches are susceptible to sale and transformation from resource production to unintended developments, turning open space into patches of blacktops and rooftops. Conversion of private ranchland into housing subdivisions would increase and become a more critical concern driving a number of environmental and land management problems, including wildland fire policy, water rights conflicts, and critical wildlife habitat.
- Recreational Conflicts: Conflicts between recreation and livestock would be reduced or mostly eliminated in the short term on upland areas. In riparian areas conflicts between cattle grazing and recreation would be expected to increase under increasing use by recreationists.

Comparison of Alternatives.

Table 4-24 Socio-Economic Comparison of Alternatives			
Component	**Alternative A - Proposed**	**Alternative B – No Grazing**	**Alternative C – SMU-G**
Permitted #	2,531	0	759
Permitted AUMs	12,009 AUMs. AUMs will be monitored; may vary over time.	0 AUMS: 20% reduction per year until no AUMs permitted	3,603
Operational Costs	Up $18,734	$165,964; $0 in 4 years	$116,161
Loss in Permit Value	$47,520	$960,720	$672,480
Annual Loss in Calving Operation	$0	$1,417,251	$992,237
Total Increased Costs	$66,254	$2,212,007	$1,780,878
Annual Loss to Counties	$231,889	$7,742,025	$6,233,073
Net Value	$118,769	$-118,769	$-83,135
Contribution to Local Economy	$415,692 – $231,889 = $183,803	$-415,692	$-290,973
Forage Produced and Available	On suitable grazing areas, 67,039,375 pounds of forage produced per year. 24% of 67,039,375 pounds total production = 16,089,450 pounds of available forage. As seral stages move from very early to mid and late, sites are more productive and greater use is allowed	Initially, 16,089,450 pounds of forage available. This would be reduced by 20% per year until no forage is available.	On suitable areas (less excluded areas), 28,713,648 pounds of forage produced per year. 12% of 28,788,923 pounds total production = 3,454,671 pounds of available forage.
Trend in Range Condition	Static to slow improvement on upland ranges; in degraded riparian sites, measurable improvement occurs within 10 years	Static to moderate improvement on upland ranges; in degraded riparian sites, measurable improvement occurs within 5 years.	A 70% reduction in numbers will result in limited use of uplands, which will show moderate improvement in 10 years. A reduction in cattle numbers will not significantly reduce concentration in riparian areas; however, the significance of the reduction should result in measurable improvement of degraded riparian sites within 5-10 years.
Proper Use Levels	Increases as seral stages in riparian areas move from very early and early to mid and late; upland use levels will remain static	No use allowed after 4th year period of reductions at 20-40-60-100% stages per year.	Use by 30% of permitted numbers allowed after 3 year period of reductions.

Chapter 4 Definitions

Alluvial Terraces: Flat elevated benches composed of unconsolidated alluvium found either side of a stream channel. Formed when a stream down cuts into its floodplain.

Alluvium: Sediment that originates from a stream.

Anchor ice: Ice formed below the surface of a body of water that attaches either to a submerged object or to the bottom. Also called bottom ice, ground ice.

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

Aquifer Recharge Area: Surface area that provides water for an aquifer.

Aquifer Storage: The ability of the aquifer to store water in interconnected pores and fractures. Aquifer storage is quantified by a values referred to as storativity and specific yield.

Area of Critical Environmental Concern (ACEC) -an area where special management attention is required to protect and prevent irreparable damage to important historic, cultural, scientific, wildlife or scenic values.

Bankfull: The term bankfull was originally used to describe the incipient elevation on the bank where flooding begins. In many stream systems, the bankfull stage is associated with the flow that just fills the channel to the top of its banks and at a point where the water begins to overflow onto a floodplain. The bankfull stage and its attendant discharge serve as consistent morphological indices which can be related to the formation, maintenance and dimensions of the channel as it exists under the modern climatic regime. The terms effective and/or dominant discharge are synonymous with bankfull discharge.

Bed Load: Portion of the stream load that is carried along the stream bed without being permanently suspend in the flowing water.

Bedrock: Rock at or near (beneath soil and regolith) the Earth's surface that is solid and relatively unweathered.

Biomass: The weight of living tissues usually measured per unit area over a particular time interval.

Biotic Potential: Maximum rate that a population of a given species can increase in size (number of individuals) when there are no limits on growth rate.

Braided Stream: Shallow stream channel that is subdivided into a number of continually shifting smaller channels that are separated by bar deposits.

Candidate Species: Any species of fish, wildlife, or plant considered for possible addition to the list of endangered and threatened species. These are taxa for which the NOAA Fisheries or USFWS has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposal to list, but issuance of a proposed rule is currently precluded by higher priority listing actions.

Cavity nesters: Birds that are cavity nesters place their nest in a hole within a live or dead tree or other structure.

Colonization: Movement of individuals or propagules of a species to a new territory.

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.

Depauperate: Impoverished, small.

Disclimax: A community of woody and herbaceous species, different from that which would be expected under prevailing climatic, edaphic, and topographic conditions. Disclimax vegetation develops after human intervention or natural catastrophic events.

Economic multipliers: Multipliers capture the size of the secondary effects in a given region, generally as a ratio of the total change in economic activity in the region relative to the direct change. Multipliers may be expressed as ratios of sales, income or employment, or as ratios of total income or employment changes relative to direct sales. Multipliers express the degree of interdependency between sectors in a region's economy and therefore vary considerably across regions and sectors.

Endemic: Present in a community at all times but in relatively low frequency. Something that is endemic is typically restricted or peculiar to a locality or region.

Environmentally preferred alternative: The environmentally preferred alternative is the alternative that will promote the national environmental policy as expressed in NEPA's Section 101. Ordinarily, this means the alternative that causes the least damage to the

biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources.

Floodplain: The area adjacent to the active stream channel which is inundated during flows that exceed bankfull level. The floodplain acts as an energy dispersion zone during flood flows, and functions as an area of deposition.

Formal consultation: A process between the Services and a Federal agency or applicant that: (1) determines whether a proposed Federal action is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat; (2) begins with a Federal agency's written request and submittal of a complete initiation package; and (3) concludes with the issuance of a biological opinion and incidental take statement by either of the Services. If a proposed Federal action may affect a listed species or designated critical habitat, formal consultation is required (except when the Services concur, in writing, that a proposed action "is not likely to adversely affect" listed species or designated critical habitat). [50 CFR §402.02, 50 CFR §402.14]

Fry: Newly hatched, active feeding post larval fishes; may include all fish stages from hatching to fingerling

Gradient: The steepness of a slope as measured in degrees, percentage, or as a distance ratio (rise/run).

Gully: A miniature valley eroded by water. A ravine is a depression worn by running water, larger than a gully and smaller than a valley.

Habitat fragmentation: The separation of a landscape into various landuses (e.g, development, agriculture, etc.), resulting in numerous small, disjunct habitat patches left for use by wildlife. Fragmentation eliminates habitat for those species requiring large unbroken blocks of habitat. Additionally, the small habitat patches resulting from fragmentation often do not provide the food and cover resources for many species that do attempt to use them . This can result in an increased risk of death by predation, if the animal has to venture beyond the cover of the patch to find new food resources, or starvation.

Infiltration Rate: Rate of absorption and downward movement of water into the soil layer.

Informal consultation : An optional process that includes all discussions and correspondence between the Services and a Federal agency or designated non-Federal representative, prior to formal consultation, to determine whether a proposed Federal action may affect listed species or critical habitat. This process allows the Federal agency to utilize the Services' expertise to evaluate the agency's assessment of potential effects or to suggest possible modifications to the proposed action which could avoid potentially adverse effects. If a proposed Federal action may affect a listed species or designated critical habitat, formal consultation is required (except when the Services concur, in writing, that a proposed action "is not likely to adversely affect" listed species or designated critical habitat). [50 CFR §402.02, 50 CFR §402.13]

Listed Species: Any species of fish, wildlife, or plant determined to be endangered or threatened under Section 4 of the ESA.

Market value: Fair market value is the price an item would sell for, assuming the buyer and a seller both have reasonable knowledge and are not under undue pressure. To determine fair market value, it is common to compare other similar properties sold near the same time as your property.

Migratory bird: All birds, whether or not raised in captivity, included in the terms of the [migratory bird] conventions between the United States and any foreign country.

Net present value: The Net Present Value (NPV) of a project or investment is defined as the sum of the present values of the annual cash flows minus the initial investment.

Non-point source pollution: NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water. These pollutants include: excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas; oil, grease, and toxic chemicals from urban runoff and energy production; sediment from improperly managed crop and forest lands, and eroding streambanks; salt from irrigation practices and acid drainage from abandoned mines; bacteria and nutrients from livestock, and other animal wastes.

Nutrient loading: Quantity of nutrients entering an ecosystem in a given period of time. A nutrient is any substance assimilated by organisms that promotes growth. Marine scientists typically measure nitrites, nitrates, phosphates, and silicates as nutrients for plant growth

Open space: An area of land that is valued for natural processes and wildlife, for agricultural and sylvan production, for active and passive recreation, and/or for providing other public benefits.

Overland Flow: The topographic movement of a thin film of water from precipitation to lower elevations. With time, this water will begin to organizing its flow into small channels called rills. The rills converge to form progressively larger channels until stream channels are formed. Occurs when the infiltration capacity of an area's soil has been exceeded. Also called sheet flow or runoff.

pH: Scale used to measure the alkalinity or acidity of a substance through the determination of the concentration of hydrogen ions in solution. A pH of 7.0 is neutral. Values below 7.0, to a minimum of 0.0, indicate increasing acidity. Values above 7.0, to a maximum of 14.0, indicate increasing alkalinity.

Point bar: Point bar deposits are curving bodies mainly constituted of sand, formed by accretion on the convex bank of a meander. Point bar deposits occur in meandering streams, where an winding flow can be observed, the surface flow towards the outer bank, eroding it sometimes very impressively, and the bottom flow towards the inner bank, where deposition occurs

Preliminary biological opinion: The opinion issued as a result of early consultation. [50 CFR §402.02]

Proposed Species: Any species of fish, wildlife, or plant that is proposed by NOAA FISHERIES or USFWS for federal listing under Section 4 of the ESA.

Reach: An expanse of a stream channel.

Recovery: Improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the Act. [50 CFR §402.02].

Riffle: Bar deposit found on the bed of streams. Associated with these deposits are pools.

Rill: A very small steep sided channel carrying water. This landscape feature is intermittent and forms for only a short period of time after a rainfall.

Riparian guild: A group of species that use are dependent, in a similar way, upon the various niches of vegetation communities found in riparian zones, i.e.., tall deciduous trees, willows, riparian shrubs, riparian grasses. In general, guild or life-form models are designed to characterize how a set of species with similar characteristics or attributes will respond to a change in environmental conditions.

Rosgen stream type A: Very steep to steep, deeply entrenched, high energy debris transport associated with depositional soils. Very stable if bedrock or boulder dominated channel.

Rosgen stream type B: Moderately entrenched, moderate gradient, riffle dominated channel, with infrequently spaced pools. Very stable plan and profile. Stable banks.

Rosgen stream type C: Low gradient, meandering, point-bar, riffle/pool, alluvial channels with broad, well-defined floodplains.

Rosgen stream type E: Low gradient, meandering riffle/pool stream with low width/depth ratio and little deposition. Very efficient and stable. High meander width ratio.

Rosgen stream type G: Entrenched “gully” step/pool and low width/depth ratio on moderate gradient.

Runoff: The topographic flow of water from precipitation to stream channels located at lower elevations. Occurs when the infiltration capacity of an area's soil has been exceeded. It also refers to the water leaving an area of drainage. Also called overland flow.

Sage nesters: Birds that use sagebrush and sagebrush habitat, often called shrub-steppe, for its nesting habitat.

Sediment: Solid material, both mineral and organic, that is in suspension, being transported, or has been moved from its site or origin by air, water, gravity, or ice.

Significant environmental impact: Significant impacts are substantial, or potentially substantial, changes in any of the physical conditions within the area affected by a project. A significant impact is based on standards identified in CEQ, applicable public policies and regulations, professional judgment and judicial decisions. Where significant impacts are identified, mitigation measures are recommended to reduce or eliminate potentially significant impacts.

Soil Permeability: The rate at which water and air move vertically through a soil.

Spawning: Spawning is the production or depositing of eggs by aquatic organisms. Depending on the species many fish spawn in different methods and at different times of the year.

Spawning redds: Most salmonids deposit their eggs in nests called redds, which are dug in the streambed substrate by the female. Most redds occur in predictable areas and are easily identified by an experienced observer by their shape, size, and color (lighter than surrounding areas because silt has been cleaned away). Spawning surveys utilize counts of redds and fish carcasses to estimate spawner escapement and identify habitat being used by spawning fish. Annual surveys can be used to compare the relative magnitude of spawning activity between years.

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 Bank: Sides of the stream channel.

Stream Bed: Bottom of the stream channel. The substrate plane, bounded by the streambanks, over which the stream water flows.

Stream Channel: Long trough-like depression that is normally occupied by the water in a stream.

Stream Discharge: A river or stream's rate of flow over a particular period of time. Usually measured by a current meter and expressed in cubic meters per second. Stream discharge depends on the volume and velocity of the flow.

Stream Flow: The flow of water in a river or stream channel.

Stream Gradient: The change in elevation from a stream's headwaters to its mouth expressed in degrees, percentage, or as a distance ratio (rise/run).

Stream Load: Refers to the material or sediment carried by a stream. In normally consists of three components: bed load (pebbles and sand which move along the stream bed without being permanently suspend in the flowing water), suspended load (silts and clays in suspension) and dissolved load (material in solution).

Stream meander: A winding, curving, and turning course. Sinuosity refers to 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.

Suspended Load: Portion of the stream load that is carried almost permanently suspended in flowing water.

Terrestrial: Living on land.

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.

Total suspended solids: Total solids" (TS) is the material residue left in a vessel after evaporation of a sample and subsequent drying in an oven at a defined temperature. Total solids includes "total suspended solids"(TSS), the portion of total solids retained by a filter, and "total dissolved solids", the portion that passes through the filter (2.0 micron or smaller 0.45 micron). "Dissolved solids" refer to any minerals, salts, metals, cations or anions dissolved in water. This includes anything present in water other than the pure water (H20) molecule and suspended solids. Suspended solids are any particles/substances that are neither dissolved nor settled in the water, such as wood pulp.

Turbidity: A cloudy condition in water due to suspended silt or organic matter. Turbidity is the measurement of the effect that suspended solids has on the transmission of light through an aqueous solution such as water. This is a qualitative measurement.

USF&WS determination:

- **No Effect (NE):** A determination of NE is applicable if (a) there are no listed or proposed species or designated or proposed critical habitat occurring in the area, or (b) the project will have no impacts on the species (documentation of this is required). A NE determination is only appropriate when the proposed action will have no direct or indirect effect whatsoever on listed or proposed species.
- **May Affect, Not Likely to Adversely Affect (NLAA):** This determination is the appropriate conclusion when a proposed action may pose any effects on listed species or designated critical habitat. When the Federal agency proposing the action determines that a "may affect" situation exists, then they must either initiate formal consultation or seek written concurrence from the Services that the action "is not likely to adversely affect" listed species.
- **Likely to Adversely Affect (LAA):** This determination is the appropriate finding in a biological assessment (or conclusion during informal consultation) if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial (see definition of "is not likely to adversely affect"). In the event the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, then the proposed action "is likely to adversely affect" the listed species. If incidental take is anticipated to occur as a result of the proposed action, an "is likely to adversely affect" determination should be made. An "is likely to adversely affect" determination requires the initiation of formal section 7 consultation.

Vector: Literally 'a carrier'. An animal, vehicle, wind, water course, etc. carrying seeds of noxious weeds.

Viability: Capability of living things of normal growth and development.

Watershed: A topographically discrete unit or stream basin that includes the headwaters, main channel, slopes leading to the channel, tributaries and mouth area. The land area from which surface runoff drains into a stream, channel, lake, reservoir, or other body of water; also called a drainage basin.

Water Table: Top surface of groundwater. The top of an unconfined aquifer; indicates the level below which soil and rock are saturated with water. The upper surface of the saturation zone.